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**SECTION 1**

**Engineering, Environmental**



**The Numerical Simulation of the Infrasonic Emission of Japanese Subducting Plate during Earthquake Incubation**

**Q. Wang, Q. Liu, X. Wang, N. Guo, J. Han, S. Lao, and M. Lu**

**ABSTRACT**

Infrasound monitoring has been applied more and more extensively in seismic monitoring. A numerical model of Northeast Japan is presented, and a 2D Finite Element Method (FEM) is used as an example. A layer geological model and effect of the Pacific subducting plate were included in the numerical model. According to the structural and fluid dynamic coupling theory, the infrasonic wave is obtained through the numerical simulation. The characteristics of the waveform and the frequency range are Corresponding to the better between observed and simulated.

**Keywords:** *Earthquake, Infrasonic, FEM, the Subducting Plate*



**Remediation of Soil Contaminated with Hexavalent Chromium (Cr<sup>6+</sup>):  
Reduction and Stability  
X. Lu, and P. Wang**

**ABSTRACT**

Samples of soil polluted with hexavalent chromium (Cr<sup>6+</sup>) were taken from an electroplating workshop in Jingjiang, China. The soil that had been contaminated with Cr<sup>6+</sup> was subsequently treated utilizing reduction and stabilization techniques. The ability of six reducing agents to remove Cr<sup>6+</sup> contamination (iron, SSL, FeSO<sub>4</sub>, Na<sub>2</sub>HSO<sub>3</sub>, Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>, and Na<sub>2</sub>S) was investigated. FeSO<sub>4</sub> was the most effective reducing stabilizing agent; its efficacy varied with pH, with neutral or nearly neutral being the ideal pH. The effects of using cement as a curing agent, acidified ferrous sulfate as a reducing agent, and coloring in combination were also examined. The curing effect on the Cr<sup>6+</sup>-contaminated soil significantly improved with increases in cement content and curing age.

**Keywords:** *Six Valence Chromium, Soil Pollution, Reducing Agent, Curing Agent*



**The Southern Margin of the Taklimakan Desert Paleotemperature Reconstruction Using Tamarix Leaf Carbon Isotope Discrimination**

**Z. Zhang, Y. Fang, L. Li, Z. Sun, Y. Zhao, and X. Xia**

**ABSTRACT**

Plant differentiation of carbon isotopes is influenced by environmental factors. Because of this, carbon isotope discrimination captures a multitude of environmental data, including temperature, precipitation, and other variables, and the influence of the dominant factor is considerable. Based on this supposition, we identified the carbon isotope composition ( $\delta^{13}C$ ) of Tamarix, a plant thriving in the southern Taklimakan Desert, where water and temperature are the main growth inhibitors. The variance in the carbon isotope discrimination value (DS) was significantly influenced by mean annual temperature (MAT), but not by precipitation. The fact that MAT was the first and only variable chosen into the prediction model of DS versus MAT and precipitation in multiple stepwise regression analysis shows that the effect of temperature on carbon isotope discrimination was predominate. The relationship between DS and the rate of precipitation fluctuation over the previous year demonstrates that precipitation, which is a significant factor in arid environments, has a certain "lag effect" on Tamarix development. The results of the reconstructed MAT regression model, which was created using the DS with least squares method, support the claim that the planet's temperatures have changed dramatically over the past 50 years.

**Keywords:** *Taklimakan Desert, Tamarix, Carbon Isotope Discrimination*

**Population Dynamics of a Dominant Haloxylon Species in the Southern Gurbantunggut Desert, Central Asia, Across a Habitat Gradient**  
**R. Yang, C. Zhao, X. Wang, Y. Yang, and Y. Li**

**ABSTRACT**

Widespread vegetation can act as useful indicators of ecosystems' resiliency or sensitivity to perturbations in the context of habitat change. This study set out to determine the haloxylon population structure and individual morphological features in order to examine morphological variations in tree and recruit density, individual size, and their geographic structure. Haloxylon populations were counted at each sampling site as part of a field experiment that we ran. To assess each individual morphological characteristic, we also measured soil nutrients and gathered climate information. As compared to basal diameter, crown radius, and height, our findings revealed a considerable decline in tree density from the southern desert (4445 trees/ha) to the center desert (481 trees/ha). All research areas displayed positively skewed, asymmetric distributions of tree basal diameters. Populations possessed a "reverse J"-shaped structure in terms of their diameter and height, which indicated population expansion. The highest tree density (6133 trees/ha) was found in the valleys between permanent dunes, although this trend is not present in the other two zones. The middle desert had few recruits, but from the central (21 individuals/ha) to the southern Gurbantunggut desert (107 individuals/ha), their density rose. In all study plots, trees were spatially grouped, with recruits showing the most pronounced aggregation in fixed dunes. Because of seed rain patterns and the availability of soil moisture and nutrients, saplings were mostly located in the vicinity of mature trees. Although Haloxylon spp. can withstand significant climatic and ecological changes, recruitment can be unexpected in hard, extreme desert environments. The primary ecological element affecting the spatial patterns was the physicochemical composition of the soil. Moisture and nutrient contents in the soil dramatically decreased as altitude rose. The Haloxylon population differed depending on the dune habitat. Future management, however, should consider species demographics when assessing the health of ecosystems.

**Keywords:** *Haloxylon, Population Structure, Latitudinal Variation, Cluster, Recruitment, Gurbantunggut Desert*

**Studying the Geographic Distribution Traits of Arable Land, Economic Quality Composite Grade, and Environment in China's Yunnan Province**

**G. Zhang, C. Zhang, S. Liu, and H. Zheng**

**ABSTRACT**

For the purpose of using and enhancing the quality of arable land, it is crucial to understand the distribution features of arable land in Yunnan Province. Based on the success of cultivated land categorization in Yunnan Province, the distribution features of the arable land grade, covering 129 counties, were examined in this study. In a scale from 1 to 13, the results showed that the average economic quality composite grade was 2.9, indicating that the economic quality of Yunnan Province's arable land is relatively poorer. The outstanding zone has a grade range of 1 to 10, with a 2.4 average. It falls between 1 and 13 and has an average grade of 3.1 in the good zone. Its range in the middle zone is 1–12, with an average value of 3.2. It falls between 1 and 11 in areas of poverty, with an average of 3. It varies from 1 to 10 in the worse zone, with an average of 2.2. The majority of the province's arable land is located in middle- and low-income areas, which has a significant impact on the province's average grade. Future arable land policy-making in Yunnan Province will use this research as a guide, particularly for improving quality, pacing arrangements, and environmental protection.

**Keywords:** *Arable Land, Economic Quality Composite Grade, Distribution, Ecological Environment, Yunnan Province*

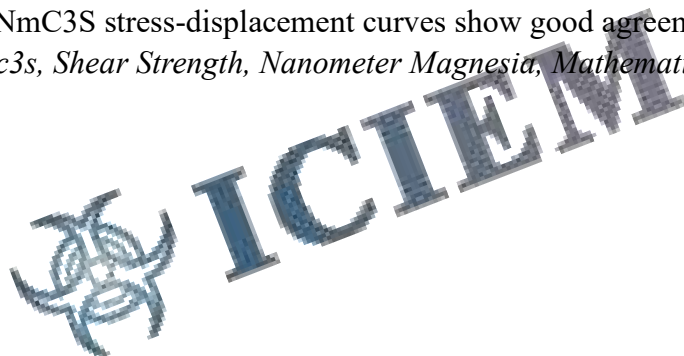
**Direct Shear Behavior of Seashore Soft Soil Reinforced with Nanometer Magnesium and Cement after 7 Days of Curing**

**A. Zhou, W. Wang, X. Song, F. Tao, and S. Chi**

**ABSTRACT**

Based on a laboratory direct-shear test, the mechanical behavior of nanoscale magnesia and cement reinforced seashore soft soil (NmC3S) with a 7d curing age is compared to seashore soft soil (3S) and cement reinforced seashore soft soil (C3S). There are four typical stresses that are taken into account. The test's findings indicate that NmC3S has a higher deformation modulus and shear strength than C3S and 3S. Before 1.0 mm of shear displacement, shear stresses of both C3S and NmC3S dramatically decrease and essentially flatten out. Their failure displacements also grow with greater normal stress at the same time. Although NmC3S has a stronger cohesive force than C3S and 3S, the size of its inner friction angle is comparable to that of C3S and 3S. Last but not least, a composite sine-exponent mathematical model is created for both harden type and soften type curves of the investigated shear stress-displacement curves. The simulated and tested C3S and NmC3S stress-displacement curves show good agreement.

**Keywords:** *Nmc3s, Shear Strength, Nanometer Magnesia, Mathematical Model*





**Research on the Arsenic Removal Capabilities of Natural Manganese Ore and Iron-oxidizing Bacteria****Y. Huang, C. Niu, Q. Qiu, W. Xu, H. Gao, R. She, and S. Tu****ABSTRACT**

In this study, natural manganese ore is leached with iron-oxidizing bacteria. The prepared eroded manganese ore is then characterized using X-ray fluorescence, X-ray diffraction analysis, and scanning electron microscopy testing technology. This study also provides additional research on the removal effectiveness and mechanism of the eroded manganese ore on the arsenic. According to the experiment's findings, eroded manganese ore had saturated adsorption capacities of 18.52 mg/g and 19.23 mg/g on As(III) and As(V), respectively. The elimination of arsenic by the eroded manganese ore is well described by the Langmuir adsorption model. When the pH value is close to neutral, the best removal performance of eroded manganese ore on the arsenic can be reached, and the coexisting cation ( $\text{Ca}^{2+} + \text{Mg}^{2+}$ ) can improve the removal rate of arsenic. The removal rate of arsenic is positively connected with temperature. The characterization experiment demonstrates that the primary components of manganese ore—Mn, Si, Fe, and Al—did not change between before and after immersion, but that the amounts of MnO and Fe<sub>2</sub>O<sub>3</sub> and hydroxyl increased and the porosity and porosity ratio decreased, respectively.

**Keywords:** *Iron-Oxidizing Bacteria, Manganese Ore, The Arsenic's Removal Rate, Mechanism*

**Chinese Inner Mongolian Wolitu Pb-Zn Deposit Under Loess Cover  
Geochemical Investigation**

**F. Yang, M. Kong, H. Liu, J. Yu, S. Yang, Z. Hao, and D. Zhang**

**ABSTRACT**

The Wolitu Pb-Zn deposit, which is covered in loess, was successfully geochemically explored, according to this paper. As an exploration target for Pb-Zn mineralization, a sizable Pb-Zn anomaly characterized by a stream sediment survey in the gullies at a density of 4–8 samples/km<sup>2</sup> in a loess-covered area in the Wolitu area, Inner Mongolia, China, was detected. A variety of geochemical exploration techniques were used to narrow the target region by gradually increasing the sampling density in order to examine the prospect of economic Pb-Zn mineralization completely. The Pb-Zn geochemical anomaly was initially thought to be mineralization of Pb, Zn, and Ag when it was first discovered by preliminary rock sampling from sporadic outcrops in the gully close to the Pb anomaly. Local Pb-Zn geochemical anomalies over the hidden marble and carbonaceous slate of the Carboniferous Shizuizi Formation delineated by a subsequent detailed survey using a special sampler originally used for exploring tombs by grave robbers at a density of 1 sample per 100 m by 50 m grid (equal to 210 samples/km<sup>2</sup>). Trenching was used to identify four regions of oxidized Pb orebodies after residual debris sampling to confirm the Pb anomaly. Drilling eventually led to the discovery of blind Pb-Zn orebodies. A reserve with a grade of Pb 1.27% and Zn 1.9% weighing 540,000 tons was found.

**Keywords:** *Geochemical Exploration, Loess-Covered Area, Pb-Zn Deposit, Inner Mongolia*

**Groundwater's Hydrochemical Evolution in the People's Victory Canal  
Irrigation District**

**Z. Liu, W. Yuan, F. Wang, and Y. Han**

**ABSTRACT**

The groundwater's natural circulation system is affected by climatic change and very labor-intensive human activities. Studying the evolution of regional water circulation has benefited by the identification and tracking of variance information. The People's Victory Canal Irrigation District has been chosen as the study region to examine the chemical properties of groundwater's geographical distribution rule throughout wet and dry seasons. The mechanism of action of the local groundwater is revealed using techniques such as statistical methods and ion proportional coefficient, among others. The results show that: the concentrations of TDS and major ions, such as  $\text{Na}^+$  and  $\text{Ca}^{2+}$ , are lower in the wet season than in the dry season, while the concentration of  $\text{HCO}_3^-$  is higher in the wet season than in the dry season, primarily because the groundwater receives a greater supply of precipitation during the wet season. In terms of space, groundwater's principal chemical ions and TDS both exhibit a steadily rising tendency. Along the groundwater's flow direction, the hydrochemical kinds progress from low-mineralization type groundwater to high-mineralization type groundwater. The excessively high TDS and ion concentrations in G-08 and G-06 are mostly the result of man-made pollution.

**Keywords:** *The People's Victory Irrigation District, Hydrochemical Characteristics, Groundwater Chemical Composition, Evolution Rule*

**Evaluation of Applicability on The Henan Province Typical Drought Indexes****F. Wang, Z. Zhang, P. Kang, and L. Wang****ABSTRACT**

The basis for drought management and decision-making, the drought index serves as the fundamental metric for drought monitoring and evaluation. We choose Pa, Z, and M as three typical drought indexes to analyze the evolution rules of arid from drought variations and the characteristics of drought index sequence values, and we evaluate the applicability of the three kinds of drought indexes in the arid region using the monthly precipitation data collected from 18 stations in Henan Province, China, between 1953 and 2012. The findings demonstrate that the features of drought areas in Henan Province are high frequency and obvious seasonal fluctuations. Meanwhile, there is a noticeable interannual variation in the severity and length of the drought, which is slowly getting worse overall. The evaluation's findings indicate that the Z index can produce a more accurate result than the Pa(M)index, which has a lower (higher) reflection than reality. The Pa index is far more reliant on the average value, responds slowly to dryness, and cannot detect exceptionally dry circumstances. The M index is more sensitive to drought, but it occasionally overstates the reality. Z index uses the normalizing method to prevent mistakes from various spatial and temporal scales in addition to taking into account the fact that precipitation changes according to partial distribution (PD). As a result, the outcome is more in line with the actual circumstance. The findings can be used as a guide when assessing the agricultural drought in Henan Province.

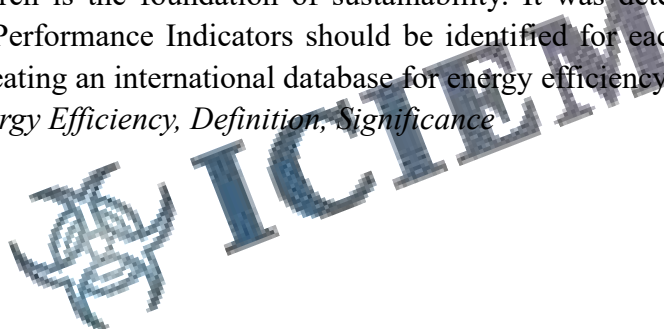
**Keywords:** *China, Drought Index, Precipitation, Applicability Evaluation, China-Z Index*

**Definition, Significance, and Efforts for Energy Efficiency**  
**U. Umit**

**ABSTRACT**

The goal of energy efficiency is to reduce the quantity of energy needed to complete a certain operation or provide a particular result. This output could be either a good or a service. Utilizing machinery and systems created to consume less energy while yet providing necessary performance is part of this process. Energy efficiency is crucial on a worldwide scale since it contributes to a decrease in energy use, expenses, and environmental effects. Furthermore, it is important for everyone since it might encourage economic growth and the creation of jobs in the energy sector. Additionally, it improves energy security. Energy efficiency definitions for the industry, building, and transportation sectors were presented in this study. The standards for energy efficiency in each area and how each sector's energy efficiency impacts its industry were looked at. A description of energy audits and their use in different industries was given along with the current state of the art in each field. Thus, it was determined that energy efficiency research is the foundation of sustainability. It was determined that open source Energy Performance Indicators should be identified for each operation in all industries by creating an international database for energy efficiency studies.

**Keywords:** *Energy Efficiency, Definition, Significance*



**The Pilot Appraisal of Coalbed Methane Reservoir's Acid Fracturing in Southeast Qinshui Basin, China****Y. Yang, H. Tian, C. Zhang, X. Peng, W. Chen, and H. Zhao****ABSTRACT**

Although the QinShui Basin's coalbed methane (CBM) reserves are extremely promising, the wells' CBM outputs are still only moderately high. According to this analysis of the fracture system containing the 3# and 15# coal seams in the Qinshui basin, both the macro-scale and micro-scale fractures are filled with clay and carbonate minerals, which accounts for the low productivity of CBM wells following conventional hydraulic fracturing. Acid fracturing has long been a successful technique for improving gas well productivity in carbonate gas reservoirs. However, there aren't many reports regarding acid fracturing being used in coal bed methane fields. The viability of acid fracturing was established by showing that the acid increases the permeability of coal seams in the Qinshui basin more beneficially than detrimentally, based on the mineral identification and acid sensitivity test. Acid fracturing is suitable for the CBM wells in the Jincheng Mining Area, according to on-site operations. The microseismic investigation also revealed that when using acid fracturing, the stimulated reservoir area depends on the amount of acid pumped in the first stage, which is essential to the stimulation's success.

**Keywords:** *Coalbed Methane, Acid Fracturing, Acid Sensitivitytest, Stimulated Reservoir Area*

**CBM Reservoir Micro Structure Characterization and Appraise Reservoir Quality****C. Guo, X. Wu, H. Tian, W. Chen, and H. Zhang****ABSTRACT**

Most of the pores in coal's porous structure are on the nanometer range. The No. 3 coal seam of Shan Xi Fm and No. 15 coal seam of Tai Yuan Group in the QinShui Basin are both potential sources of coalbed methane (CBM). The productivity of gas wells in the No. 3 coal seam is fairly good, while it is poor in the No. 15 coal seam, according to data on onsite output. It is particularly perplexing to learn that while traditional analyses revealed equal porosity values for both coal seams, the No. 15 coal seam has substantially lower permeability. A series of liquid nitrogen adsorption and high-pressure mercury injection experiments were used to assess the micro structures in order to learn what factors affect the permeability of coal seams. The research presented here demonstrated that the No. 15 coal seam had less development in the interconnected nano-pores, meso-pores, and microfractures that serve as the pathways for gas diffusion and seepage. The No. 15 coal seam's nano-pores and micro-fractures contain an abundance of secondary crystals, including pyrite, calcite, kaolinite, and quartz, which significantly reduce permeability and block seepage. This was also confirmed by scanning electron microscopy and observations of cores. The findings demonstrated that the coal seam's microstructure has a significant impact on permeability. Therefore, before the construction of coalbed methane wells, it is crucial to evaluate the microstructure of CBM.

**Keywords:** *Coal bed Methane, Microstructure, Reservoir, Productivity*

**Eastern Qinghai-Tibet Plateau Margin's Deep Physical Structure and Geotectonic Consequences****J. Li, X. Wang, Q. Qin, G. Zhang, D. Li, and J. Zhou****ABSTRACT**

Studies on the eastward lateral extrusion of the latter's crustal material have focused on the eastern boundary of the Qinghai-Tibet Plateau (QTP). This study intends to investigate the geological structure of the QTP's eastern crust-mantle and its structural response to extrusion. The physical makeup of the crust-mantle near the eastern edge of the plateau was ascertained using information from long-period magnetotelluric sounding of cross-tectonic units and Bouguer gravity. These are the conclusions: (i) At the eastern boundary of the QTP, the middle-lower crusts of the Songpan and Sichuan-Yunnan blocks extensively contain a low-density material, according to the apparent density structure. On the other hand, a substance with a noticeably higher density is present in the Yangtze cratonic block (Sichuan Basin). There is a clear low-density zone located in a northeast-southwest direction, along the lower crust at 40–50 km depth, to the west of the Longmenshan–Panxi tectonic zones; (ii) Three unique electrical structural units can be seen along the cross-section bordered by the Longmenshan tectonic zone in the electrical structural model covering Songpan block, Longmenshan tectonic zone, and Yangtze block. The shallow layer and middle-lower crusts of the Songpan block have high and low resistivity, respectively. The Yangtze craton comes next, with low and substantially higher resistivity at the shallow layer and middle-lower crusts, respectively. The Panxi tectonic zone has a weakened structure in the lower crust, according to apparent density and electrical structures, and the deep structure of the QTP has physical characteristics that point to its east. The third is the Longmenshan transitional tectonic zone, whose shallow layer and deep structure are each distinguished by an electrical structure with a thrust nappe towards the east and a high-conductivity material that extends to the lithospheric mantle, respectively. Its distribution is intimately correlated with the deep seismogenic activity at the eastern QTP margin and the uplift process.

**Keywords:** *Eastern Margin of Qinghai–Tibet Plateau, Bouguer Gravity, Long Period Magnetotellurics, Crustal Fluid, Apparent Density*



**Regulation and Control of Water Resources and the Regional Carbon-Water Symbiosis System from a Low-Carbon Perspective**  
**J. Xu, X. Chen, and X. Chen**

**ABSTRACT**

In order to promote the development trend of "reducing sources and increasing exchange rate" and to achieve the ideal state of negative carbon emissions, the purpose of this paper is to propose a new research methodology to address the issue of reducing "source" and "sink" measures in the implementation of low carbon governance. Based on the social and economic demands, a carbon cycle system based on carbon emission and carbon capture characteristics and a water resource circulation system characterized by ecological water demand and water pollution are constructed, and the two structures are coupled to one another. This paper is based on research on low carbon sustainable and carbon - water coupling in ecological environment management. The regional symbiotic coupling of carbon and water is postulated, along with the coupling relationship of carbon water circulation system. From a "low carbon" perspective, this study studies the underlying mechanisms of the regional carbon-water symbiosis system, discloses its influencing elements, and establishes a multi-objective game decision model for water resource regulation. The article also continues to optimize the plan for controlling and regulating water resources in the pilot area. In this work, the "source-sink" integration in the carbon cycle is realized, which is the optimum mode of "reducing source and increasing exchange rate," by changing and improving the configuration of the carbon and water coupling system in the regional water resources system.

**Keywords:** *Comprehensive Evaluation Model, Sustainable Development Index, Carbon-Water Coupling, Low Carbon Mode, Water Resource Rational Allocation*

**Measures to Avoid Ships and the South China Sea's Twin Typhoon  
Characteristic  
J. He, and W. Ai**

**ABSTRACT**

In this article, existing phenomena related to the South China Sea tropical cyclone's doubling, including a range of meteorological factors and waves, are discussed. In the meantime, we predicted the relative position and movement around the ship and the typhoon, taking into account the influence of numerous factors and accounting for unanticipated occurrences. Additionally, we develop some effective plans and strategies for preventing simultaneous typhoons while also avoiding actions performed during a single typhoon.

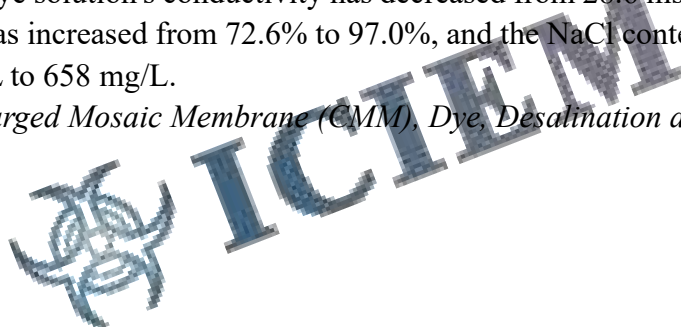
**Keywords:** *Feature, Typhoon, Safety, Navigation, Measure*



**Dye Desalting with Charged Mosaic Membrane****J. Deng, J. Tie, J. Liu, and H. Zhang****ABSTRACT**

Dye's quality and worth can be raised through desalination and purification. One of the key technologies for the desalination and purification of dyes is membrane separation technology. In this study, the charged mosaic membrane (CMM) is made via interfacial polymerization (IP). The desalination and purification of crude dye is the next step. The findings reveal NaCl and Reactive Light Yellow (PF-6GS) both had rejection rates of the CMM of 13.2% and 99.2%, respectively. As the operating pressure rises from 0.2 MPa to 0.5 MPa, the flux rises from 6.22 Lm<sup>-2</sup>h<sup>-1</sup> to 18.5 Lm<sup>-2</sup>h<sup>-1</sup>. When the concentration of NaCl is increased from 500 mg/L to 2000 mg/L, its flow decreases from 13.32 L m<sup>-2</sup> h<sup>-1</sup> to 11.11 L m<sup>-2</sup> h<sup>-1</sup>, and its rejection for NaCl steadily improves from 12.5% to 13.7%. When the PF-6GS concentration is increased from 500 mg/L to 2000 mg/L, its flow steadily decreases from 10.17 Lm<sup>-2</sup>h<sup>-1</sup> to 8.21 Lm<sup>-2</sup>h<sup>-1</sup>, and the rejection for the dye is greater than 99.00%. After the crude dye has been desalinated five times, the dye solution's conductivity has decreased from 28.6 ms/m to 8.92 ms/m, the dye purity has increased from 72.6% to 97.0%, and the NaCl content has decreased from 8775 mg/L to 658 mg/L.

**Keywords:** *Charged Mosaic Membrane (CMM), Dye, Desalination and Purification*



**Agricultural Crops' Flood Tolerance in Huaibei Plain****S. Liu, H. Wang, D. Yan, and Z. Wang****ABSTRACT**

Global and regional scales of temperature and precipitation patterns have changed as a result of global climate change, which has also increased the frequency of catastrophic climate events like flooding. The Huaibei Plain in the province of Anhui served as our study area. We carried out four groups of agricultural waterlogging trials with various waterlogging times, and we examined the connection between crop production and waterlogging in the vertosol (Shajiang black soil) regions. The yields of crops exposed to several levels of waterlogging, from no waterlogging to waterlogging for 72 hours, were significantly different. The timing was ideal for rice waterlogging to be minimized within 48 hours. The ideal circumstances for waterlogging clearing entailed lowering the ground water level to 0.4-0.5 m below the ground surface within 3 days of flooding for both rice and soy, from 48 to 72 hours. The Huaibei Plain appears to have experienced an increase in the frequency and lengthened duration of storm events, from a localized area to the entire region, as a result of global climate change. When the crops were in their flood-sensitive stages, high storm frequency periods increasingly coincided with those times. As a result, there is an increasing overlap between flood events and times when plants are sensitive to flooding, leading to extreme circumstances that go beyond what crops can tolerate.

**Keywords:** *Waterlogging Experiment, Flood Tolerance Capability, Storm Event, Climate Change, Huaibei Plain*

**Analysis to Distribution Characteristics of Lichens in Forest of Dabie Mountain,  
Anhui Province, China  
Y. Wang, and Xing. Jian**

**ABSTRACT**

In the Yaoluoping national natural reserve of Dabie mountain in Anhui Province, China, lichens were investigated and examined using the species composition of the quadrats, spatial distribution characteristics of lichen species, and environmental factors. Within Yaoluoping National Nature Reserve, 29 floor lichen quadrats were sampled. Relative humidity, height, and illumination were the three environmental parameters whose data were gathered in the quadrats. 29 quadrats, data from three environmental conditions (an independent variable), and data from 20 species in the quadrats (a dependent variable) were used in the redundancy analysis (RDA). The eigenvalues of canonical axes 1 and 2 were 0.123 and 0.068, respectively, according to the RDA results, and they accounted for 82.9% of the total eigenvalue of the first four axes. The first canonical axis mostly recorded changes in environmental variables such as humidity, whereas the second canonical axis primarily reflected changes in environmental variables such as lighting. *Peltigera neopolydactyla* showed the strongest positive correlation with humidity out of all the species, while *Stereocaulon japonicum*, *S. soreidiiferum*, and *Xanthoparmelia orientalis* had the worst negative link with it. *Cladonia chlorophaea* and *Leptogium saturninum* had the largest positive correlations with illumination and altitude, respectively. A negative connection was present in 139 species-pairs, according to the Spearman rank correlation coefficient test, however none that was significant ( $P < 0.05$ ) was discovered. Fifty-one species-pairs showed positive relationship, of which three species-pairs, *Anzia opuntiella* and *Leptogium saturninum*, *Phaeographyscia erythrocardia* and *Xanthoparmelia orientalis* and *Stereocaulon japonicum* and *X. protomatrae*, are significant positive correlation relationships ( $0.01 \leq P < 0.05$ ), and nine species-pairs (*Lobaria pseudopulmonaria* and *L. retigera*, and so on) have highly significant positive correlation relationships ( $P < 0.01$ ). The distribution pattern of lichens is a complex reaction to environmental conditions, with humidity in the environment—more specifically, the availability of moisture for lichens—having the biggest impact. On the basis of ambient humidity, lighting, and altitude, 29 quadrats may be grouped into six associations. Because of the lichens' small size, uneven distribution, and limited interspecific competition, there were no significant negative correlation species-pairs in the lichens ( $P < 0.05$ ). Lichen interspecific bonding intensity is a thorough response to moisture availability and substrate type. However, there are certain ecology issues with lichens that still need to be further investigated, such as the size of the quadrat in lichen field studies, how to assess the importance value of lichens in various growth forms, and so on.

**Keywords:** *Floor Lichen, Redundancy Analysis, Distribution Characteristics, Interspecific Relationship, Spearman Rank Correlation*

**Research on the Distribution Characteristics and Regulating Variables of Hydrogen Sulfide of China's Xishan Coal Mine on the Southern Edge of the Junggar Basin**

**Q. Deng, F. Wu, X. Wu, Y. Wang, and M. Liu**

**ABSTRACT**

The Xishan coal mine is situated at the intersection of the southern boundary of the Junggar basin and northern Tianshan; the region's structural belt is made up of foothill fault-folds. The majority of coal seams created by continental facies fall into the category of medium-extra-low sulfur coal, however some also fall within the category of high sulfur coal. The largest amount of hydrogen sulfide found in coal seam enrichment anomalies is up to 2.11%. The principal gases found in coal beds are N<sub>2</sub> and CH<sub>4</sub>, with minor amounts of CO<sub>2</sub>, H<sub>2</sub>S, C<sub>2</sub>H<sub>6</sub>, and other heavy hydrocarbons. The average mirror reflectivity of coal is between 0.5% and 0.7%, and the plentiful source rocks offer a solid material foundation for H<sub>2</sub>S production. The coalbed's pore structure is of the fracture-pore variety, and the medium and better reservoirs are widely distributed. The coal seam's roof microclastic rock proportion can reach 75%, and its floor microclastic rock proportion can reach 87%, both of which are favorable to the enrichment of H<sub>2</sub>S. Under the influence of the hydrodynamic block gas, a thick aquifer created in the sag basement offers a significant area for the occurrence and movement of groundwater and H<sub>2</sub>S. Water in the area is rich in sulfate ions, indicating that the environment is closed well of regional deep confined water, in sufficient organic matter and reducing environment, prone to BSR role, and then the hydrogen sulfide will formation. These factors all gradually increased along the runoff direction.

**Keywords:** *Southern Margin of Junggar Basin, Hydrogen Sulfide, Distribution Characteristics, Control Factors*

## Using Improved D-S Evidence Theory, Assess the Safety Situation at an Open Pit Slope

S. Jiang, M. Lian, and C. Lu

### ABSTRACT

In the subject of information disaster science, the safety Situation Assessment of open pit slope has recently been a popular research topic. A safety assessment approach for open pit slope based on improved D-S evidence theory is developed in order to address the issue of over-reliance on expert expertise in the current evaluation. This method integrates situation factors from multiple sources, obtains the basic probability assignation, or BPA, of the DS evidence theory based on back propagation neural network, computes BPA by the DS evidence theory sequentially, weakens the influence of human factors on BPA, increases the prediction accuracy of BPA, and raises the rate at which open pit slope safety situations are recognized. Finally, monitoring information from a few open pit slopes is used to confirm the viability and efficacy of this method in pit slope safety evaluation.

**Keywords:** *Open Pit Slope, D-S Evidence Theory, Back Propagation Neural Network, Situation Assessment*

**Suitability for Reclamation Using the Integrated Index Method and the  
Difference-product Method to Assess Damaged Mined Land**

**L. Cheng, and H. Sun**

**ABSTRACT**

The appraisal of a reclamation's suitability serves as the foundation for choosing the path of reusing damaged land. The majority of academic research has concentrated on the innovation and enhancement of evaluation models and procedures, with little to no attention paid to the investigation of constraining constraints. In this study, the integrated index approach is used to assess the suitability of the damaged area near the Longchi coal mine for reclamation, and the difference-product method is used to analyze the limiting variables. The findings indicate that reclaiming damaged land as woods is the most appropriate use for the area around the Longchi coal mine. The level of contamination in the soil and water as well as the irrigation conditions are the key limiting variables. This research serves as a foundation for the sensible reutilization and enhancement choices for the devastated land surrounding the Long Chi coal mine. The study also confirms that, in the absence of notable assessment indices, the integration of the integrated index approach and the difference-product method is effective for assessing the suitability of reclamation and for analyzing limiting variables.

**Keywords:** *Reclamation Suitability Evaluation, Analysis of Restrictive Factors, Damaged Mined Land, Integrated Index Method, Difference-Product Method*



**Organic Carbon and Humus Components in the Alkaline Soil with Aluminium Sulfate and Rice Straw**

**X. Zhao, M. Zhu, X. Guo, H. Wang, B. Sui, and L. Zhao**

**ABSTRACT**

Controlled simulation experiments in the lab were used to look at the buildup of soil organic carbon in soda saline-alkaline soil and the changes in humus composition caused by the addition of aluminum sulfate and rice straw. With varying applications of rice straw and aluminum sulfate, the organic carbon content and humus composition in soda saline-alkaline soil were examined to assess the amelioration impact. The composition of humus and the levels of organic carbon were examined using the Kumada method and potassium dichromate oxidation titration (exogenous heat) techniques, respectively. This research clarifies how soil organic matter changes in a saline-alkaline soil during the amelioration. The findings showed that applying various volumes of rice straw and aluminum sulfate greatly boosted the soil's organic carbon content (13%–92%). With varying rice straw application levels, the contents of the free fraction and mixed fraction of humus, as well as their compositions (humic acid and fulvic acid), were enhanced. The free proportion of humus was considerably increased. The application of aluminum sulfate caused a partial transformation of the free fraction of humus and humic acid (HA) into the mixed fraction. With the use of rice straw, free HA was transformed into P type. The administration of aluminum sulfate transformed the free form of HA from the P type to the Rp type. Only combined HA was transported inside the A type area for rice straw application. The kind of mixed form of HA was unaffected significantly by the addition of aluminum sulfate. By applying more aluminum sulfate with the same amount of rice straw, the amount of organic carbon in the soil was enhanced. Applications of aluminum sulfate and rice straw can both lessen the degree to which free and mixed fractions of HA humify. The forms of HA led to the conclusion that the use of rice straw and aluminum sulfate caused humus to become younger and refreshed.

**Keywords:** *Aluminum Sulfate/Rice Straw, Soda Saline-Alkaline Soil, Soil Organic Carbon, Humus Composition, HA Type*

**Research on the Leaf Litter Decomposition and Mixed Effects of Two Perennial Herbs in Desert Steppe: A Five-year Long-term Test**  
**H. Qu, C. Pan, X. Zhao, S. Wang, X. Ma, and L. Liu**

**ABSTRACT**

Litter's primary ingredient, leaf, is frequently seen in mixed forms in nature. The mixed impacts of decomposing leaf litter varied depending on the mixed ratio. In contrast to other ecosystems, the decomposition of leaf litter is more significant in desert ecosystems because it not only contributes to an important biogeochemical cycle that links the movement of matter and energy, but also to the maintenance of ecosystem stability, even though the ecosystem-wide effects of litter decomposition are still unclear. A five-year long-term study was conducted to compare the observed and expected decomposition ratio under single and mixed (same proportion (SA1:1) and natural proportion (SA4:1)) states of two common and typical perennial herbs (*Stipa klemenzii* and *Achnatherum splendens*), the relationship between decomposition rate and precipitation, and other factors to reveal the mixed effects and impact factors of leaf litter decomposition in desert ecosystem. Results revealed that (1) after five years of decomposition, SA4:1 mixed litter and *Stipa klemenzii* litter decomposition ratios are significantly higher than SA1:1 mixed litter and *Achnatherum splendens* litter; (2) all the litter decomposed significantly faster in summer and autumn than in winter and spring; (3) the mixed effects of SA4:1 and SA1:1 litter showed differently.

**Keywords:** *Mixed Litter, Non-Additive Effects, Synergistic Effects, Antagonistic Effects*

**Research on the Impact of the Environment and the Productivity of the Modern  
Agricultural Demonstration Zone**

**S. Wu, Y. Zhang, and P. Yang**

**ABSTRACT**

This study examines the production efficiency of the national modern development region, analyzes the impact of the environment on agricultural production efficiency, and provides countermeasures based on the three-stage DEA model that integrates DEA and SFA. 2015 saw the selection of 51 modern agriculture demonstration zones in Shandong Province for empirical study. The findings demonstrate that the agricultural production efficiency assessed before and after the adjustment of the input components has changed significantly under the influence of environment effect and random error factors. The level of urbanization, financial support, and rural information technology have a considerable impact on the input factor redundancy. Farmers' income levels. The average technical efficiency of the demonstration zone grew from 0.79 to 0.83, the average pure technical efficiency increased from 0.90 to 0.91, and the average SE increased from 0.88 to 0.90 when compared to the findings of the first and third stages of the DEA model. The demonstration zones should integrate their distinct characteristics with policy-driven forces, allocate agricultural production factors rationally, raise the level of agricultural technology, encourage production method reform, improve the development environment, and boost agricultural production efficiency in accordance with local conditions.

**Keywords:** *Environment Effect, Modern Agricultural Demonstration Zone, Agricultural Production Efficiency, Three-Stage DEA*

**PIV And Numerical Studies of Differential Heating-Induced Artificial Upwelling  
in Open Environments**

**M. Lv, Y. Mao, M. Xia, H. Liu, X. Nie, X. Tian, H. Pan, and Z. Zhu**

**ABSTRACT**

A promising solution for restoring the maritime environment, particularly for fisheries, is artificial upwelling. This paper used PIV and numerical analysis to investigate the fundamental properties of "Differential-Heating- Liquid- Upwelling" (DHLU) in open environments. Using a PIV device, the flow field of an upwelling was measured under normal conditions. On the basis of the experimental results, a sound numerical model was created in order to examine the fundamental properties of the DHLU system using numerical simulations. Results indicate that the masses with a high rising speed are primarily responsible for the upwelling in the DHLU system. It seems sense to use the K- turbulence model to simulate the flow field of the DHLU. The cross-sectional area of the upwelling stream, the characteristic ascending speed, and the upwelling's flow rate are all three crucial criteria that grow initially before declining as the distance from the heating source increases. However, compared to the other two factors, typical ascending speed has a much lower position of maximum value. The development of upwelling is not favored by the decline in ambient temperature. In the situations that were examined for this paper, a flow rate as high as 95.9 cm<sup>3</sup>/s was attained.

**Keywords:** *Artificial upwelling, Differential heating, Numerical simulation, PIV*

**Total Transport of Sediment from an Urbanizing Watershed in China's Upper  
Yellow River**

**Z. Wang, W. Ta, J. Zheng, and K. Zhang**

**ABSTRACT**

Determining fluvial sediment dynamics is crucial to developing trustworthy strategies to handle environmental changes at the watershed scale for many event-based, high sediment yield rivers draining arid regions where fluvial erosion in the stream channel and watershed erosion activities are nearly equally important in sediment transport. The lower Huangshui River, the largest tributary of the upper Yellow River, contributes significantly to the wash load of the Inner Mongolia desert reach of the Yellow River, causing complex water-sediment interactions. For the first time, the wash load rating curve indicating watershed characteristic changes and Ackers and White's bed load function (wash load excluded) used to determine bed load transport dynamics are distinguished. Our findings showed that the sediment transport regime has changed since the 1980s in response to eco-environmental changes primarily caused by urbanization, with suspended sediment concentration (SSC) decreasing by 50% on average compared with the natural state (1950–1980). These findings were based on the continuous and detailed hydrological data monitored at the Minhe gauge station. According to the theoretical bed load function and wash load rating curve combined, the lower Huangshui River's total sediment transport due to extensive ecological management since the 2000s is estimated to be 3.43 10<sup>7</sup> t, of which the total bed load is 1.40 10<sup>7</sup> t and the wash load is 2.03 10<sup>7</sup> t. Wash load to total bed load transit ratio is 1.45:1.

**Keywords:** *Sediment Rating Curve, Wash Load, Bed Material Load, Sediment Transport Dynamics, Huangshui River, Yellow River*

**Research on the Characteristics of the Chinese Traditional Village's Space Environment and Its Development: Using Pengzhuang in The Northern Jiangsu Province As An Example**

**Y. Peng**

**ABSTRACT**

Traditional villages in the northern Jiangsu province have a distinctive artistic style that is integral to Jiangsu's traditional culture and history. The challenge of ensuring sustainable and harmonious development in rural regions is one that is currently prevalent there. The traditional villages in northern Jiangsu's space environment aspects, including location and spatial pattern, are elaborated and the state of rural development is examined in this work through field research and theoretical analysis using a multidisciplinary method. Discuss the current situation as well as the architectural details of the space environment group and architectural kinds using Pengzhuang Village in northern Jiangsu as an example. Discussing the importance of traditional architectural elements in Northern communities is suggested as the primary area for ecological environmental protection and rural development policy. Particularly in the course of our socialist new rural construction, Jiangsu's village spatial patterns for basic research have both positive practical value and significant historical significance. Beautiful traditional village development should be coordinated development of economic and social environment.

**Keywords:** *Traditional Villages, Space Environment, Characteristic, Ecological, Development*

**Evaluation of the Nutrient Overflow of Purple Soil Based on Variations in the  
Soil Nutrient Pool and Nutrient Apparent Balance**

**T. Liang, X. Shi, X. Chen, and Y. Zhang**

**ABSTRACT**

Three counties in Chongqing, in the Yangtze River Three Gorges Reservoir Region, southwest China, were chosen to best depict acidic purple soil, neutral purple soil, and calcareous purple soil. From 1979 to 1982, survey data from the three counties that were chosen were gathered, and from 2008 to 2012, fertilization inquiry projects involving soil testing and formulated fertilization were established. The fertilizer and the overflow production of soil nutrients were determined through the calculation of nutrient surface balance and the variations of soil plough horizon nutrient stock. While this was going on, the effects of nutrient balance and overflow were studied, as well as the structure of the plantation, fertilizer application, and variations in the nutrients that were available. The use of chemical nitrogen fertilizer (N), phosphorus fertilizer (P<sub>2</sub>O<sub>5</sub>), and potassium fertilizer (K) has increased over the 30 years of this study in the three representative counties, respectively, by 198% to 231%, 366% to 401%, and nearly 0 to 65.8-103.7kg<sub>hm</sub><sup>-2</sup>. This increase is most likely attributable to the decline in grain crops and the rise in commercial crops. Organic N, P, and K fertilizer inputs have fallen by 29%, 22%, and 20%, respectively, to 76%, 67%, and 72%. The increase in nutrients caused the output of N and P<sub>2</sub>O<sub>5</sub> to increase by 68.0 to 171.1 kg<sub>hm</sub><sup>-2</sup> and 57.3 to 88.7 kg<sub>hm</sub><sup>-2</sup>, respectively. However, the intake of fertilizer containing potassium oxide reduced 37.1 to 90.2 kg<sub>hm</sub><sup>-2</sup>. The apparent usage ratios of phosphatic and nitrogenous fertilizers fell from 26% to 46% and 1% to 5%, respectively, while the apparent utilization ratio of potash fertilizer increased from 31% to 49%. The total nitrogen content of the soil increased while the total phosphorus and potassium content dropped in the three locations. The average annual N spillage during the course of the 30-year study period was determined to be 308.1 to 373.7 kg<sub>hm</sub><sup>-2</sup> a<sup>-1</sup>, and the average annual P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O spillages were 73.0 to 108.1 kg<sub>hm</sub><sup>-2</sup> a<sup>-1</sup> and 479.5 to 1261.1 kg<sub>hm</sub><sup>-2</sup> a<sup>-1</sup>, respectively.

**Keywords:** *Apparent Balance, Purple Soil, Nutrient Overflow, Soil Nutrient Pool*

**Employing Remote Sensing Pictures to Estimate Changes in the Amount of  
Vegetation Along the Minjiang River's Upstream**

**B. Deng, W. Yang, J. Huang, and N. Mu**

**ABSTRACT**

The report chose as its study location the area upstream of the Minjiang River, one of the principal water sources for the Chengdu Plain and the Yangtze River. The vegetation covering of the research area was determined using a series of cloud-free Landsat TM/OLI pictures taken on June 24, 1994, and June 1, 2014. This was done using the vegetation index and a dimidiate pixel model. The county area and digital elevation model were used to assess the temporal and spatial changes in vegetation cover. The study area's average vegetation coverage fell from 68.97% in 1994 to 60.39% in 2014. The analysis's findings demonstrated how closely topographical features and vegetation changes were related. With elevation, the percentage of the vegetation degradation area grew, with the most severe levels occurring between 3500 and 4500 meters above sea level. Wenchuan County and Songpan County had the most pronounced vegetation deterioration. The degradation of the vegetation was mostly brought on by earthquake-related geological risks and human disturbance, with the aridity trend in the studied area playing a significant role as well.

**Keywords:** *Vegetation Coverage Change, Vegetation Index, Dimidiate Pixel Model, The Upstream of Minjiang River, China*



**An Investigation into the Use of Micro-Vortex Clarification to Treat Source Waters Being Micro-Polluted**

**Z. Tong**

**ABSTRACT**

The integrated micro-vortex clarifier is used for intense conventional treatment of raw water from water plants with typical water quality issues as well as from sources of water that are micro-polluted. The findings revealed that the influent turbidity of the integration micro-vortex clarifier was 21.7 NTU when the influent flow was 8 m<sup>3</sup>/h, and that when the dose was 10 mg/L, the effluent turbidity of the clarity tank remained stable below 3 NTU. UV<sub>254</sub> and COD<sub>Mn</sub> were removed at rates of 25% and 41%, respectively. The dose was raised to 16 mg/L when the working conditions remained the same. The removal rates of UV<sub>254</sub> and COD<sub>Mn</sub> improved to 40% and 60%, respectively, while the effluent turbidity of the clarifier remained constant at 0.5 NTU. The FCD (Flocculation Control Device) and the Zeta potential instrument were used to measure the removal rates of UV<sub>254</sub> and COD<sub>Mn</sub> as the dosage was raised within a specified range. As a result, effluent turbidity decreased while the removal rates of UV<sub>254</sub> and COD<sub>Mn</sub> increased. This study contrasts various tools for clarifying. For its many benefits, including a higher coagulation efficiency, a shorter reactivity time, better finished water quality, and a stronger adaptive capability, the micro-vortex clearing method merits widespread use.

**Keywords:** *Micro-Vortex Clarification, Vortex Reactor, Micro-Polluted Water, Water Quality*

**Bio-Fuel Technology for Net Zero Emissions****Y. Lin****ABSTRACT**

The development of renewable and more ecologically friendly energy sources is primarily motivated by the rapid depletion of fossil fuel-based resources and the effects of climate change on global warming. Given its advantage in producing fewer CO<sub>2</sub>, SO<sub>x</sub>, and hydrocarbon emissions—which help maintain the environment—biodiesel has generally been regarded as an environmentally beneficial fuel. The necessity to lower diesel engine emissions without changing them is what is driving the development of biodiesel. A transesterification procedure using methanol or ethanol as the catalyst can make biodiesel from animal fats or vegetable oils. Utilizing biodiesel has several benefits, chief among them being renewability, reduced exhaust gas emissions, and biodegradability. Additionally, the warming impact and a net increase in atmospheric carbon dioxide are not caused by biodiesel. The high cost of biodiesel is the main barrier to its commercialisation. In our lab, a microwave system can speed up reactions and improve product output and purity. Palm methyl ester yields were increased, reaction time and energy consumption were decreased, and a sodium methoxide (CH<sub>3</sub>ONa) catalyst was utilized. With a catalyst concentration of 0.75 weight percent, a methanol to oil molar ratio of 6, a reaction duration of 3 minutes, and a microwave power of 750 W, the best methyl ester yield was 99.5%, with a methyl ester content of 99.8% and a biodiesel yield of 99.7%. Second, biodiesel produced from used cooking oil and eggshells is a cheap source that can significantly lower the price of raw materials. Waste cooking oil performed better in experiments than standard heating methods, with the best results coming from catalysts containing 0.75 weight percent sodium hydroxide (NaOH) and 0.75 weight percent sodium methoxide (CH<sub>3</sub>ONa), respectively. When using a CH<sub>3</sub>ONa catalyst, more biodiesel is produced than when using a NaOH catalyst. According to experimental findings using used eggshell, a 9:1 methanol to oil molar ratio, a 5 weight percent catalyst loading, 165 minutes of reaction time, an 800 W microwave, and a 65°C reaction temperature were used to achieve a high biodiesel yield of 92%. Up to the fifth cycle of reuse, the produced catalyst had largely maintained its reusability. The findings of this study are not just for scholarly purposes. By utilizing biowaste as catalysts and non-edible oils as

feedstocks in microwave heating systems as ecologically friendly chemistry systems, they can also serve as models for industrial biodiesel synthesis. Researchers have also been drawn to manufacture biofuels from feedstock that is readily available naturally by adopting a variety of cutting-edge novel techniques to biomass pretreatment as a result of advancements in the fields of biomass and bioenergy. At microwave power levels of 800, 900, and 1000 W, the concentration of produced hydrogen accounts for roughly 30.80%, 33.20%, and 37.58% respectively. With an increase in microwave power, the hydrogen gas output is accounted to be as much as twice that at lower power. Additionally, it was noted that no methane was created during this investigation since the majority of the methane created during microwave plasma conversion has already reacted with CO<sub>2</sub> to produce CO and H<sub>2</sub>, causing the concentration of CO<sub>2</sub> to decrease as power intensity decreases.

**Keywords:** *Net Zero Emission, Bio-Fuel Technology, Green Fuel*



**Emission Reduction Analysis of Greenhouse Gases for Punjab's Power Sector  
Using Energy Modeling  
R. Nasir**

**ABSTRACT**

Pakistan's largest province, Punjab, uses the majority of the country's energy resources. One of the current generation's most pressing demands is energy. A lack of planning in the energy sector has resulted in unwelcome energy shortages, inefficiencies, a lack of supplies, and subsidization that has generated cyclical debt. Since non-renewable energy sources account for the majority of generation, there are higher greenhouse gas emissions as a result. Greenhouse gases are a class of gases in our atmosphere that store solar heat and keep it from escaping into space. Carbon dioxide, methane, and nitrous oxide are typical GHGs. To determine the demand and supply sides of technologies, their source, GHG emissions, and cost for this study, LEAP is utilized as an energy accounting modeling tool. It is employed in particular to simulate several scenarios based on various associated policies and real-time baseline data (2020). Overall energy demand was calculated by multiplying these activity levels across all demand sectors by the energy intensities of each activity (energy per unit of activity). The findings show that by 2050, all sectors of Punjab, including home, commercial, lighting, industrial, and agriculture, will experience an increase in power consumption up to 279.7 Tera Watt hours (from a baseline of 73.9), with growth rates of 5.42%, 4.45%, 2.98%, 2.65%, and 2.16%, respectively. The electricity production modeling scenarios show a rise in coal use of 18%, gas use of 15%, and oil use of 44.5%. The nuclear (25.7%), hydel (17.3%), solar (4%), wind (2.3%), and biomass (9.7%) sectors all exhibit growth in the Green Punjab scenario. In BAUS, CS, OS, and GPS, respectively, GHG emissions will be 45.5, 58.3, 55.0, and 24.1 million metric tons of carbon dioxide equivalent (Mt CO<sub>2</sub>e). According to the study, compared to all other scenarios, the Green Punjab Scenario produces power at the lowest cost and with the least amount of greenhouse gas emissions.

**Keywords:** *Greenhouse Gases, Leap, Power Sector*

**Exploring Changes in the World's Nitrogen and Phosphorus Cycles in  
Agriculture Brought on by the Production of Animals Between 1900 and 2050**  
**L. Bouwman, K. K. Goldewijk, K. W. Van Der Hoek, V. V. Beusen, P. Detlef, J.  
Willems, M. C. Rufino, E. Stehfest**

**ABSTRACT**

The main factor influencing human change of the nitrogen (N) and phosphorus (P) cycles globally is crop-livestock production systems. In the early 20th century, nutrient budgets were either balanced or had small surpluses, according to our thorough spatially explicit inventory of N and P budgets in livestock and crop production systems. However, between 1900 and 1950, the global soil N surplus nearly doubled to 36 trillion grams (Tg)  $y^{-1}$ , and the global soil P surplus increased by a factor of 8 to 2 Tg  $y^{-1}$ . The worldwide surplus rose to 138 Tg  $y^{-1}$  of N and 11 Tg  $y^{-1}$  of P between 1950 and 2000. The majority of excess N is lost to the environment, whereas excess P either runs off or builds up as leftover soil P. In spite of rapidly rising recovery in crop production (+35% N recovery and +6% P recovery) and livestock production (+35% N and P recovery), the world's nutrient surpluses continue to rise (+23% N and +54% P), and during this time, surpluses also rise in Africa (+49% N). This scenario is based on the International Assessment of Agricultural Knowledge, Science, and Technology for Development. Alternative management of livestock production systems demonstrates that nutrient fluxes can be efficiently reduced through the use of intensification, improved animal waste incorporation into crop production, and matching N and P supply to livestock needs. In nations with intensive ruminant production, changing human diets to include more pork or poultry instead of beef can lower nutrient fluxes.

**Keywords:** *Emissions, Global Nitrogen and Phosphorus Cycle, Soil Nutrient Budget*

**When, How Much, and Why Does Biochar Reduce N<sub>2</sub>O Emissions During Denitrification in Soils?**

**L. C. Maria, A. S. M. Miguel, R. Asunción, H. Kelly, E. Akio, and L. Johannes**

**ABSTRACT**

The primary source of anthropogenic N<sub>2</sub>O emissions is agricultural soils. Black carbon interactions with the nitrogen cycle have just come to light, and the application of biochar as a way to lower N<sub>2</sub>O emissions is now being researched. The ways in which reduction occurs, meanwhile, are still unknown. Here, we show how biochar has a major effect on denitrification by showing a consistent 10–90% reduction in N<sub>2</sub>O emissions across 14 distinct agricultural soils. The N<sub>2</sub>O/ (N<sub>2</sub> + N<sub>2</sub>O) ratio was consistently reduced using the (15)N gas-flux method, showing that biochar promotes the last stage of denitrification. The ability of biochar to buffer acid was recognized as a crucial component for mitigation that wasn't largely brought on by a change in soil pH. We suggest that biochar serves as an "electron shuttle" that makes it easier for electrons to be transferred to soil-denitrifying bacteria. This, along with its liming effect, would encourage the conversion of N<sub>2</sub>O to N<sub>2</sub>.

**Keywords:** *N<sub>2</sub>O Emissions, Agricultural Soils, Biochar*

**Effects of Long-Term Manuring and Fertilizer on Depletion of Soil Organic Carbon Stocks in Western India's Rotation of Pearl Millet, Cluster Bean, and Cattle**

**C. H. Srinivasarao, B. Venkateswarlu, R. LaL, A. K. Singh, S. Kundu, K. P. R. Vittal, J. J. Patel, and M. M. Patel**

**ABSTRACT**

For the purpose of preserving soil productivity and lowering the net CO<sub>2</sub> loading of the atmosphere, soil organic carbon (SOC) pools are crucial. In order to investigate the impacts of chemical fertilizers and manuring on carbon pools in connection to crop productivity and C sequestration, an 18-year-long field experiment including a pearl millet-cluster bean-castor sequence was carried out on an Entisol in western India. The data demonstrated that, even with the addition of 33.5 Mg ha<sup>-1</sup> C inputs from crop residues and farm yard manure, the SOC depletion through oxidation could not be compensated, leading to a net loss of 4.4 Mg C ha<sup>-1</sup> in 18 years. In the control, there was a 12 Mg C ha<sup>-1</sup> drop in SOC stock. Higher agronomic yields were obtained when farm yard manure and chemical fertilizers were used together, and the rate of SOC depletion was also slowed down. Over six cropping seasons, the greater average seed yields of pearl millet (809 kg ha<sup>-1</sup>), cluster beans (576), and castor (827) were attained by integrating the use of fertilizers and manure. There was an overall increase of 0.46 Mg in crop production for every Mg increase in profile SOC stock, which included increases in the individual output of pearl millet (0.17 Mg ha<sup>-1</sup> y<sup>-1</sup> Mg<sup>-1</sup> SOC), cluster beans (0.14), and castor (0.15). The amount of SOC buildup was inversely related to the C inputs. SOC and carbon pools had a strong correlation that grew stronger as organic amendments were applied. Even at the low antecedent level, a threshold C intake of 3.3 Mg C ha<sup>-1</sup> y<sup>-1</sup> was required to maintain the SOC stock.

**Keywords:** *Soil Amendments, Carbon Sequestration, Carbon Pools, FYM, Sustainable Yield Index, Semi-Arid Tropics, India, Soil Organic Carbon*

**Levels of Replication, Erroneous Presences, and Estimation of The  
Presence/Absence from Edna Metabarcoding Data**

**G. F. Ficetola, J. Pansu, A. Bonin, E. Coissac, G. C. Charline, D. B. Marta; G.  
Ludovic, C. M. Lopes, F. Boyer, F. Pompanon, G. Raye, and P. Taberlet**

**ABSTRACT**

Environmental DNA (eDNA) metabarcoding is being utilized more and more to explore the biodiversity of the past and present. Amplification of extremely small amounts or damaged DNA is frequently used in eDNA analysis. Multiple extractions and amplifications of the same materials are frequently carried out to prevent missing identification of species that are truly present (false negatives). The amount of replication required for accurate estimations of the presence/absence patterns hasn't been discussed, though. Furthermore, false positive results could be caused by damaged DNA and PCR/sequencing mistakes. We assessed the effectiveness of techniques used to lower the chance of false detections as well as the level of replication necessary for reliable detection of the targeted species in various scenarios using simulations and empirical data. Additionally, we assessed the accuracy of estimates of real prevalence, detection probability, and false-positive rates using statistical methods designed to predict occupancy in the presence of observational errors. Replications decreased the percentage of false negatives; the best level of replication was highly influenced by the likelihood that a taxon would be detected. With more replicates, occupancy models performed better in estimating true prevalence, detection probability, and false-positive rates. If detection probability is low, as in ancient DNA research, at least eight PCR duplicates should be run. Consistent results were obtained from several DNA extractions from the same sample, and in some cases, taking multiple samples from the same location allowed the detection of additional species. In order to increase the trustworthiness of the results, it is possible to explicitly estimate the appropriate level of replication for precise species detection.

**Keywords:** *Detectability, Earthworms, False Negatives, False-Positive Detection, Lake Sediments, Occupancy Modelling, Simulations, Species Occurrence*



**Review of Nitrogen and Organics Removal Processes in Artificial Wetlands with Subsurface Flows: Effects of Environmental Factors, Operational Factors, and Supporting Media**

**T. Saeed, and G. Z. Sun**

**ABSTRACT**

The use of subsurface flow built wetlands for wastewater treatment has been growing quickly all over the world thanks to their special benefits of lower operational and maintenance costs. Such systems have received a lot of interest recently for their ability to remove organics and nitrogen. Subsurface flow wetlands frequently rely on a variety of coexisting physical, chemical, and biological channels for the removal of pollutants, all of which are critically dependent on a variety of operational and environmental factors. The thorough study of wetland architecture, traditional and cutting-edge organics and nitrogen removal processes, and significant environmental factors and operating variables that favor removal in subsurface flow wetland systems are all covered in this work. The important investigation identifies the significant environmental parameters, including pH, DO, and temperature, as well as operational factors, including the availability of organic carbon, loading, feed mode, retention time, recirculation, harvesting, and the complex role (of both parameters) on traditional nitrogen and organics removal pathways. Following this, it has also been made clear that more in-depth research is required to promote new methods for removing nitrogen from wetland systems. The expansion of the review on the impact of the unconventional wetland matrix shows that, under ideal operating conditions, the structural variations and intrinsic features of these media can enable significant nitrogen and organics removal from wastewater. Overall, the critical review demonstrates how improving the treatment performances of subsurface flow wetlands requires a thorough understanding of the intricate interrelationships between nitrogen and organics removal routes, governing environmental and operational parameters, and wetland matrix. All rights reserved. (C) 2012 Elsevier Ltd.

**Keywords:** *Constructed Wetlands, Environmental Parameters, Media, Nitrogen, Operating Conditions, Organics*

## How Water, Sanitation, and Hygiene Effect Stunting in Underdeveloped Nations?

M. N. N. Mbuya, and J. H. Humphrey

### ABSTRACT

One in four (26%) children under the age of five were stunted in the world in 2011. The fact that most stunting cannot be attributed to poor diet or diarrhea and cannot be fully corrected by improved food and decreased diarrhea has led to the theory that subclinical gut illness is the main underlying cause of stunting. In essence, ingested microorganisms trigger two overlapping and interconnected pathways that hinder linear growth. First off, a reduced absorptive surface area and a lack of digestive enzymes are the results of partial villous atrophy. Maldigestion and inadequate absorption of crucial nutrients follow. Second, the stomach becomes leaky due to microorganisms and their byproducts, allowing luminal contents to move into systemic circulation. Chronic immune activation results from this, which (i) diverts nutrients away from growth to fight infections, which is a metabolically expensive endeavor; (ii) inhibits bone growth by suppressing the growth hormone-IGF axis, which results in growth impairment; and (iii) further damages the intestinal mucosa, aggravating the issue. Therefore, this environmental intestinal dysfunction must have unsanitary settings as a contributing factor, if not the primary reason, in which newborns and young children live and develop. We propose that the core of global stunting reduction efforts may be a package of baby-WASH interventions (sanitation and water improvement, handwashing with soap, ensuring a clean play and infant feeding environment, and food hygiene) that disrupt particular pathways through which feco-oral transmission occurs in the first two years of a child's life.

**Keywords:** *Stunting, Nutrition, Disease, Infant and Child Nutrition, Early Growth, Sanitation*

**Earth System Models' Predictions of Changes in Soil Organic Carbon Storage  
During the Next Century**

**K. E. O. Todd-Brown, J. T. Randerson, F. Hopkins, V. Arora, T. Hajima, C. Jones, E. Shevliakova, J. Tjiputra, E. Volodin, T. Wu, Q. Zhang, and S. D. Allison**

**ABSTRACT**

Although soil is now believed to be a carbon sink, it is unclear how this sink will react to rising amounts of atmospheric carbon dioxide and climate change. In this study, we examined changes in soil organic carbon (SOC) using simulations provided by 11 Earth system models (ESMs) for Coupled Model Intercomparison Project Phase 5 (CMIP5). For the historical and high radiative forcing (RCP 8.5) scenarios between 1850 and 2100, we analyzed the causes of SOC change using a reduced complexity model based on temperature and moisture sensitivities. With a multi-model mean gain of 65 Pg C, ESM predictions of SOC change over the 21st century (2090-2099 minus 1997-2006) range from a loss of 72 Pg C to a gain of 253 Pg C. With a multi-model mean gain of 39 Pg C throughout tundra and boreal biomes, many ESMs predicted significant changes in high-latitude SOC that ranged from losses of 37 Pg C to increases of 146 Pg C. Over the 21st century, all ESMs displayed cumulative decreases in SOC turnover times (15 to 28%) and increases in worldwide NPP (11 to 59%). Initial SOC stocks in combination with relative changes in soil inputs and decomposition rates accounted for the majority of the model-to-model variation in SOC change ( $R^2 = 0.89$ ,  $p < 0.01$ ). A combination of baseline decomposition rate, ESM-specific Q (10)-factors, and changes in soil temperature were effective at explaining increases in decomposition rate between models ( $R^2 = 0.80$ ,  $p < 0.01$ ). With the onset of global change (mainly caused by rising CO<sub>2</sub>), continuous increases in NPP became a prerequisite for all SOC changes. A considerable number of ESMs produced SOC accumulations in high-latitude biomes that are inconsistent with actual research. Most ESMs did a poor job of capturing the dynamics of permafrost and neglected factors that can limit the amount of SOC that can be stored, like priming effects, nutrient availability, mineral surface stabilization, and aggregate formation. Future simulations that take these restrictions into account are likely to predict slower growth in SOC storage over the twenty-first century.

**Keywords:** *Earth System Models, Soil Organic Carbon, Coupled Model Intercomparison Project*

**SECTION 2**

**Engineering, Manufacturing**



**Test Study on the Dynamic Properties of the Remolded Red Clay by Dynamic Stress and Load History**

**J. Li, S. Chen, and L. Jiang**

**ABSTRACT**

The dynamic performance of subgrade materials is a key factor in the field of transportation engineering. Remodeled red clays are often used as filling materials for subgrade filling, however, there are still few data on the dynamic characteristics of this material. Accordingly, a lot of dynamic triaxial tests were conducted under cyclic loads. Quantification of the suitability of remolded red clay as subgrade filling. A number of possible factors that may affect the dynamic properties are taken into account, such as the dynamic stress, the frequency of vibration, the confining pressure, the consolidation rate and the density of the soil. In addition to the above factors, the plastic strain and dynamic strength curves of the remodeled red clay have been developed under different dynamic load and load history. The test results indicate that, in the range not exceeding the intrinsic strength of the test specimens. The increase in the density, the confining pressure, and the frequency of the vibration are used to increase the overall dynamic strength in conjunction with the retardation of the accumulation of plastic strain. Conversely, an improvement in the amplitude of the dynamic stress and consolidation ratio was shown to result in a reduction in dynamic strength and an acceleration in the development of accumulated plastic strain. In order to provide basic reference data for future research, an empirical equation has been developed which relates the critical dynamic strength and load history of the remodeled red clay.

**Keywords:** *Accumulated Plastic Strain, Dynamic Characteristic, Dynamic Strength, Load History, Remolded Red Clay*

**Direct Relative Orientation Model with Seven Constraints for Measuring and Reconstructing Geologic Landslide****Y. Chen, Z. Xie, Z. Qiu, M. Zhang, and S. Zhong****ABSTRACT**

Along with the development of computer vision and high precision 3D model reconstruction, it is very important and important to obtain high precision relative orientation based on multiple images in order to guarantee and improve the precision of 3D model and spatial location. Currently, the conventional relative orientation model includes five independent parameters. There are 9 parameters for the direct relative orientation model to construct the geometrical relation between the image and the spatial point. In order to reduce the influence of more parameters, and to improve the precision and stability of the calculated parameters, in this paper, a new type of relative orientation model with seven constraints is presented and verified. Based on the orthogonality of the rotational matrix of a stereo imaging pair, the additional constraints are related to the least-squares adjustment, and the relative orientation is obtained. By evaluating the precision of the space position, it is found that the new model has more advantages than the conventional model of direct Relative orientation, especially at 3D model reconstruction and close-up Photogrammetric and applications for the geological landslides measurement.

**Keywords:** *3D, High-Precision, Relative Orientation, Space Position, Additional Constraints, Imaging Pair*

**Water Inrush Mechanism in Tunnel Karst Area Construction****L. Li, W. Tu, S. Shi, and Y. Zhang****ABSTRACT**

Along with the fast development tendency of long, big and deep construction Characteristics for underground engineering in the world, China has the largest number of karst tunnels with the wide scales and big difficulties. As the hydrogeological conditions are becoming unprecedentedly complex, water inrush, the disaster has become a bottleneck for the further development of the transportation tunnel. On the basis of statistical analysis of a great deal of water inrush in Karst tunnels. Finally, the influence factors of water inrush are proposed. Influence Factors of Water Inrush is from Karst Hydrogeology Factors and technical disruptions of human factors. Karst hydrogeologic factors include geologic faults, strata dip, formation lithology and landform and the subterranean level, and Human Factors of Engineering Disturbance include Excavation and reinforcement geological prediction, and monitoring and measurement of surrounding rock. In addition, some geological disasters caused by the water inrush in Tunnel excavation. Based on the forming process of water inrush, it can be classified as geologic defect. Inrush, non-geologic defect inrush and combination. The conclusions will be helpful for the further study of the hazard control in the underground building.

**Keywords:** *Mechanism of Water Inrush, Tunnel Construction, Geological Disaster, Karst Area in Western China*

**Field Test of Expansive Soil Embankment Slope Deformation Due to The  
Evaporation Cycle – Rain  
J. Wang, J. Zhao, and Y. Xu**

**ABSTRACT**

In order to provide the necessary basic parameters for the development of the airport expansion project in Ankang, in particular, a physical test field model of filling slope stability was set up, and the test slope in the rain-evaporation period was followed by a series of deformation. The results showed the process of rainwater infiltration: (1) New fill slope from the free infiltration, infiltration and erosion stable infiltration three phases. In the experiment, most of the erosion of Rainwater infiltration process happened in the infiltration phase, leading to its limited depth of infiltration. (2) For a complete uniform fill slope, the deformation of the development has been a leading role in the expansion of soil deformation; Mainly in the top of the hill to the expansion and contraction of the vertical deformation; Slope is mainly for the cumulative horizontal deformation; with the increasing depth increases, the deformation rate drastically reduced of rainfall. (3) Slope deformation and precipitation have close relationship with evaporation. Precipitation is the main factor that causes the deformation to increase rapidly, and evaporation is the precondition of the deformation. (4) avoid the slope in precipitation - evaporation during deformation and failure should be a two-pronged approach: Firstly, it is effective to reduce the range of soil moisture variation in the slope, and secondly, to prevent the runoff of slope erosion.

**Keywords:** *Expansive Soil, Fill Slope, Precipitation-Evaporation, Deformation*



**Analysis of Vibration Enhancement Heat Transfer Mechanism Based on  
Orthogonal Design  
H. Sun**

**ABSTRACT**

In this study, a combination of numerical simulation methods is used to study the characteristics of flow and heat transfer on the exterior of the vibration tube. By means of orthogonal design, the effects of amplitude, frequency and other parameters on the heat transfer performance are analyzed. On the basis of field synergy theory, the variation law of the cod-angle cosines of the outer tube near wall area is derived with the variation of frequency and amplitude. Through the analysis, it was found that the vibration enhanced heat transfer was enhanced. As the frequency and amplitude increase, it will rise to the peak when the resonance condition is present. Compared with oval pipe, the best heat transfer performance is found in the short axis of oval pipe, and the long axis is the worst. The results show that the tube type is also an important parameter to influence the heat transfer performance.

**Keywords:** *Orthogonal Design, Vibration Enhancement Heat Transfer, Field Synergy Theory, Tube Type, Heat Transfer Performance*



**The Low Carbon Architectural Concept of Residential Building Design Based on Building****J. Zhou, and L. He****ABSTRACT**

In view of the increasing global warming and the increasing amount of CO<sub>2</sub> emitted by Chinese buildings, this article puts forward that low carbon buildings should be a permanent theme in architecture. In this paper, the concept of low-carbon architecture is expounded, and the design of natural lighting, natural ventilation, solar energy storage space and temperature gradient field room are put forward. Through the analysis of the application of low-carbon building technology and the calculation of carbon dioxide emissions of three examples of residential buildings, it is pointed out that the realization of low-carbon buildings in the whole life cycle is not only to achieve low carbon in the building use process, but also to fully consider the production, construction, maintenance and renewal of materials to reduce energy consumption and carbon dioxide emissions, disassembly and reuse.

**Keywords:** *Low Carbon Building, Carbon Dioxide, Design Concept, Low Carbon Technology*



**Green Building Parametric Design Based on Environmental Parameter**

**L. He, and J. Zhou**

**ABSTRACT**

Parametric design is a new field in digital design, which can adapt to complicated and changing environment. Therefore, it is of great significance to combine parametric design method with green building design thinking, fully extract and maximize environmental factors as design parameters, reduce energy consumption and realize green concept. This paper selects various factors of environment from the perspective of the main object, and then based on parametric design of the environmental parameters, analyses and studies have been carried out in the hope of finding environmental adaptations parametric design method is combined with green design concept.

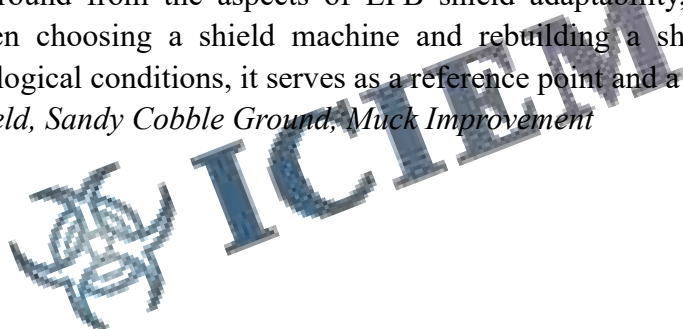
**Keywords:** *Environmental Parameter, Green Building, Parametric Design, Environment Adaptive*



**The Muck Problems of Sandy Cobble Stratum in Subway Shield Tunneling****C. Hu, and Y. Zhang****ABSTRACT**

Investigations aimed at muck improvement for Chengdu subway shield tunneling in water-rich sandy cobble ground first determine the kinds and ratio of muck improver suitable for the strata, and through field application determine the reasonable ratio of muck improver for shield tunneling in sandy cobble ground, providing a reference to other muck improvement for shield tunneling in similar ground. And the earth pressure balanced shield, with its attributes of wide adaptability, safe operation, quick driving speed, low environmental noise, and low cost, is widely employed in tunnel engineering. The Chengdu Metro Line is used as a backdrop. Aiming to address the challenges that EPB shield tunneling in water-rich sandy cobble ground presents, and building on the explorations and research of the forerunners and scholars, engineering and technical personnel, the present paper combines with engineering examples to make a systematic summary and research on key construction technology of EPB shield tunneling through sandy cobble ground from the aspects of EPB shield adaptability, scalability, and sturdiness. When choosing a shield machine and rebuilding a shield machine in challenging geological conditions, it serves as a reference point and a direction.

**Keywords:** *Shield, Sandy Cobble Ground, Muck Improvement*



**Radiant Heating and Cooling System Performance Evaluation for an Office in Hot and Humid Climates****W. Cai****ABSTRACT**

A numerical investigation was done into the thermal comfort of a radiant heating/cooling (RHC) system in hot and humid areas. To determine the distributions of air flow rate and temperature inside an office that was cooled by cooling ceiling integrated with displacement ventilation (CC/DV) systems and heated by radiant floor heating (RFH) systems, a mathematical model based on computational fluid dynamics (CFD) was developed. A comparison between CC/DV, cooling walls combined with DV systems, and traditional air-conditioning systems was done in order to determine how outside windows affect RFH systems. The workplace with an RFH system exhibits significant circulation, and a CFD simulation reveals that the average air temperature in the entire space is around 1.8 K lower with external windows than without. The RFH system produces a consistent temperature across the space and a good vertical temperature gradient. It was discovered that the CC/DV systems, which have a reduced vertical temperature gradient and achieve a horizontal temperature gradient of less than 1.2 K, could provide more comfort in hot and humid regions than cooling walls and convective terminals. In hot and humid conditions, the systems can successfully deliver chilling fresh air and lessen the chance of condensation on the chilled ceiling surfaces.

**Keywords:** *Radiant Heating and Cooling, Thermal Comfort, Cfd, Ventilation*

**A Study on the Direct Shear Experiment of Unsaturated Soil****P. He, Z. Wang, and L. Sun****ABSTRACT**

The current investigation focuses on some preliminary laboratory tests performed with a recently created modified direct shear test apparatus. To ascertain the shear rate and test design of the unsaturated shear test, the single-stage and multistage direct shear tests were conducted. The nonlinear matric suction failure envelope is derived using the shear strength parameters of unsaturated soil in various situations, which show good agreement with common theories of unsaturated soil. The experimental findings are also used to fit a few shear strength equations.

**Keywords:** *Unsaturated Soil, Direct Shear Test, Matric Suction*



**Research on the Stimulatory Action of Immunological and Antioxidant  
Polysaccharide Fig**

**M. Bai, W. Xin, M. Miao, X. Fang, and C. Wang**

**ABSTRACT**

**Objective:** To research the antioxidant and immunological stimulatory properties of *Ficus carica* polysaccharide (FCPS). **Method:** D-galactose metabolism was carried out in aging model mice, and FCPS effects on red blood cell Superoxide dismutase (SOD), Catalase (CAT), Glutathione peroxidase (GSH-Px), and lipid peroxidation in serum, liver homogenate, and brain homogenate (LPO) levels were observed. Cyclophosphamide (CY) induced by mice immunosuppression model, FCPS on peritoneal macrophage phagocytic percentage and phagocytic index, hemolysin production and hemolysis, and lymphocyte transformation effects. Mushroom polysaccharide showed promise in two experiments. **Results:** FCPS increased peritoneal macrophage phagocytic percentage and phagocytic index (P0.01), promoted the formation of hemolysin and hemolytic plaque, and promoted lymphocyte transformation. It also significantly decreased plasma, liver homogenate, and brain homogenate LPO levels (P0.05), and SOD, CAT, and GSH-Px levels in aging model mice. FCPS may enhance the antioxidant capacity of aging model mice and the immunological function of immunosuppressive mice.

**Keywords:** *Ficus Carica Polysaccharide, D-Galactose, Cyclophosphamide, Antioxidant, Immuno Exciting*

**Construction of a Single Tree Three-Dimensional Model and the Extraction of Impact Factors Based on Oblique Photogrammetry**

**W. Xi, Z. Shi, and D. Li**

**ABSTRACT**

This study employs unmanned aerial vehicle (UAV) oblique photogrammetry technology based on the digital photogrammetry principle and computer vision theory to create a three-dimensional model of the vegetation canopy structure and to determine the impact factor of the model by performing image data orientation, matching, and aerial triangulation. It uses vegetation point cloud data from three-dimensional laser scanning to confirm the extraction factor is accurate. The findings indicate that the factor data extracted from this model are trustworthy on the basis of the case study.

**Keywords:** *Unmanned Aerial Vehicles (UAV), Oblique Photogrammetry, Three-Dimensional Structure Model, 3 D Laser Scanning, Point Cloud Data*





**Key Sustainable Strategies for Suburbanisation Urban Design Framework: A  
Proposal for Southeast Queensland Transit Oriented Community  
J. Shao, Z. Hu, B. Li, and S. Lin**

**ABSTRACT**

Modern cities have been increasingly suburbanized, forcing many people to live in places that are much less accessible than their previous homes and necessitating the use of motorized heavy transportation. Walking and bicycling, population density, employment prospects, urban design, open space, and mixed-use land are among the sustainable suburban development qualities claimed to be pertinent to Transit Oriented Development (TOD). The study's urban design plan for Reedy Creek Town Centre aims to direct the outlying community's sustainable development as a cohesive, dense urban center centered on the new rail station. Furthermore, a variety of people with different income levels and social interests can live and work in the suburbs thanks to a variety of residential development options, commercial office uses, convenience commerce, and related services. By analyzing the concepts and methods of TOD, this study expands on the work of the transit-oriented community plan and creates a framework for urban design for suburban growth that highlights the most important sustainability measures. According to the findings, transit-oriented development has a lot of potential for putting quickly suburbanizing communities on more comprehensive sustainable development strategies, which provide a foundation for guiding suitable growth, transformation, and development and guard against inconsistent development.

**Keywords:** *Urban Design, Sustainable Development, TOD, Community, Suburbanization*

**Rollover State Numerical Simulation for Heavy Semi-trailer Train Based on Truck****Z. Zhao, Y. Tao, J. Wang, J. Liu, and Y. Yang****ABSTRACT**

The identification of the rollover condition has a direct impact on the lateral stability of semi-trailer trains. The multi-body dynamics program Trucksim is used to build the semi-trailer train model based on the research goal of handling stability of vehicles. It has been decided to evaluate the steering wheel angle step input in accordance with national standard GB/ T6323-2014. The effect of a single parameter on the targeted vehicle as well as the effects of vehicle speed, tractor, the mass of a semi-trailer train, wheelbase, and other characteristics will be assessed using the method of controlling variables. The outcomes will serve as benchmarks for semi-trailer design and safe operation.

**Keywords:** *Semi-Trailer, Trucksim, Lateral Stability, Rollover, Numerical Simulation*



**Research on the Well-logging Curve Based on Morphological Characteristics  
Similarity Feature Extraction Method**

**R. Du, F. Shang, and N. Ma**

**ABSTRACT**

This study provides a method for finding well-logging curve similarity based on morphological traits, with a focus on the well-logging curve with an axis of depth to reflect geological information and similarity analysis of time series. This study aims to weight the slop difference in order to measure the similarity of contrast sequences by dividing the well-logging curve into contrast subsequences using the comprehensive activity analysis method and morphological characteristics such as sequence trend, depth span, and fluctuation range. This approach has a clear physical meaning, emphasizes morphological changes, and effectively describes morphological distinctions. The results of the experiments support this approach's efficacy.

**Keywords:** *Time Series, Well-Logging Curve, Morphological Characteristics, Activity Analysis*



**An Experimental Investigation of Grain Silo Walls at High Pressure**

**H. Huang, and J. Wang**

**ABSTRACT**

The author obtained the numerical lateral pressure value of the silo wall under grain weight through a field test of a warehouse in the national grain reserves in three big diameter squat silos. The results were compared with theoretical analysis of several widely used methods to calculate and draw some conclusions, and they served as a guide for the design of the light silo.

**Keywords:** *Shallow Silo, Side Pressure, Bin Test*

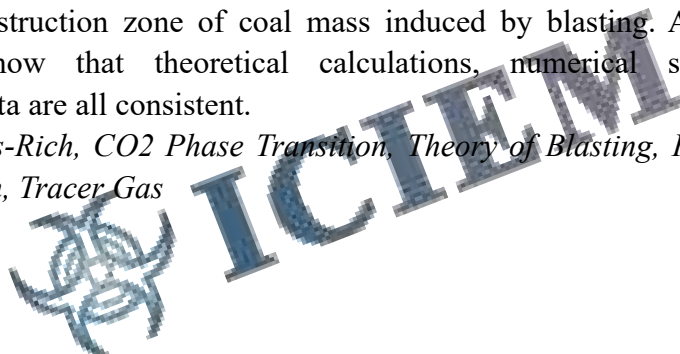


**Experimental Study on Evolutionary Characteristics of Gas-Rich Coal Seam  
Damage and Destruction by CO<sub>2</sub> Phase-transition Blasting  
W. Zhang, K. Xu, Y. Lei, B. Zhang**

**ABSTRACT**

In order to study the evolution of damage and destruction to gas-rich coal seams caused by CO<sub>2</sub> phase-transition blasting, this paper develops a mathematical model for blasting based on three major parameter variables: initial peak impact pressure, effective radius of cracked circle, and diameter of blasting-split borehole. The research then establishes a discrete element numerical calculation model using numerical values of the granular discrete element software PFC2D for simulation, based on the mathematical model for blasting and the geological and physical parameters of coal seam used in the experiment. According to the simulation's final results, the destruction zone surrounding coal seam bores caused by blasting disturbance has a radius of 2 m and a dimension of 2 m to 3 m. In the paper, an experimental method based on the principle of tracer gas is proposed for the first time in this sector for measuring the damage and destruction zone of coal mass induced by blasting. Analyses of field experiments show that theoretical calculations, numerical simulations, and experimental data are all consistent.

**Keywords:** *Gas-Rich, CO<sub>2</sub> Phase Transition, Theory of Blasting, PFC2D, Damage And Destruction, Tracer Gas*



**The Study of Applying a Physical Process Parameterization Technique to Simulate a Severe Downpour in the WRF Model on the Tibetan Plateau**

**J. Sheng, X. Wang, T. Cao, and X. Zhang**

**ABSTRACT**

This study examines a downpour that occurred in Qinghai Province on the QingTibet Plateau on July 11, 2016, from 0:00 to 0:00 using the WRF model to perform numerical simulations at the mesoscale level. The best physical parameterization schemes are determined by combining three cumulus parameterization methods with eight microphysical processes parameterization schemes. The findings demonstrated that the microphysics approach has more sensitivity than the cumulus convection strategy for small to heavy rain level modeling on the Tibetan Plateau. For the Tibetan Plateau, BMJ is superior in the cumulus convection scheme to simulate light rain, whereas KF is better than BMJ GF to simulate moderate to heavy rain. For the Tibetan Plateau, Kessler performs better in the microphysics scheme when compared to other programs on the simulated tiny rain; Lin performs better while simulating moderate to heavy rain. For the Tibetan Plateau, the BMJ cumulus convection scheme with the Kessler microphysics scheme is the best option when other parameterization schemes are fixed. The KF cumulus convection scheme with Lin microphysics system is the best for moderate to heavy rain.

**Keywords:** *Wrf Model, Numerical Simulation of Mesoscale, Physical Process Parameterization Schemes, The Tibetan Plateau, Heavy Rainfall*

**A Quick Hardware Architecture for enTTS Signature Generation****H. Yi****ABSTRACT**

Due to Peter Shor's technique, quantum computers may now challenge RSA, ECC, and other signature methods used by many circuits. Thankfully, multivariate signature is present in a few post-quantum contenders for signature chips. The Multivariate Public Key Cryptosystem (MPKC), one of the principal families of public key cryptosystems with the potential to withstand attacks by quantum computation, is the parent of the Multivariate Signature. We must accelerate multivariate signature implementations in comparison to RSA and ECC implementations. In this paper, we suggest a quick hardware architecture for enTTS signature generation implementation and improve our design in three ways. In a finite field, enTTS uses 20-byte hashes and 28-byte signatures. Utilizing a composite field expression, we may multiply in finite fields more effectively. In terms of multiplicative inversion, binary trees are used to create a multiplicative inverter. Our advancements in the area of system of linear equations solving are based on a parallel Gauss-Jordan elimination. We create a new hardware architecture that creates an enTTS signature in just 90 clock cycles and 0.9  $\mu$ s by incorporating the primary optimizations above with additional minor parallelization process optimizations. We test and validate our design using Altera Stratix FPGAs; the experimental results support our predictions, and comparisons reveal that our design is significantly quicker than existing implementations.

**Keywords:** *Cryptographic System, Multivariate Public Key Cryptography (MPKC), Tame Transformation Signature (TTS), Entts, Field-Programmable Gate Array (FPGA)*

**Analysis of Lateral Sloshing in a Liquid Tank Semi-Trailer: Dynamic Characteristics**

**Z. Zhao, G. Peng, L. Wang, J. Liu, and J. Wang**

**ABSTRACT**

To prevent liquid from sloshing during the lateral movement of the semi-trailer tanker and to ensure the safety of liquid tanker transportation. For the purpose of numerically simulating the shaking of the liquid in the tank, the VOF (Volume of Fluid) multi-phase flow model and the traditional k- turbulence model are utilized. According to the modeling results, the tank can experience a variety of forces and moments depending on the lateral acceleration, the number of baffles, and the liquid filling ratio. Consequently, the tanker's driving steadiness will be affected. The greater the lateral acceleration, the greater the amplitude of the liquid sloshing, and the greater the impact on the tank when the liquid filling ratio is fixed. The peak magnitude of the impact on the tank lowers as the liquid filling ratio rises and progressively stabilizes over time. The tank's lateral force impact has a lower peak value when there are more baffles present during a cycle, and its lateral force decays more quickly when there are fewer hits. The findings demonstrate the viability of the study methodology used in this paper and offer a design guide for enhancing the lateral stability of liquid tank trucks.

**Keywords:** *Semi-Trailer Liquid Tank, Lateral Movement, Liquid Sloshing, Driving Stability*



**Analysis of the Natural Gas Well Production System and Its Application to Gas Well Down-Hole Throttling Design**

**C. Lv, and L. Li**

**ABSTRACT**

A reliable and efficient energy source is natural gas. Compared to conventional fuels, natural gas provides more advantages in terms of emissions reduction and environmental preservation. Natural gas is a key component of renewable energy and has the potential for extensive growth. Transportation with natural gas is clean, effective, safe, convenient, and so on. Nodal analysis of the natural gas well production system is an important tool for the overall optimization of the system. It can do an overall optimization study and employs system engineering theory to deal with the flow process in the gas reservoir, the vertical flow process of gas wells, and the gas gathering system as a complete gas production system. It can be utilized to plan and assess the benefits and drawbacks of different components of the natural gas well production system. In this study, the downhole throttle design for a natural gas well is examined using a nodal analysis of the natural gas production system's overall situation. Additionally, gas well production system analysis software (PIPESIM software) was used to simulate and optimize the natural gas wells in the G production block of a natural gas field. The development of hydrates was examined during the simulation process using numbers of variables, including temperature, wellhead pressure, inflow depth, and down-hole throttle diameter, in order to choose an appropriate throttle diameter and throttler depth into the well. The application has produced positive outcomes and can efficiently streamline the steps involved in natural gas ground production systems, increasing their effectiveness.

**Keywords:** *Clean Energy, Natural Gas, Production System Analysis, PIPESIM Software, Down-Hole Throttling, Application*

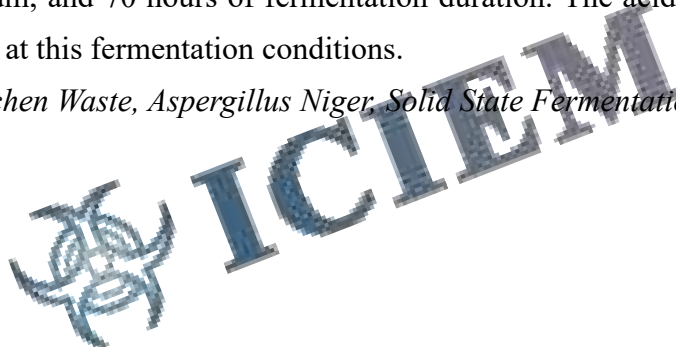
**Aspergillus Niger's Solid State Fermentation of Kitchen Waste to Produce Acid  
Protease**

**S. Zhang, H. Cheng, and N. Chen**

**ABSTRACT**

Kitchen trash served as the primary substrate for the solid state fermentation (SSF) process used to produce acid protease using *Aspergillus niger*. Studies and improvements were made to the SSF conditions. Using the one factor at a time method, the effects of water levels in SSF medium, inoculum size, and fermentation time on acid protease activities were investigated. Based on the findings, the orthogonal array design was used to optimize the fermentation parameters for the synthesis of c acid protease, which were determined to be 30 g of kitchen waste, 20 mL of starting water, 4 mL of inoculum, and 70 hours of fermentation duration. The acid protease activity were 223.518 U at this fermentation conditions.

**Keywords:** *Kitchen Waste, Aspergillus Niger, Solid State Fermentation, Acid Protease*



**Study of Dredging Slurry Using Parabolic Hydrocyclone for Heavy Metal  
Removal**

**X. Yang, P. Lin, Y. Zhang, and L. Jiang**

**ABSTRACT**

Prior to recycling the dredge slurry, heavy metals must be removed or decreased as they typically aggregate in the fine particles. However, because small particles are challenging to entirely separate, the separation achieved by conventional hydrocyclone technology frequently results in low separation efficiency. In order to remove heavy metals from the dredge slurry, the article suggests a novel type of parabolic hydrocyclone. The internal flow field of the parabolic hydrocyclone was first simulated using the Computational Fluid Dynamics (CFD) program, together with Mixture and the Reynolds stress model (RSM), and then confirmed through an experimental test. According to the simulation results, the parabolic hydrocyclone's flow field is more stable than the one within a typical hydrocyclone, thus preventing the combination of coarse and fine particles brought on by flow field disturbance. Additional experimental findings show a clear drop in the overall proportion of fine particles in the underflow product. The fact that the cut size may be increased from 30 to 49 millimeters and the steepness index can go from 0.13 to 0.2 demonstrates that it is possible to boost separation precision while also efficiently reducing the tiny particles intermingled in the underflow. Additionally, the overflow products' heavy metal recovery rates for Zn and Cr are 97.21% and 78.27%, respectively, confirming the enrichment effect. As a result, the underflow products following the parabolic hydrocyclone separation process contain less heavy metal and are no longer harmful.

**Keywords:** *Heavy Metal, Parabolic Hydrocyclone, CFD, Separation Efficiency, Cut Size*

**Experimental Research on Variation Law of Coal Fire Indicator Gas  
Entire Combustion Stages in A Confined Space  
B. Lei, Bing, Wu, and X. Wang**

**ABSTRACT**

In order to create effective rescue plans when a coal mine fire erupts, it is essential to assess the fire combustion status by examining indicator gas concentrations and shifting trends of different gas ratios. By analyzing the trends of indicator gases and gas ratios independent of disturbances to the external environment, such as air leakage and internal gas injection, it is a successful way to properly assess the changes in combustion state in coal mine fire. However, there are currently just a few experimental studies about the shifting regulations of indicator gases and gas ratios during various combustion phases. In order to conduct experimental research on variation trends regarding indicator gases and gas ratios throughout the entire combustion phases, a small-scale coal combustion experimental platform in limited space has been built in this work. The experiment's findings demonstrated that the relationship between indicator gases and gas ratios throughout various combustion stages may be used to accurately determine coal combustion trends. The conclusions of this research are validated at the end using a genuine coal mine fire disaster relief example, and the practical outcomes are consistent with the experimental analysis.

**Keywords:** *Coal Combustion, Indicator Gases, Gas Ratios, Trend Analysis*

**High-Performance Liquid Chromatography and Quantum Dots Extraction for the Determination of Polycyclic Aromatic Hydrocarbons in Water**

**X. Yang, N. Luo, Y. Zong, Z. Jia, and X. Zhao**

**ABSTRACT**

The extraction and preconcentration of polycyclic aromatic hydrocarbons (PAHs) from water samples is done using a brand-new alternative technique. The strong affinity between PAHs and N-acetyl-L-cysteine modified CdS quantum dots (NAC-CdS QDs) is used in this novel method. We created the NAC-CdS QDs in our own lab. NAC-CdS QDs were used to preconcentrate 12 distinct PAHs in tap water samples prior to HPLC-FLD (high-performance liquid chromatography with fluorescence detection). According to the test results, the PAHs' limits of detection (LODs) ranged from 1.0 to 100 ng/L, with relative standard deviations between 0.4 and 2.8% and recoveries between 74.3 and 95.9%. With this new pretreatment, the complete extraction process uses just 1 mL of organic solvents per sample, which makes it economical and environmentally beneficial.

**Keywords:** *Reconcentration, Polycyclic Aromatic Hydrocarbons, NAC-Cds Quantum Dots, HPLC-FLD*

**Ultraviolet-Visible Spectroscopy and Cloud Point Extraction for the  
Determination of Trace Zinc in Environmental and Rabbit Blood Samples**

**X. Yang, Z. Jia, X. Yang, N. Luo, and X. Liao**

**ABSTRACT**

For the preconcentration and determination of zinc, the cloud point extraction (CPE) with ultraviolet-visible spectroscopy (UV-vis) approach has been developed. On the basis of the complexation reaction of Zn (II) ions with 1-(2-pyridylazo)-2-naphthol (PAN), non-ionic surfactant Triton X-100 was used as an extractant. As a cloud point reagent and synergistic reagent, sodium dodecyl sulfate (SDS) and sodium chloride electrolyte solution successfully lowered the cloud point temperature (CPT) of Triton X-100 to 0°C. Using spectrophotometry at 549 nm, the enriched analyte in the surfactant-rich phase was identified. The concentrations of Triton X-100 and SDS, concentration of the chelating agent, pH, and salt effect were among the influence parameters that were assessed and optimized for CPE. The suggested CPE-UV-vis method demonstrated linear calibration within the range 10-1000 ngmL<sup>-1</sup> of Zn (II) under ideal conditions, and the method's limit of detection was 3.3 ngmL<sup>-1</sup> with a preconcentration factor of 38. When C<sub>Zn (II)</sub> = 100 ng/mL, n = 11, the relative standard deviation (RSD) was calculated, it was found to be 2.8%. With appropriate analytical results, the suggested method might be used to find trace amounts of zinc in authentic, certified materials.

**Keywords:** *Cloud Point Extraction, Ultraviolet-Visible Spectroscopy, Zinc*

**The River with Numerical Solution for Dissolved Oxygen and Biochemical  
Oxygen Demand of One-Dimensional Bod-Do Model**

**S. Wang, and R. Li**

**ABSTRACT**

The concentration of DO always receives a lot of attention as the primary indicator of water quality. Since DO is primarily involved in the chemical reactions that occur in water bodies, the concentration of DO and water quality are closely related. The relationship between the content of BOD or DO and the physical characteristics of the river is demonstrated using the biochemical oxygen demand and dissolved oxygen (BOD-DO) model. Since the analytical solution to this model is difficult to ascertain, the numerical solution of the model is derived using a Chebyshev orthogonal polynomial. This method involves rewriting the model in differential form, and using a Chebyshev orthogonal polynomial with coefficients, it was possible to express the four-order differential of the oxygen deficiency. Finally, a simulation test was performed to confirm the model's logic. The original model is used to calculate the real BOD and oxygen deficiency values. The coefficients may be solved and the expected values could be computed using the actual values and formulas. The forecasted and actual values for BOD and DO concentration are compared. The expected outcomes were assessed using five statistical methods.

**Keywords:** *Water Quality, Dissolved Oxygen Forecasting, Numerical Solution, Biochemical Oxygen Demand Forecasting*

**Experimental Investigation of Water Injection of Cryogen****B. Zhang, X. Zhang, and W. Wu****ABSTRACT**

To visually explore the cryogen injection into water's explosive boiling mechanism, an experimental apparatus was created. Visualized data demonstrate that the LNG and LN2 injection processes both experience explosive boiling, which is characterized by a cloud of bubbles that accelerates heat transfer. Water is subcooled when LC3H8 is injected into it, causing flow boiling. The liquid cryogen column has not broken significantly, and the cloud is bubble-free. When LNG is injected into open water under a pressure of 7 bars, the maximum heat transfer flux can exceed 1.9 MW/m<sup>2</sup>. The instability of Rayleigh-Taylor, Kelvin-Helmholtz, Weber number, and Marangoni convection are analyzed and used to explain the differences of maximum pressure and its occurrence time in different experimental conditions, such as injection depth into water, injection pressure, water temperature, and injecting fluid. This analysis is done in order to investigate the determinant factors for explosive boiling occurring. Therefore, it is plausible to draw the conclusion that the Kelvin-Helmholtz instability and Weber number will define the breaking of a liquid column or droplet if the relative velocity between the cryogen and surrounding fluid is high enough. The edge of the vapor film around the column head is also much stronger than other areas in the Marangoni convection effect at the beginning of the column floating upwards or the ending of the column traveling downwards during the subcooling mixture or pure substance injection process. These are all considered to be the main elements that enhance heat transmission capacity and cause explosive boiling.

**Keywords:** *Cryogen, Explosive boiling, Experimental study, Instability, Marangoni effect, Bubble behaviors*



## Nonylphenol Ethoxylate's Effect on the Surface Features of Sub-Bituminous Coal

X. You, X. Lyu, L. Li, M. He, L. Wu, and W. Zhang

### ABSTRACT

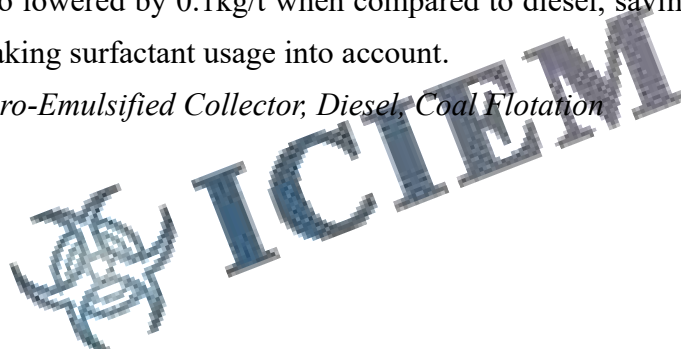
Nonylphenol ethoxylate with nine ethylene oxide groups (NP-9) has been used to analyze the surface properties of sub-bituminous coal. Zeta potential measurement, contact angle measurement, and surfactant adsorption are surface characterisation techniques that have been applied. Because the surfactant molecules are insulating the sub-bituminous coal's negative charge, the addition of NP-9 results in fewer negative zeta potential profiles. Contact angle measurements are used to evaluate changes in the hydrophobicity of the sub-bituminous coal surface. The contact angle gradually increases and subsequently drops as the concentration of NP-9 rises, reaching its maximum at around the CMC of NP-9. The effect of temperature and concentration on the surfactant adsorption has been studied. The Langmuir equation provides a good fit for the adsorption isotherms. Thermodynamic parameters are computed using the adsorption data. According to the thermodynamic functions, the entire adsorption process is exothermic and is driven by a synergistic interaction between entropy and enthalpy.

**Keywords:** *Sub-Bituminous Coal, Nonylphenol Ethoxylate, Adsorption, Contact Angle*

**Investigation of Coal Flotation Using Micro-Emulsified Collector****X. Lyu, X. You, M. He, W. Zhang, and L. Li****ABSTRACT**

By using coal flotation experiments, the flotation performance of the home-made micro-emulsified collector LY was investigated, and its performance with that of the conventional hydrocarbon oil collector, diesel, was compared. For the slime sample that was obtained from a coal preparation plant owned by the Chinese mining company Shandong Xinwen. When LY was administered at a dosage of 0.6 kg/t, clean coal with a yield of 60.17% and an ash level of 10.65% could be produced. By employing LY, the output of clean coal is 4.85% greater and the ash content is 0.83% higher than it would be with the optimum sorting index for diesel. The consumption of the micro-emulsified collector LY also lowered by 0.1kg/t when compared to diesel, saving around 73% of diesel without taking surfactant usage into account.

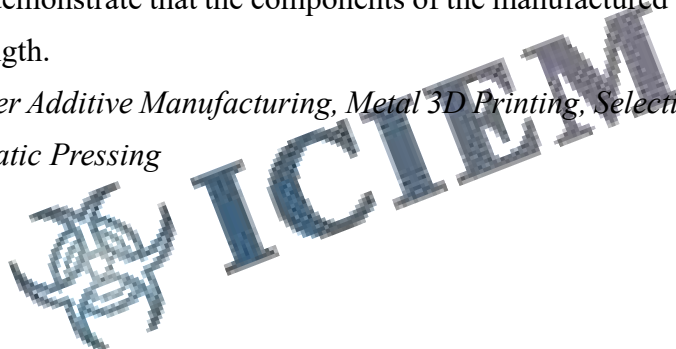
**Keywords:** *Micro-Emulsified Collector, Diesel, Coal Flotation*



**Vehicle Engine Valve Design and Manufacture 3D Printing Technology of Metal****C. Li, N. Dai, G. Qiu, Q. Huang, and Z. Tan****ABSTRACT**

In terms of material structure, function integration, and weight reduction, metal 3D printing offers a natural advantage. It has the ability to quickly produce intricate metal pieces and is crucial in the disciplines of high-end manufacturing, processing, and design. The classification, guiding concept, and process flow of metal 3D printing technology are presented in this study. Selective laser melting technique is used in the design and production of the valve parts for V8 engines. It elaborates on the entire design and manufacturing work flow. The primary technological aspects of hot isostatic pressing and metal 3D printing pretreatment are thoroughly explained. The results of the fatigue test demonstrate that the components of the manufactured valve block reach the desired strength.

**Keywords:** *Laser Additive Manufacturing, Metal 3D Printing, Selective Laser Melting, Valve, Hot Isostatic Pressing*



**Research on the Use of Rainwater in the Vertical Design of Urban Green Spaces  
Design of the Land and Resources Bureau in Lishui City: A Case Study**

**W. Wu, Y. Ren, S. Zhang, C. Huang, and Y. Huang**

**ABSTRACT**

The shortage of freshwater supplies and hazardous pollution have gotten worse due to the modern society's rapid urbanization. Given the situation, the collecting and use of rainwater, one of the most important sources of water resources, has gained increasing attention. One of the simplest and most efficient ways to conserve water during the creation of urban green spaces has been to collect and use rainwater resources. The study includes an example analysis of the landscape design of the Bureau of Land and Resources in Lishui City based on the investigation of the rainwater utilization strategy in the urban green space and the primary carrier and form of rainwater consumption. The study investigates the vertical design of urban green space based on the exploitation of rainwater with the natural fusion between rainwater collection techniques and the vertical design of landscape, combining theory and practice. Its purpose was to serve as a resource for pertinent design and research.

**Keywords:** *Vertical Design, Rainwater Utilization, Strategy, Carrier, Urban Green Space, Lishui City*

**Studies on the Effects of Steam and Catalyst on the Efficiency of a Fixed Bed Gasifier Using Lignite Feedstock**

**D. S. Upadhyay**

**ABSTRACT**

In a 10 kWe pilot scale (atmospheric pressure) downdraft gasifier, gasification of low-rank high ash lignite (22-25 mm) using magnesium carbonate ( $MgCO_3$ ) and steam (individually) was conducted. Eliminating clinker formation, which causes flow issues in lignite gasification, is the primary goal of the catalyst study. The clinker formation issue was solved by using lignite and  $MgCO_3$  lumps as a catalyst. Four distinct catalyst to lignite (C/L) ratios (wt%), namely 0%, 3%, 5%, and 7%, were used in the trials. The results show that clinker formation decreased with an increase in the C/L ratio and almost disappeared at a 7% C/L ratio. Additionally, the same ratio resulted in increases in the gas yield,  $H_2/CO$  ratio, producer gas Lower Heating Value (LHV), Cold Gas Efficiency (CGE), and energy efficiency of 2.52%, 9.94%, 22.22%, and 20.24%, respectively. While the concentration of tar, particulate matter (PM), and specific fuel consumption (SFC) decreased by 16.48%, 41.61%, and 33.09%, respectively. According to the results of the catalyst gasification study, 7%  $MgCO_3$  loading with lignite produced the best results out of all the reported feedstocks. The second section of the study tries to determine the ideal Steam to Lignite ratio (SLR), w/w, to produce producer gas with a higher  $H_2$  production and a lower tar output. In order to examine the effects of six various SLRs (0, 0.06, 0.14, 0.18, 0.24, 0.30, and 0.48), lignite was employed as the feedstock. For various SLRs, the LHV and CGE were discovered to be in the range of 4.96 MJ  $Nm^{-3}$  to 3.62 MJ  $Nm^{-3}$  and 70.6% to 81%, respectively. The ideal SLR was determined to be 0.24, having a lower specific fuel consumption of 1.437 kg  $kWh^{-1}$ , a lower tar content of 112.28 mg  $Nm^{-3}$ , a lower PM content of 27.34 mg  $Nm^{-3}$ , a higher LHV of 5.62 MJ  $Nm^{-3}$ , and a higher CGE of 81%. In comparison to air gasification, the  $H_2$  yield and  $H_2/CO$  ratio both increased by 34.7% and 52%, but the tar output decreased by 78.31% at 0.24 SLR. The catalyst and steam gasification investigation also included thermodynamic analysis such as mass, energy, and exergy study. The 0.24 SLR produced better results among the selected ratios to generate higher  $H_2$  yield and lower tar yield in the producer gas, according to the steam gasification investigation.

**Keywords:** *Steam to Lignite Ratio, Lower Heating Value, Lignite Feedstock*

**Parametric Optimization of Nd: YAG Laser Drilling Operation on Glass Woven  
Fiber Coated basalt-PTFE Composite Composite Using Teaching Learning  
Based Optimization Algorithm**

**A. K. Srivastava, and D. R. Mishra**

**ABSTRACT**

Because of their directional characteristics, corrosion resistance, and fatigue resistance, composite materials are well known for use in engineering. It is made up of fibers inside of a matrix substance that outperforms metals and alloys and has a high strength-to-weight ratio. Composite materials, on the other hand, are challenging to cut because of the variations in material characteristics and the abrasiveness of the fibers, which results in reduced tool life in traditional machining processes and circumstances where the fibers tear away from the matrix. As a result, non-traditional machining techniques like laser drilling are preferable to traditional ones. The composite material is melted and burned during the thermal process of laser drilling to create the holes. Depending on the distribution of the fiber and matrix materials as well as the laser parameters, the holes made by the laser drilling process are tapered. Thus, Nd: YAG laser drilling on a newly created hybrid composite material made of basalt and PTFE-coated glass woven fibers is reported in this research. This is followed by parametric optimization of the hole taper process using a Teaching Learning-based optimization algorithm. The laser drilling process characteristics were taken into consideration, including lamp current, pulse width, stand-off distance, and compressed air pressures. The hole taper was projected to be 0.017 degrees, and the parametric setting for the laser drilling process was 180 A of lamp current, 3ms of pulse width, 1 mm of stand-off distance, and 12 kg/cm<sup>2</sup> of compressed air pressure.

**Keywords:** *Laser Drilling, Hybrid-Composite, Fibre-Reinforced Composite, Optimization, TLBO*

## Making Use of Makkah's Waste Biorefinery as Means of Producing Renewable Energy

A. S. Nizami, K. Shahzad, M. Rehan, O. K. M. Ouda, M. Z. Khan, I. M. I. Ismail, T. Almeelbi, J. M. Basahi, and A. Demirbas

### ABSTRACT

Millions of Muslims visit Makkah in the Kingdom of Saudi Arabia (KSA) each year to worship. As a result, the amounts of municipal solid waste (MSW) increase dramatically. During the holy months of Ramadan and Hajj, these amounts increase to 3.1 and 4.6 thousand tons per day, respectively, from the daily average of 2.4 thousand tons of MSW that is dumped in city landfills. As a source of renewable energy generation and a solution to the challenges associated with landfill waste, KSA now lacks a waste-based biorefinery or waste-to-energy (WTE) facility to handle diverse fractions of MSW. Therefore, if a waste-based biorefinery were to be built in Makkah, it could process 87.8% of the city's MSW using WTE methods such as anaerobic digestion (AD), transesterification, pyrolysis, and refuse-derived fuel (RDF). Recycling is possible for the remaining 12.2% of MSW component. Together with the recycling strategy, the waste-based biorefinery may save 87.6 million Saudi Arabian Riyals (SAR) in carbon credits. Similar to landfill diversion, power production can produce a total net revenue of 758 million SAR (530.4 million SAR) and 288.5 million SAR (288.5 million SAR). Moreover, a cost reduction of 485.5 million SAR can save 1.95 million barrels of oil and 11.2 million MCF of natural gas. Recycling and waste-based biorefinery can lower 1.15 million MtCO<sub>2</sub> eq of the global warming potential (GWP) as a whole.

**Keywords:** *Waste-Based Biorefinery, Waste-To-Energy (WTE), Municipal Solid Waste (MSW), Renewable Energy, Recycling, Anaerobic Digestion (AD)*

**SECTION 3**

**Logistics Engineering**

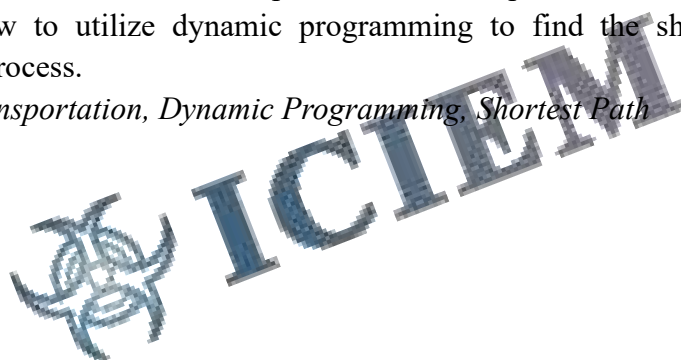




**Using Dynamic Programming to Find the Shortest Path in Transport****Y. Xiao, and W. Zhang****ABSTRACT**

People's concerns about how to lower the transportation costs of this issue are growing as China's transportation industry develops. The dynamic programming method has a wide range of applications in various domains, including engineering, transportation, and industrial production, as science and technology have advanced. The shortest path problem in the transportation industry is one of the key applications of dynamic programming in this context. The shortest path inside the transportation process, which is broken down into multiple sub-phases, will be solved using the dynamic programming method in this study. The article chooses the best course of action at many points and, in the end, determines that the shortest path routing is the best overall goal for the entire transportation procedure. This essay explains the fundamentals of the dynamic programming approach, establishes its broad mathematical model, and examines how to find the shortest path. The article provided a clear and concise example of how to utilize dynamic programming to find the shortest path in a transportation process.

**Keywords:** *Transportation, Dynamic Programming, Shortest Path*

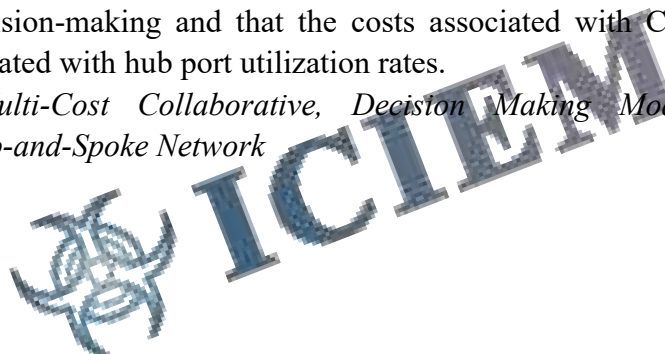


**Design of Hub and Spoke Container Shipping Network Based on CO<sub>2</sub> Emissions**  
**B. Lu**

**ABSTRACT**

The decision-making system for the container shipping network is facing additional obstacles as a result of the International Maritime Organization (IMO) starting to levy shipping companies for carbon emissions. This study suggests a brand-new hub-and-spoke container transportation network design multi-costs collaborative optimization and decision-making approach. The suggested approach is based on a Lagrangian relaxation algorithm and a non-linear optimization model with the constraints of container flow equilibrium and hub port capacity restriction. Based on numerical studies, the utilizations of both hub ports are 0.9932 and 0.9732 when CO<sub>2</sub> emission costs are taken into account; otherwise, they are 0.6872 and 0.5106, respectively. The outcomes therefore demonstrate the viability, efficacy, and availability of the suggested model and algorithm for designing the container transportation network. Furthermore, it can be deduced that hub port capacity restrictions have an impact on shipping businesses' decision-making and that the costs associated with CO<sub>2</sub> emissions are adversely correlated with hub port utilization rates.

**Keywords:** *Multi-Cost Collaborative, Decision Making Models, Lagrangian Relaxation, Hub-and-Spoke Network*



**A New Genetic Algorithm and Ant Colony Algorithm-Based Logistics  
Distribution Route Optimization Method for Fresh Agricultural Products**

**X. Li, J. Wei, and J. Yuan**

**ABSTRACT**

The distribution route of agricultural items was optimized by applying the novel genetic algorithm-ant colony algorithm to construct a mathematical model of agricultural product logistics distribution with many limitations. Ant colony clustering algorithm provides strong distributed parallelism and positive feedback ability, whereas genetic algorithm has the advantage of rapid and good global search ability. The self-adaptability, convergence speed, and global search capability of the new algorithm are enhanced by the combination of the two algorithms. The testing findings demonstrate that the new algorithm can be utilized to find the exact or close to exact optimal solution for the distribution route of agricultural products rapidly and effectively.

**Keywords:** *Fresh Agricultural Products, Genetic Algorithm, Ant Colony Algorithm, Fusion*



**Improvement of Logistics Operation Efficiency via Machine Vision and Radio  
Frequency Identification Research**

**X. Sun, N. Zhang, and K. Gao**

**ABSTRACT**

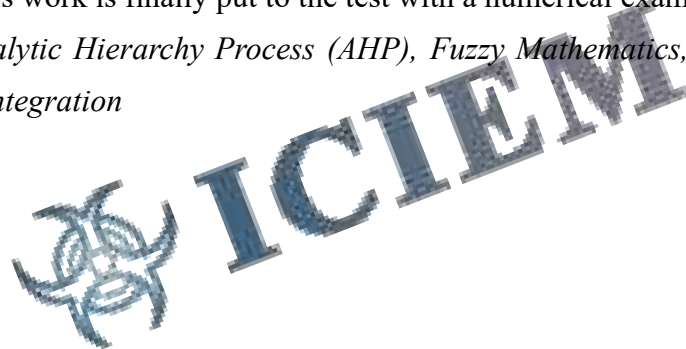
Living standards increased as a result of the economy's quick growth, and the country's pertinent policies have also helped to advance logistics. The efficiency of logistics operations is greatly impacted by traditional human management of the product, instability of the eye detection products in the operation, and various recurring operations. Finding a technique to sort and identify items with efficiency is the key to increasing the efficiency of logistics operations. This paper discusses the current issues with logistics operation efficiency, using machine vision and RFID to analyze and solve the problem, discusses the work flow of technology itself in logistics operation, through the analysis of their advantages and disadvantages, using machine vision combined with RFID two-way interaction in the operation process to improve operational efficiency, and ultimately reduce logistics operation labor cost.

**Keywords:** *Machine Vision, Radio Frequency Identification Technology, Efficiency Improvement*

**The Research on 4PL Integration Using AHP and Fuzzy Math****X. Sun, Y. Li, and K. Gao****ABSTRACT**

In order to select the third-party logistics partner, we established a multi-objective optimization model that takes into account four factors: the cost of choosing the candidate, the amount of time needed to complete the task, the degree to which the candidate companies and other companies are complementary, and the capability of the candidate companies. We then focused on the fourth party logistics integration problem. By putting the concrete data into the model, using the method of fuzzy mathematics and AHP to concretely express the degree of matching between prospective companies and the ability evaluation of them, and then calculating the ideal partner. The model developed in this work is finally put to the test with a numerical example.

**Keywords:** *Analytic Hierarchy Process (AHP), Fuzzy Mathematics, Multi-Objective Optimization, Integration*



**Fast Information Scheduling for Large-Scale Logistics Supply Chain****C. Ren, J. Zhao, and L. Chen****ABSTRACT**

Large-scale logistics supply chain information is currently promptly distributed, however there are too many limitations. As a result, this research proposes an information scheduling technique based on adaptive genetic optimization for large-scale logistics supply chains. The genetic algorithm is utilized to find a solution, and adaptive technology is introduced to address the genetic algorithm's congestion issue. Experiments demonstrate that the suggested technique can efficiently increase scheduling efficiency and address the issues that currently exist.

**Keywords:** *Large-Scale Logistics Supply Chain, Information Fast Scheduling, Algorithm*



**SECTION 4**

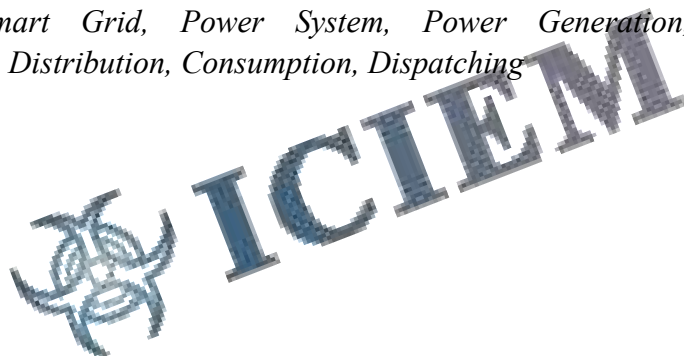
**Engineering, Electrical and Electronic**



**Practice Research of Smart Grid Innovation China****S. Gu, L. Li, G. Wang, and C. Wang****ABSTRACT**

Around the globe, Smart Grid has become a major trend in the development of power networks and technological progress. Moreover, they are a common choice for tackling climate change, guaranteeing energy security and promoting industry. Therefore, the development of Smart Grid has strategic meaning. In addition, Smart Grid can help to adjust energy structure in a clean way, achieve optimum distribution of energy, support a revolution in consumption patterns, accelerate technological innovation and develop strategic new industries. Therefore, the Smart Grid is a key platform for the Energy Revolution, and it will play a leading role in the current driven by Innovation Development Strategy. In this article, we discuss the smart in the production and consumption of energy, including the connection of generating, transmitting, converting, distributing, consumption and scheduling to ensure energy security and promote industrial development.

**Keywords:** *Smart Grid, Power System, Power Generation, Transmission, Transformation, Distribution, Consumption, Dispatching*





**Consideration of Smart Substations Design for Future Power Grids  
Environment Friendly and Energy Sustainable Development  
S. Gu, P. Yan, B. Liu, and L. Xie**

**ABSTRACT**

Substation is one of the key points in power system's energy transformation and operation control. The construction of smart substations is a key step in the implementation of a powerful intelligent grid strategy. To undertake informatization, automation, interaction of the strong smart grid strategy, the present paper points out the current problems and deficiencies in the application of substation technology by taking into account the current state of the technology and the development needs of the future. It discusses key technologies required for a smart substation i.e., state Monitoring, data acquisition, protection control, the information network and Building technology. The design and construction plan of on-line monitoring, sub-station protection, integration information network and modular construction technique are proposed. Furthermore, it also analyses the effect of applying the new technology to practical projects.

**Keywords:** *Substation Design, Environment Friendly, State Monitorin, Substation-Area Protection, Integrated Information Network*



## Nonlinear Drift in Spring Gravimeter Caused by Kunming GS15 Gravimeters with Air Pressure

J. Wei, W. Shen, H. Li, and Z. Liu

### ABSTRACT

The characteristics of the time-varying gravity changes produced by meteorological variables were examined in order to monitor and adjust the meteorological factors of the spring gravity meter. Continuous gravity observations using the pressure observation sample rate have been made using a Kunming GS15 gravity meter since 2007. In this work, we compare the impacts of 3 different station types, 4 different gravity meter types, and the observed seasonal gravity signals. According to the evidence, the cave's observed seasonal gravity signal is only 1/10, and a constant temperature and constant pressure device are there. The gravity signal of the gravity signal is approximately 100 times smaller than it was at the time. Using the theory of pressure, the impact of the gravity meter's pressure load is examined. The findings demonstrate that only the actual value of the 2cpd–3cpd pressure load varies between  $-0.395$  and  $-0.28010 \cdot 10^{-8} \text{ms}^{-2}$ , and the periodic partial type gravity meter operating in the range of 1cpd–1cpm is also consistent with the laws of gravity and air pressure. Additionally, with temporal delayed features, This study simulates the nonlinear zero drift parameters of the gravity meter using the time series of the GS15 gravity meter and the nonlinear drift parameters of the linear regression model with time lag. The findings indicate that the air pressure admittance is  $0.8 \cdot 10^{-8} \text{ms}^{-2}/\text{mbar}$  and that the gravity signal has a time lag of 35 hours. In certain cases, the correlation is 79%. The gravity changes signal, satellite gravity, and gravity water load signal of the land water model are identical to the minimum gravity water load signal in the autumn and the seasonal variation of the maximum gravity value in the summer.

**Keywords:** *GS15 Gravimeter Meter, Air Pressure Admittance, Nonlinear Air Pressure Correction, Superconducting Gravimeter*

**Wind Turbine Startup Speed with Dead Band Feasibility Study****H. Li****ABSTRACT**

Typically, the design and operation of wind turbines have a fixed starter speed. When the wind varies at the initial speed, it could start and stop several times. An excessive amount of stress brought on by frequent startup and shutdown could increase the chance of component failure and have a detrimental impact on a wind turbine's availability. In this article, a startup speed with a dead band is suggested to avoid repeated startup. To assess the potential loss of wind power production and the potential reduction in startup times with the suggested approach, 5-year wind data from 15 wind farms are evaluated. Once an adequate dead band is used, numerical simulation reveals that the startup durations could be cut in half with a negligible impact in the potential wind power generation in most of the tested sites.

**Keywords:** *Wind Power, Wind Turbine, Startup, Dead Band*



**The Myth of Applying Complex Forecast Models-A Comparison of Electric Power Consumption in Singapore between ARIMA, ANNs and Hybrid ARIMA-ANNs**

**S. Lai, K. Kuo, and M. Liu**

**ABSTRACT**

For the protection of the environment and future economic growth, energy management is essential. The creation of intelligent prediction techniques is necessary given the rising global demand for electricity. Energy planners and regulators now place a high priority on managing energy resources in the most efficient way possible. This study compares the accuracy of forecasts for Singapore's electric power consumption made between 1971 and 2010 using hybrid ARIMA-ANN models, artificial neural networks (ANNs), and the autoregressive integrated moving average (ARIMA) model. Population, GDP, exports, and overall tourist arrivals are the four economic and demographic indicators taken into account in this study. The findings demonstrate that the ARIMA model outperformed ANNs and ARIMA-ANN hybrid models in its ability to estimate Singapore's electric power consumption with a high degree of accuracy. Although univariate ARIMA does not require predictors, it nevertheless produces efficient and frugal forecasts. The precisely linear trend in Singapore's electricity use suggests that the nonlinearity assumption made by ANNs and hybrid modeling is incorrect. It has been established that one crucial consideration when using ANNs and hybrid techniques to prevent needless difficulties is the linearity of data series. It's possible that adding additional explanatory factors as inputs to ANNs won't improve forecast accuracy but rather make estimate more difficult. In ANN estimation, it is more important to choose the right predictors than to add more predictors. This study also demonstrates that ARIMA and ANNs still have a possibility to produce accurate results when used to tiny samples.

**Keywords:** *Autoregressive Integrated Moving Average (ARIMA), Artificial Neural Networks (Anns), Electric Power Consumption, Forecast, Singapore*

**View of an Electric Vehicle's Electric Power Steering System****C. Li, N. Dai, G. Qiu, Q. Huang, and Z. Tan****ABSTRACT**

The market for electric vehicles is expected to grow significantly in the next years. The fundamental element of the comfort, safety, and accuracy of driving an electric car is the direction-al power steering system. Electric power steering systems are currently directly installed in electric cars. The control parameters, driving characteristics, and dynamic characteristics of a fuel car and an electric car are unlike, therefore the fuel car's EPS performance will be directly reduced in the electric car. The advancement of technology has led to intelligent demands from passengers for EPS in electric vehicles. The author's experimental findings are presented in this study together with a detailed history, development, and trend analysis of related technology.

**Keywords:** *Intelligent Control, Autonomous Fault Diagnosis, Test Platform, Electric Power Steering*



**Studying the Energy Management Plan for Hybrid Electric Buses Based on PMP****Z. Wu, G. Yin, Y. Wang, Z. Zhao, and Y. Tao****ABSTRACT**

The aim of a hybrid car is to maximize fuel efficiency. Consequently, the main difficulty for a hybrid bus is how to balance the power output between two sources of energy. In this study, an energy management strategy (EMS) based on the Pontryagin minimum principle (PMP) is created and applied in ADVISOR. Using a mix of forward simulation and thereafter simulation, the EMS developed successfully calculates the fuel consumption of parallel hybrid electric buses with a specific operating cycle. Furthermore, because the PMP accomplished the goal of global optimization through real-time local optimization, the fuel efficiency has significantly increased as compared to its original control method. After that, a performance benchmark is obtained using the Dynamic Programming (DP) technique. According to the simulation results, the hybrid electric bus' fuel economy while utilizing a PMP-based control strategy is comparable to the benchmark figure determined by DP. As a result, not only did the fuel economy increase, but the engine operating point adjustment made the engine more environmentally friendly by reducing exhaust emissions and extending the battery life by keeping the battery state of charge (SOC) at a healthy level.

**Keywords:** *ADVISOR, Energy Management Strategy, Pontryagin's Minimum Principle, Parallel Hybrid Electric Bus, Fuel Economy*

**Demand for Forest Carbon Sequestration Based on China's Thermal Power and Steel Industry Emission Reduction**

**F. Long, H. Qi, and G. Wang**

**ABSTRACT**

Thermal power and steel production in China account for 38% and 16% of all CO<sub>2</sub> emissions, respectively, which is significantly higher than the global average. The marginal costs of reducing CO<sub>2</sub> emissions in the two sectors between 2005 and 2014 are determined using the directional distance function in this research based on the estimation of carbon intensity, and the carbon price for each sector is then estimated. Our empirical findings demonstrate that while the marginal costs of reducing CO<sub>2</sub> are often increasing, the carbon intensity is generally declining. The acceptable price of forest carbon sequestration is substantially lower than the marginal abatement costs of CO<sub>2</sub> and ranges from 134 to 189 CNY/ton in the thermal power industry and from 519 to 758 CNY/ton in the steel industry. Therefore, in order to achieve specific emissions reductions, the covered firms may decide to invest in or purchase forest carbon sequestration.

**Keywords:** *Marginal Abatement Cost, Carbon Intensity, Price of Forest Carbon Sequestration, Forest Carbon Sequestration*

**Handling Stability Control Strategy of FSAE Pure Electric Racing Car****X. Zhao, Y. Lu, S. Wang, and Q. Fan****ABSTRACT**

The FSAE pure electric racing car is used as the platform for this study, and the direct yaw moment control is used as the foundation to address the stability control issue of distributed drive electric vehicles. The optimum side slip angle and yaw rate of the vehicle are predicted using the linear two degrees of freedom vehicle model, and the side slip angle is determined using the extended Kalman filter approach. The direct yaw moment control is utilized to regulate the handling stability of the vehicle because the FSAE pure electric racing car's rear wheels are controlled by dual motors that operate independently of one another. On the MATLAB/Simulink platform, the designed control strategies of handling stability are simulated and compared under the operating conditions of the steering wheel step input angle and the double-shift line. The PID controller, the fuzzy logic controller, and the PID and fuzzy logic joint controller of the additional yaw moment are designed, respectively. The results demonstrate that the proposed PID and fuzzy logic joint control strategy, when compared to no control and PID control alone, can significantly reduce the steady state value and the extremum of the yaw rate by 12.17% and 43.87% at most respectively, and those of the side slip angle by 8.4% and 68.53% at most respectively. Additionally, the convergence rates of the two are both accelerated, improving the handling stability of the vehicle.

**Keywords:** *FSAE Pure Electric Racing Car, Handling Stability, Direct Yaw Moment Control, PID Control, Fuzzy Logic Control, Control Strategy*



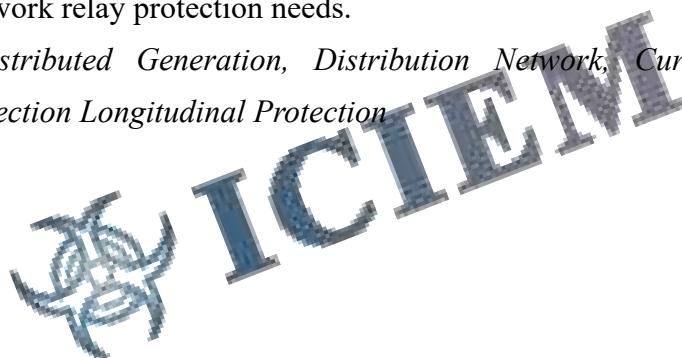
**Research on the Impact of Distributed Generation on Current Network  
Protection and Countermeasures**

**X. Zhu, and J. Liu**

**ABSTRACT**

With distributed generation, the distribution network's configuration will change, which affects the strength, direction, and duration of the fault current. Through the computation of fault current before and after distributed generation synchronization development, it examined the impact on main feeder, recloser, and conventional branch line protection. It created a distribution network model with distributed generation in Matlab/Simulink, used simulated examples to demonstrate the impact on current protection, and proposed centralized direction longitudinal protection that can satisfy distribution network relay protection needs.

**Keywords:** *Distributed Generation, Distribution Network, Current Protection, Centralized Direction Longitudinal Protection*



## Opportunities and Challenges Encountered by Electric Vehicles Versus Biofuels (Methanol) in India

V. K. Singh

### ABSTRACT

Electric vehicles (EVs) and biofuels, notably methanol, have drawn attention in India as alternative transportation technologies with the potential to lower greenhouse gas emissions and improve energy security. Methanol is a viable fuel for transportation since it has the benefit of a variety of feedstock alternatives and is compatible with current internal combustion engines. Conversely, EVs are an appealing solution for solving India's air pollution and environmental issues because they have cheap running costs and low emissions. However, there are issues with methanol and EVs in India. Methanol production, distribution, and storage lack a robust supply chain and infrastructure, which calls for a substantial investment to address. A further difficulty is the requirement for technical know-how and skilled labor in building, maintenance, and operation. Similar infrastructure issues affect EVs, as India's limited and unevenly distributed charging infrastructure raises questions about range and prevents their widespread adoption. Furthermore, many prospective purchasers are still put off by the high upfront cost of EVs compared to conventional cars. Investment in methanol production, distribution, and storage infrastructure as well as the creation of a thorough EV charging infrastructure are necessary to meet these obstacles. Building a skilled workforce that can support these technologies on a large scale also requires investing in training and skill development initiatives. Despite the difficulties, India has a lot to gain from the use of EVs and methanol as a biofuel. Methanol can assist increase energy security by reducing reliance on imported crude oil and diversifying energy sources. EVs can help India achieve its sustainability goals by lowering local air pollution and greenhouse gas emissions. EVs are a desirable alternative due to their low operating costs and utilization of renewable energy sources for charging. EVs and methanol as a biofuel offer India both opportunities and challenges. However, India can pave the road for a sustainable and energy-efficient transportation industry that is in line with its sustainability and energy security goals by tackling these issues through smart investments in infrastructure and workforce development.

**Keywords:** *Biofuels, Electric Vehicles (EVs), Opportunities, Low Emissions, Infrastructure and Challenges*

**Studying the Speed Prediction Method of a Faulty Variable Frequency Drive  
Induction Motor**

**Y. Yao**

**ABSTRACT**

Simply using the motor speed increment to anticipate the upcoming moment's motor speed is how first-order incremental prediction is currently used. This work suggests a new speed prediction method of variable frequency drive induction motor based on second-order increment to address the issue that the prediction error is significant when the nonlinear speed changes with time. Using the second-order speed increment, the future speed of an induction motor with a variable frequency drive operating with a fault is projected. Future speed predictions can do N-class promotion and are more accurate than first-order predictions in predicting future motor speeds while they are operating incorrectly. The experimental findings demonstrate that the approach enables the prediction and control of motor speed; under the condition of minor disturbance error, the effect of calculation reduction is obtained, and the speed prediction accuracy is enhanced.

**Keywords:** *Variable Frequency Drive Induction Motor; Running with Fault; Speed, Prediction Method*

**An Overview of Solar System Maximum Power Point Tracking Based on  
Metaheuristic Improvements**

**R. S. Pal**

**ABSTRACT**

One global peak and several local peaks make up the photovoltaic (PV) system's characteristic under conditions of partial shadowing. Therefore, it's crucial to fully comprehend the PV's characteristic curve before moving on to comprehend maximum power point tracking (MPPT) systems. Therefore, it's crucial to comprehend how a power interface device (such a DC-DC converter or DC-AC converter) is used. It is consequently extremely challenging to measure maximum power from the P-V curve due to the P-V curve's many peaks. Commonly, homogeneous irradiance circumstances are the only ones that traditional MPPT algorithms can handle. The tracking of a PV array's maximum power in a real-time system is the issue that is being researched. As a result, several optimization strategies are investigated in a range of environmental settings. The speaker attempts to offer the findings and discussion in this presentation based on a few cutting-edge optimization-based techniques. These findings also demonstrate that the tracking effectiveness of the suggested method is, for the most part, superior to that of traditional ways, which gives it a better chance of success when applied to the control block for searching the PV setup's global MPP.

**Keywords:** *Maximum Power Point Tracking, Photovoltaic, Power Interface Device*

**SECTION 5**

**Human Factor**



**Utilizing Extensive GPS Taxi Trajectory Data to Investigate Intra-Urban  
Transport Mobility**

**H. Wang, F. Liu, and J. Tang**

**ABSTRACT**

It is crucial to examine the spatiotemporal characteristics of human movement when constructing and planning transportation systems by using GPS data from taxi trajectories. The information was gathered over the course of a week from taxi GPS devices in Harbin. The travel distance and time in occupied and unoccupied states are initially utilized to analyze human mobility. The taxi rides are retrieved from GPS data. The urban area is then split up into 400 grids. Additionally, a traveling network corresponding to taxi rides is created to further investigate the dynamics of mobility. In this network, the grid is viewed as a set of nodes, and the edge weights are the sum of all trips between the nodes. Degree, edge weights, clustering coefficients, and network structure entropy are some of the fundamental statistical characteristics of the network that we see. In order to assess the importance of nodes, we also use the connection between strength and degree. In order to analyze the spatial and temporal characteristics of journeys that start from and terminate at these two grids, we choose two high degree and strength central business district and residential district grids based on network analysis. The hourly trip volume expresses a negative link with operation efficiency, according to our investigation into the relationship between trip volume and operation efficiency.

**Keywords:** *Urban Mobility, Taxi GPS Trajectories, Travel Time, Travel Network, Spatial-Temporal Property*

**Studies On Detecting and Correcting Skin Tones Under Difficult Lighting****C. Zhu, and X. Liu****ABSTRACT**

The difficulty of recognizing skin color increases during the process of detecting illumination interferences on the original image. In order to address the issue, this work suggests a theory for clustering pixels based on brightness using the K-Means algorithm. After that, divide the original image into numerous pieces based on the clustering results. The regions labeled as "Too Dark" and "Too Bright" are corrected and improved using an improved "Reference White" approach. The original image tends to have a smooth and natural brightness distribution after correction, and the effect of illumination will be reduced. This method not only efficiently addresses the problems of omission and inaccuracies in skin-color recognition brought on by anomalous brightness, but it also satisfies real-time requirements.

**Keywords:** *Detection of Skin-Color, Clustering, K-Means, Reference White*



**Sheltering Techniques' Calming Impact on Physiological Stress in High-Temperature Outdoor Environments**

**G. Zheng, Y. Wang, W. Bu, Z. Li, B. Wei, and Y. Gao**

**ABSTRACT**

Summertime brings high temperatures and prolonged periods of extreme humidity. However, sanitation workers, on-duty traffic cops, and other outside workers continue to work at their jobs to maintain society's regular production and living processes. As a result, the hot weather poses a threat to the health and safety of outdoor employees. For sanitation employees (walking circumstances) and on-duty traffic police (standing conditions), certain shelter types, such as tree shade, sun hats, and sun umbrellas are chosen to safeguard the staff's safety in the outside high temperature environment. By contrasting the physiological parameters in these three shelter forms, the alleviating effects of the shelter types on physiological stress are examined. The findings demonstrate that the sun umbrella and tree shade have a positive impact on reducing physiological stress. Additionally, while protecting the face from direct sunlight, wearing a sun hat has no impact in reducing physiological stress. But it results in a greater heat sense. This study may offer crucial strategies for safeguarding workers' health in hot outdoor environments. It also offers a theoretical justification for the adjustment of the labor protection standard for outdoor high temperature work.

**Keywords:** *Outdoor High Temperature Environment, Physiological Response, Relief, Shelter, Tree Shade*



**SECTION 6**

**Operations Research and Management**



**The Dynamic Relationship of China's Energy Consumption and Urbanization:  
Using Panel VAR**

**L. Xu, T. Zhao, and J. Sun**

**ABSTRACT**

In this paper, a panel VAR model is used to analyze the dynamic relation between energy consumption and urbanization, and the panel VAR estimation based on provincial panel data from 1990 to 2010 in China. The results indicate that: (1) Urbanization has long-term co-integration relation with energy consumption in East, Middle and West China; (2) the impact of urbanization on energy consumption is significantly different from three regions. the highest effect is eastern region, followed by western region, middle region. In order to promote the harmonious development of Urbanization and energy consumption, based on the relation of urbanization and energy consumption in the east, central and west areas, China should improve the efficiency of energy use and make energy consumption policies.

**Keywords:** *Urbanization, Energy Consumption, Panel VAR Model*



**Economic Evaluation of Geothermal Resource Development Model Based on  
DEA Method**

**M. Wang, Y. Yang, D. Zhang, P. Wang, Y. Nan and H. Zhang**

**ABSTRACT**

In this paper, the Economic Evaluation Model of geothermal resources exploitation based on DEG is proposed on the basic of consideration of resource, economic and environmental. Based on the principle component analysis method, the key evaluation indexes are found, including the input and output index, which includes the economic and environmental benefits. The Hot Spring Project of Dongli District of Tianjin City is used as an example to evaluate its efficiency. Based on a case study, this paper puts forward some feasible suggestions for the development of global geothermal energy, which will promote the harmonious development of China's economy and environment.

**Keywords:** *DEA Model, Geothermal Resource, Economic Evaluation*



**GIS-Based Studies of Industrial Gravity Centers and Chinese Economy during  
1985-2010 Shifting Regulation****J. Liu, Q. Chang, T. Chen, M. Liu, Y. Qi, and X. Liu****ABSTRACT**

The studies on the shifting of China's economic and industrial gravity centers using GIS from 1985 to 2010 were conducted in order to reveal Chinese economic development, the shifting characteristics of various industries, and the driving factors. They used the Chinese provincial level administrative region (aside from Taiwan, Hong Kong, and Macao) as their study unit. The findings indicate that during the past 25 years, the economic and industrial gravity centers have moved away from China's geographic center to varying degrees. The relationship between changes in the economic and industrial gravity centers is also examined in the research. The amplitude and trend of the economic gravity center's variation are discovered to be connected to the tertiary industry's gravity center. The tertiary industry has the smallest yearly average variation rate of gravity center, while the secondary industry has the highest.

**Keywords:** *Economy, Industry, Gravity Centre Shift, Driving Force, China*



**Shenyang City's Green GDP Measurement Based on Energy Value Analysis****T. Chen, K. Chen, Y. Zhang, S. Zhou, and C. Wang****ABSTRACT**

The loss of resources to the environment has been assessed using energy value and monetary value utilizing a framework for the analysis of complex ecological systems, Odum's eco-economic system energy theory, and energy value analysis. The study calculated the city of Shenyang's overall green ecological economy from 2005 to 2014. The following results were displayed: (1) From 2005 to 2011, Shenyang City's economy relied extensively and at a rate of roughly 40% on the use of resources (including natural resources and input resources), which resulted in serious environmental damage; (2) Between 2012 and 2014, Shenyang City's economic growth style altered, and the atmosphere got better, but it wasn't immediately apparent. The city of Shenyang's current economic development paradigm cannot last. To prevent the economy from entering a vicious cycle, the development mode dependent on resources and environmental costs should be brought about.

**Keywords:** *Energy Value, Green GDP, Ecological Environment, Renewable Environmental Resources, Sustainable Development, EMA*



**Evidence from China's Listed Companies' Static and Dynamic Panel Data on the Effect of Ownership Structure on Firm Performance****H. Shan, and G. Gong****ABSTRACT**

In this study, we analyze the relationship between ownership structure and company performance using static and dynamic panel data. The outcome implies that ownership concentration is significant for firms. The current changes in ownership concentration will undoubtedly have a negative impact on performance because the largest shareholder's ownership concentration has been shown to greatly improve long-term business performance. The unfavorable impacts progressively fade away over time and may even slightly improve business performance. As a result, it is crucial for the largest shareholder to hang onto their shares for a very long period and work to keep the ownership steady.

**Keywords:** *Ownership Structure, Ownership concentration, Firm Performance, Panel Data, Dynamic Effects*



**Current Conditions and Connections between Favorable Psychological Traits  
and Staff Wellbeing in Businesses**

**J. Luo, and Y. Yu**

**ABSTRACT**

**Objective** To determine the presence and link between employees' psychological well-being and their positive psychological traits in businesses. **Methods** The Life Orientation Test Revised (LOT-R), Adult Dispositional Hope Scale (ADHS), General Self-Efficacy Scale (GSES), and Oxford Happiness Test-Revised (ROHS) were used to assess the happiness of 342 employees. **Results** (1) Subjective well-being, self-efficacy, hope, and optimistic ratings were (21.72 3.17), (26.33 5.03), (24.24 3.21), and (39.61 9.90), respectively. (2) There was no significant difference between males and females on the optimistic dimension, but there were significant differences depending on marriage ( $t=2.82$ ,  $p < 0.01$ ), having only one kid ( $t=2.78$ ,  $p < 0.01$ ), and place of growth ( $t=2.79$ ,  $p < 0.01$ ). There was no discernible variation in the hope and self-efficacy dimensions according to gender, marital status, number of children, or geographic location. There were no differences in the other categories, and urban employees scored better in the well-being category than rural employees did ( $t=2.50$ ,  $p < 0.05$ ). (3) There was a strong positive association ( $r=0.420$ ,  $p < 0.01$ ) between optimism, self-efficacy, hope, and well-being. (4) We can obtain regression equations by assuming that subjective well-being is independent in each case and that hope, optimism, and self-efficacy are dependent variables. Self-efficacy and optimism explain rates to well-being were 34.1%. **Conclusion** Regardless of whether they were viewed separately or together, optimism and self-efficacy had a favorable correlation with wellbeing.

**Keywords:** *Employees, Self-Efficacy, Optimism, Well-Being*

**A Study on Innovative Model of Economic Experimental Teaching in the Context of Systematic Construction****L. Guo****ABSTRACT**

The experimental teaching component of the economy discipline education system is a crucial component, as it helps students develop their innovative thinking and practice skills in key courses. This system also serves as a support for the establishment of college teaching requirements and plays a crucial role in other courses. In recent years, majoring in colleges and universities, our nation's economic construction of the laboratory, the study on the regulations of the practice teaching obtains greater achievements, but in the experimental teaching mode, teaching technique, teachers still exist some issues. In order to improve the quality of experiment instruction and develop students' all-around practical ability, there is a need to assess problems and provide focused strong innovation models based on system construction background.

**Keywords:** *Experiment Teaching, Innovation Strategy, Practical Ability*





**Current Communication Conditions and Protective Precautions for Fishing  
Ships**

**J. He, and W. Ai**

**ABSTRACT**

The cases of commercial fishing vessels colliding in recent years are examined in this study along with their causes, current conditions in the fishing industry along the coast, and safety precautions.

**Keywords:** *Present situation of communication, secure communication, counter measures*



**Path Analysis on Water Supply Effects of Forest ES Value Transfer in the Upper Watershed of Shenyang City**

**Y. Jiang, K. Chen, T. Chen, and X. Li**

**ABSTRACT**

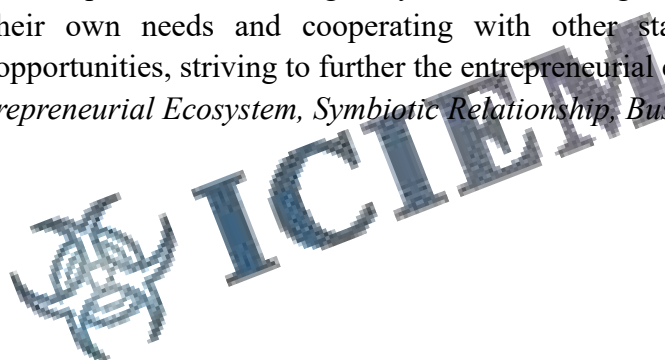
Water supply in Shenyang city is significantly impacted by the ecological function of soil and water conservation that is supplied by the forest ecosystems in the upper basin of the Hunhe river. The thesis uses Buffer and Intersect of ArcGIS9.3 to calculate the ecological service value of transferring in the upper basin of the Hunhe river toward Shenyang city from 2010 to 2014 from the perspective of forest ES transfer. The thesis then uses path analysis to investigate the impact of the ecological service value of transferring in the upper basin of the Hunhe river on the water supply in Shenyang city. The findings show, firstly, that the total value of transfers from 2010 to 2014 amounts to 5.647 billion RMB, and, secondly, that the ecological service of soil and water conservation has favorable external effects on the water supply in Shenyang city by the surface water, groundwater, and chemical oxygen demand. It is clear from the thesis that the mechanism of action regarding the effect of the transfer value of forest ecosystem services (ES) in the upper watershed on the availability of water in the lower basin is explained. This mechanism of action serves as the theoretical basis for the quantitative analysis of the transfer of value for ES and significantly affects the formulation of criteria for the compensation of forest ecology in particular river basins.

**Keywords:** *Ecological service (ES), Transfer value, Water supply, Hunhe river basin*

**An Entrepreneurial Ecosystem's Symbiotic Relationship****Y. Ding, and X. Song****ABSTRACT**

The author presents the idea that both the specialization and diversity of resources among entrepreneurs, the main bodies of business startups, and serve as the foundation on which symbiotic relationships are built in his overview of the theories and papers on the entrepreneurial ecosystem that are available in both China and abroad. The author also analyzes the concepts, composition, and characteristics of the entrepreneurial ecosystem. Additionally, the author develops a symbiotic relationship of the entrepreneurial ecosystem model, which is made up of three stages including identification, formation, and development of the symbiotic relationship, based on an analysis of the driving factors of the symbiotic relationship of the entrepreneurial ecosystem. According to the research finding, business startups in the entrepreneurial ecosystem, driven by enterprise needs along with external environmental factors, create symbiotic relationships and encourage symbiosis among entrepreneurs by incorporating their own needs and cooperating with other startups to explore entrepreneurial opportunities, striving to further the entrepreneurial ecosystem.

**Keywords:** *Entrepreneurial Ecosystem, Symbiotic Relationship, Business Startup*



**Pastoral Landscape Aesthetic Degree Evaluation System****D. Liu, and T. Ning****ABSTRACT**

The natural beauty, ecological beauty, social beauty, scientific beauty, and artistic beauty of high-grade pastoral culture in northeast China were shown from many perspectives and angles in this paper, combined with the background of the green concept and highly respected pastoral landscape, using the aesthetic practice and exploration of Zhaoguang Farm as an example. Using the method of qualitative description of aesthetic category in combination with quantitative evaluation of landscape aesthetic degree, a thorough analysis of the aesthetic practice of pastoral landscape in northeast China ---Zhaoguang Farm Pastoral Landscape Demonstration Park --- was carried out, providing scientific theoretical support and technical support for the practice of pastoral landscape.

**Keywords:** *Pastoral, Landscape, Evaluation, Aesthetics*



**Research of Sustainable Hotel Design****Y. Chen, P. Tsui, and C. Lee****ABSTRACT**

The research examines sustainable development in relation to practices in tourism and hospitality. By implementing sustainability, buildings and lodging facilities can play a significant part in reducing their harmful effects on the environment. The goal of this study is to give hoteliers an FAHP evaluation methodology to use when developing environmentally friendly hotel interiors. Prior to FAHP, the Delphi approach was used to construct the hierarchy. Design priorities can be easily derived from FAHP's determined criteria priorities. In comparison to hotels that are just built to code, sustainable hotels that are designed, built, and run sustainably use energy, water, materials, and land far more effectively. The findings of this study will aid hoteliers in making decisions with constrained funds and resources. We also want to draw more attention to green hotel initiatives.

**Keywords:** *Hotel Design, FAHP Evaluation Methodology, Delphi*

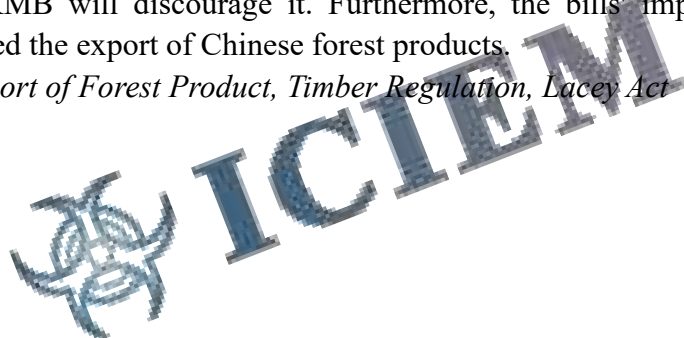


**EU and US Timber Act's Effect on China's Exports of Forest Products**  
**F. Hou**

**ABSTRACT**

The challenges of a harmonious development between trade and the environment have gotten a lot of attention as a result of the deteriorating natural environment. These days, legislation to outlaw the use of illegal wood has been passed in certain industrialized nations, like the US "Lacey Act" and EU "Timber Regulation". The measures mandate not only the importation of wood from ethical and sustainable sources, but also the ability to identify the legal source of wood used to make forest products. Forest goods are widely imported and exported from China. The aforementioned bills will unavoidably have a significant impact on businesses that make forest products. This study examines the consequences of the laws' implementation and conducts an empirical analysis of how the US Lacey Act and EU Timber Regulation affect the export of Chinese forest products. The development, on the other hand, will encourage the export of Chinese forest goods, while the depletion of forest resources and the strengthening RMB will discourage it. Furthermore, the bills' implementation has already prevented the export of Chinese forest products.

**Keywords:** *Export of Forest Product, Timber Regulation, Lacey Act*



**A Regional Medical Service Evaluation and Medical Resource Allocation  
Empirical Study**

**J. Wang, Y. Chen, B. Li, and S. Yang**

**ABSTRACT**

The assessment of regional medical development has received a lot of attention recently due to the implementation of medical reform. There are numerous characteristics of regional medical service evaluation (RMSE) comprising multiple inputs and multiple outputs. The majority of research has so far been on this issue, but study on how to better allocate medical resources and reduce data complexity has not been taken into account. It is necessary to conduct research to assess the level of development of regional medical services and resolve the issue of medical resource distribution in order to address these issues. In order to conduct an empirical study to address these issues, we use data envelopment analysis (DEA) and factor analysis in this paper. Additionally, it offers some suggestions for the growth of local medical services and the distribution of medical resources.

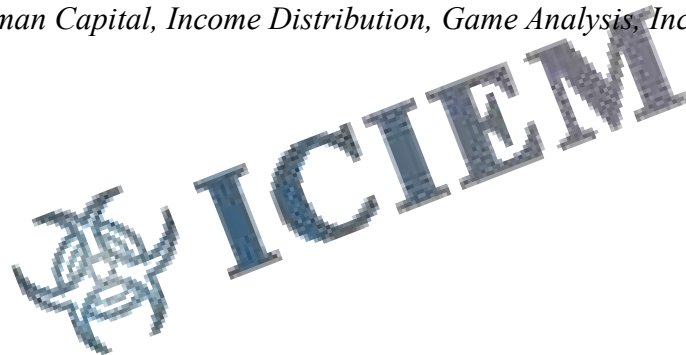
**Keywords:** *Evaluation, Medical resources allocation, Regional medical industry, Data envelopment analysis (DEA), Factor analysis*



**Enterprise Human Capital Participating in Enterprise Income Distribution: A  
Game Analysis****B. Li, J. Wang, and Y. Lan****ABSTRACT**

According to modern enterprise theory, a particular relationship between human and non-human capital exists in business. A significant aspect of the evolution of contemporary enterprise content is the willingness of corporate human capital owners to share corporate surplus profits. This study uses the surplus income ratio of human capital as a starting point for a game process, proposes a basis for core employees to share the residual income, and applies the game theory analysis method to build under the assumption of symmetric information under the assumption of asymmetric information How employees and business owners achieve the distribution of the problem, as well as the impact of the distribution of factors. The conclusion is that a win-win situation can be achieved by increasing the surplus income, increasing the share of the enterprise's core employees, and increasing the human capital stock.

**Keywords:** *Human Capital, Income Distribution, Game Analysis, Incentive Theory*





**Research on the Zhuhai Seaport of the Hong Kong-ZhuHai-Macao Bridge  
Development Model**

**R. Dong**

**ABSTRACT**

Based on the theory of external economics of infrastructure and the land compensation mechanism, this paper explains the macro mutual supporting relationship based on synergistic effect and feedback relationship based on micro interaction between the port infrastructure construction and land development, demonstrates the Zhuhai port land development benefit balance port construction investment, the feasibility of operating facilities proceeds balance port operation cost, and the analytic framework for the study of the relationship between the port infrastructure construction and land development.

**Keywords:** *Zhuhai Seaport of Hongkong-Zhuhai-Macao Bridge, Development Model, Money Mobilization*



**A Review of the Scoring Criteria for the General Sports College Entrance Examination for Women in Shandong Province Was Conducted.**

**X. Wang, N. Li, and X. Wang**

**ABSTRACT**

According to a statistical analysis of the women's sports college entrance examination (SCEE) for Shandong province from 2013 to 2016, female students have tended to apply for the technical evaluation program during the last four years. The women's shot put and 100 meters have both dropped annually. The results of those three quality tests are unfair, with the standing long jump's average score being high due to the low scoring criteria. This paper revised the SCEE women's quality test in Shandong province in accordance with the existing scoring criteria, using the methods of progressive scoring, curve fitting, and difference fitting. It attempted to make the project's score more equitable, thereby improving the SCEE's grading standard. A more fair grading method—difference fitting and related score standards—is proposed in light of the SCEE's actual circumstances in Shandong Province.

**Keywords:** *Physical Quality Test, General Sports College Entrance Examination, Difference Fitting, Quality scoring standard model, Progressive Scoring*



**Utilizing A Fuzzy Comprehensive Evaluation Model, Evaluate Chinese  
Compensatory Supply Cultural Products**

**H. Li, Y. Hang, Q. Wang, and Y. Xu**

**ABSTRACT**

The evolution of all nations' economies and politics is increasingly influenced by cultural products. The accompanying issues regarding the worth of cultural items, however, have garnered increased attention. The research object for the project was Chinese cultural artifacts used as compensation. As it was building the assessment index system, it took into account the key elements that influence the value of paid-for-supply cultural products, including political orientation, social advantages, product quality, economic benefits, and resource value. Additionally, the indicator weight was established through an analytical hierarchy method, creating a novel model for evaluating Chinese compensating supply cultural products. On this foundation, it used a simulation experiment to confirm the model's accuracy.

**Keywords:** *Compensatory Supply Cultural Products, fuzzy comprehensive evaluation*



**Analysis and Forecast of the Chinese Coal Price Trend Using the ARIMA Model**  
**J. Zhu, and J. Wang**

**ABSTRACT**

In order to reach a more rigorous conclusion, this paper uses the ARIMA model to predict the development trend of coal prices in China by collecting data on Chinese coal prices from January 2012 to June 2017, conducting a stationary test using time series data, creating the model, and using it to forecast coal prices.

**Keywords:** *ARIMA Model, Stationary Test, Model Identification, Price Prediction*

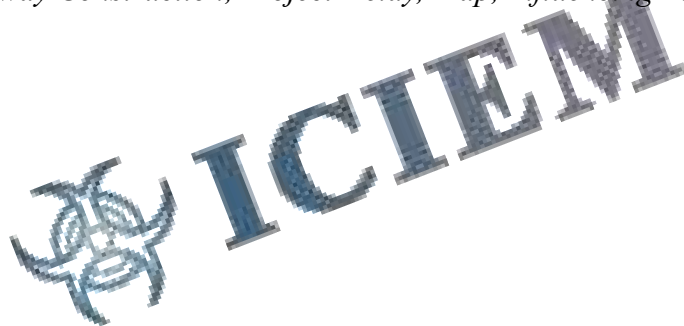


**Management of Project Delays and Analysis of the Initial Construction of the  
Fuzhou Subway  
W. Wang, and W. Lin**

**ABSTRACT**

Complex factors play a role in the initial subway building timeline delay. By combining the first-hand information and literature reading obtained from the subway construction management, the article confirms and issues a questionnaire about 37 influencing factors of subway construction delay and then analyzes it with SPASS17.0 in order to construct a map about influencing factors of subway construction delay and confirm 15 core influencing factors. The article will analyze the key influencing factors and develop targeted solutions from six angles, such as prospective design, temporary transport reconstruction, line pipe modification of land acquisition, construction units, administrative department, etc., to minimize the occurrence of subway construction delays to the fullest extent. On the subject of engineering schedule control, it is important to take into account for the initial construction of a subway system.

**Keywords:** *Subway Construction, Project Delay, Map, Influencing Factor*



**The Strategy of The Cultivation of Talents in Colleges from the Perspective Of  
the "Belt And Road Initiative"**

**K. Liu, W. Zhou, C. Ji, and B. Yang**

**ABSTRACT**

Universities play a crucial part in the development and success of college students as the primary source of talent training. The "Belt and Road Initiative" strategy's development and proposal presents hitherto unexplored opportunities and difficulties for the development of talent in colleges and universities. The needs of the construction of "The Belt and Road Initiative" plan cannot be met by single, professional employment China Western Traditional College students. Therefore, western colleges should combine regional specifics with geographic advantages, stepping up training of "The Belt and Road" strategic talents. Through collaboration between schools and businesses, international cooperation, communication, raising the bar for software and hardware, stepping up ideological and political education efforts, and other measures, "The Belt and Road Initiative" talents will be more deeply cultivated in western universities, boosting cultural soft power.

**Keywords:** *The Belt and Road, Western Universities, Personnel Training*



**Application of the Non-Equidistant Weighted Grey Model NFWGM (1,1) with Fractional Order Accumulation**

**Y. Luo, Y. Li, and C. Wang**

**ABSTRACT**

The non-equidistant weighted grey model NFWGM (1,1) with fractional order accumulation was proposed in order to apply the modeling issue that the weighted grey model GM (1,1) does not deal with non-equidistant series and satisfy the requirement of the fraction order specific properties and non-equidistance data in engineering systems. Two optimization models were created with the minimum average relative error and minimum mean square as the object functions, respectively, using the fractional order, the weighted coefficient, and the correction amount of the initial value of the response function as design variables. For these models, MATLAB routines have also been created. The examples demonstrate the greater accuracy of the grey NFWGM (1,1) models developed in this work. Both equidistance modeling and non-equidistance modeling are appropriate for these models. These techniques are valuable for promotion and use because of their high versatility.

**Keywords:** *NFWGM (1,1), Fractional Order Accumulation, Background Value, Optimization, Linear Weighted*

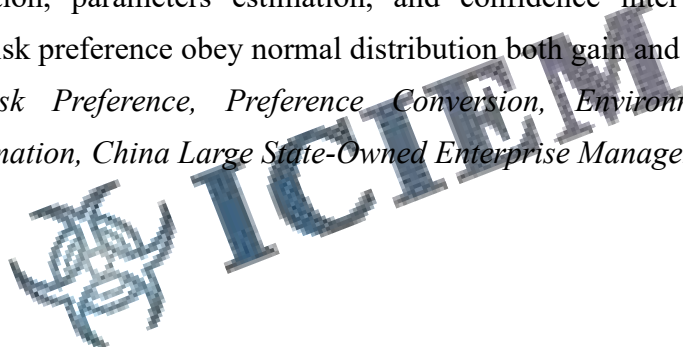
**A Case Study of China's Large State-owned Enterprise Managers' Conversion of Risk Preference in a Gain-and-Loss Situation**

**L. Wang, and Y. Zhang**

**ABSTRACT**

A fundamental component of decision behavior models is risk preference. This study polls 305 managers using the Risk Preference Index (RPI) approach, which is based on the expected utility theory. According to the findings, the mean risk preference index is 4.0815 in win-win scenarios and 5.0952 in loss-win scenarios. Under many circumstances, there are significant variations (significant probability). We incorporate environmental factors into reliability engineering practices, developing the shifting research of risk preference under different situation, giving the point estimation, interval estimation, parameters estimation, and confidence interval because the distribution of risk preference obey normal distribution both gain and loss situation.

**Keywords:** *Risk Preference, Preference Conversion, Environmental Factors, Parameter Estimation, China Large State-Owned Enterprise Managers*





**Parkinson's Disease Asymptotic Asymmetry Identification Using Kinect****Z. Hou, Y. Zhang, Y. Mo, J. Liang, and C. Chen****ABSTRACT**

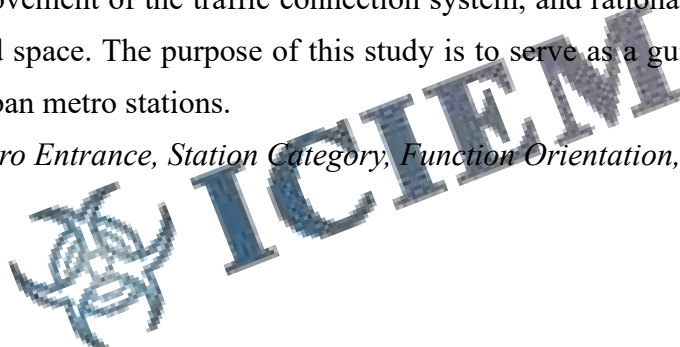
In daily living, people's regular lives are frequently impacted by stroke, falls, and other conditions brought on by unusual gaits. Parkinson's syndrome is one of them, and its diagnosis and early detection of aging are now more crucial than ever. Parkinson's syndrome is a high-risk condition in the aged. Ordinary medical testing apparatus is typically wearable, disrupting normal gait, more expensive, and based on laborious and complicated picture processing analysis and other techniques. As a result, this research introduces a computer-aided detection technique for Parkinson's illness based on Kinect. The process is easy and practical. First, comparison studies are used to confirm that Kinect is dependable for gathering gait data. Then, a hypothesis is put out to explain the symmetry of Parkinson's illness, and the matrix technique for string similarity confirms the validity of the idea. The HMM model of normal gait mode is then trained to produce the threshold of Parkinson's disease gait, and the threshold is subsequently employed for disease identification based on the plausible explanation. Research demonstrates that when using the Kinect as a data gathering instrument, Parkinson's disease-related gait can be recognized to some extent.

**Keywords:** *Pd, Gait Symmetry, Hmm, Kinect*

**Analysis of the Various Metro Entrance Problems and The Solutions****C. Gao, H. Zhao, and H. Li****ABSTRACT**

Let's use the Zhengzhou Metro Line 1 as an illustration. According to the function-oriented classification technique, the currently operational metro stations are divided into three different kinds. There was a brief discussion of the traits of various entrance kinds. During the building of Metro Line 1's entrances, a number of issues with the surrounding area, the transfer system, and space usage were found. Then, three countermeasures were suggested to improve metro station entrances as well as the incorporation of urban functions, so that the stations could fully support the city's comprehensive development. These included consideration of the surrounding buildings, improvement of the traffic connection system, and rational development of the underground space. The purpose of this study is to serve as a guide for designing the layout of urban metro stations.

**Keywords:** *Metro Entrance, Station Category, Function Orientation, Spatial Form*



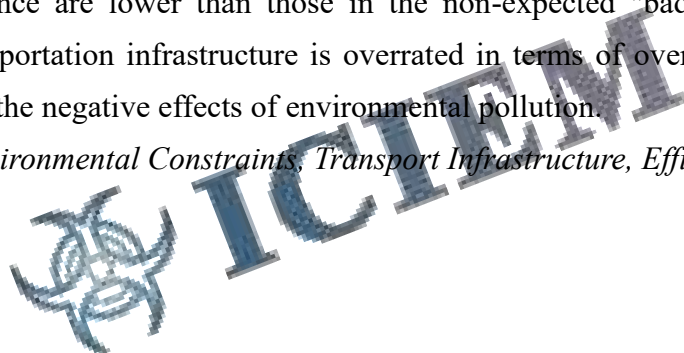
**Based on the Malmquist-Luenberger Index Approach, the Measurement of  
Transportation Infrastructure Effectiveness in Hubei Province Under  
Environmental Constraints**

**Y. Zhou**

**ABSTRACT**

Utilizing the transportation infrastructure of prefecture-level cities in Hubei Province as the research object, the efficiency of the transportation infrastructure in Hubei Province from 2004 to 2016 was assessed using the directional environment distance function and Malmquist-Luenberger index method. After taking into account the environmental limits of carbon emissions, the results demonstrate that the average total factor productivity and technological advancement of the transportation infrastructure in Hubei Province are lower than those in the non-expected "bad" output. Hubei Province's transportation infrastructure is overrated in terms of overall effectiveness since it ignores the negative effects of environmental pollution.

**Keywords:** *Environmental Constraints, Transport Infrastructure, Efficiency; Measure*



**Analysis of the Related Party Transactions of the Listed Company's Regulatory System**

**Z. Li, and D. Wei**

**ABSTRACT**

The attitude toward related party transactions, as determined by institutional analysis, is a crucial issue. The study develops models that show that the tunnel of significant shareholders is restricted to engaging in unfair related party transactions and joined the internal oversight, the remaining equity structure, and other factors. It does this by relying on the findings of prior research and combining them with practice. The study concludes that the fraction of the controlling shareholder modifying related party transactions causes the value of the marginal benefit to decrease as regulatory efforts grow. Internal control and a centralized holding structure can work together to lessen the impact of unethical related-party transactions on the company's marginal value. The marginal value effect of unethical related-party transactions on the corporation can be diminished by strengthening the legal protection framework and raising the percentage of shareholdings under control.

**Keywords:** *Listed Company, Related Party Transaction, Corporate Governance, Regulatory System's Efficiency*

**Total-Factor Energy Efficiency of Regions in China Taking into Account the  
Effects of Natural Disasters**

**C. Liu, and L. Zhang**

**ABSTRACT**

This study examined the effects of natural catastrophes on the total-factor energy efficiency (TFEE) of 30 regions in China from 2004 to 2010. The study calculates the total-factor energy efficiency of 30 regions in China and the three major regional areas of China: the east area, the middle area, and the west area. This is based on input-oriented data envelopment analysis (DEA). The Malmquist index was used to determine the primary factor in the paper's total-factor energy efficiency, and based on that study, improvement recommendations were made. The empirical findings of the study show that China's total-factor energy efficiency has been declining over the study period, while total-factor energy efficiency in various regions has varied over the study period. Total-factor energy efficiency in the three major areas also varies from one another, despite having a trend toward convergence. The article also comes to the conclusion that technological advancement is a double-edged sword because it contributes less to overall factor energy efficiency when taking into account the consequences of natural disasters than when ignoring them. To reduce the negative consequences of increasing investment in technology science and fostering technological innovation, the government must therefore use technology responsibly in order to improve China's energy efficiency.

**Keywords:** *Total-Factor Energy Efficiency, Natural Disaster, Panel Data, Malmquist Index*

**A model study of the Total Flavone of Epimedium Effecting on Mouse of  
Perimenopausal Syndrome**

**W. Xin, M. Bai, L. Cao, M. Miao, S. Tian, and L. Kang**

**ABSTRACT**

Investigation of the total flavone of Epimedium (TFE) on a mouse model of the perimenopausal syndrome (PMS) with the goal of laying the groundwork for the creation of a PMS medication. Observe the effects of high, medium, and low doses of TFE on PMS model mice's viscera index, serum sex hormone levels, and organ histomorphology. Results: In comparison to the control group, the uterus index, serum E2 levels, LH and FSH levels, endometrial thickness of mice in the model group, thickness of the muscle layer, thickness of the thymic cortex and cortical lymphocytes, and volume of the splenic nodule were significantly reduced ( $P < 0.01$ ), which explained the model's success. When compared to the model group, the TFE medication group showed varying degrees of increases in the thymus index, uterus index, serum E2 level, LH and FSH levels, endometrium, thymic cortex thickness, splenic nodule volume, and lymphocyte count. In summary, TFE significantly affects the management of PMS.

**Keywords:** *Total Flavonoids of Epimedium, Perimenopausal Syndrome, Mice*

**Economic System and Water Environmental System Coupling Relationship of  
Beijing Based on the Structural Equation Model**

**M. Chen, and C. Xu**

**ABSTRACT**

This article introduced the idea of "system coupling" and used the coordinate coordination model to determine the degree of linkage between Beijing's economic system and water environmental system. The water environmental system consists of water supply and water environmental carrying capacity subsystems, and a total of twelve components were chosen, including population, water consumption per ten thousand Yuan GDP, etc. The economic system is specifically made up of population and economic development subsystems. After that, the micro-coupling routes between the subsystems were inventively analyzed using the Structural Equation Model (SEM). Finally, based on the coupling state perspective and the coupling path perspective, we came to the following conclusions: (1) From a macro perspective, Beijing's economic system and water environmental system are intertwined in complicated ways, and the degree of this connection will rise as economic structure is optimized and technology advances. (2) The four subsystems in Beijing exhibit intricate relationships from a microscopic perspective. Particularly, the water supply subsystem promotes the other three subsystems to some extent.

**Keywords:** *Beijing, Economic System, Water Environmental System, System Coupling, Coordinate Coordination Model, Structural Equation Model*

**Evidence From the Ardl-Ecm Model in China Shows That Financial  
Macroenvironment Influences Carbon Intensity**

**Y. Tian, S. Zhu. and W. Chen**

**ABSTRACT**

One of the most effective ways to combat climate change is through carbon financing. The issue of how to create and enhance China's carbon financial system necessitates both theoretical research and practical strategies. The implications of the financial macroenvironment on carbon emissions have been studied in the literature. Through the use of the ARDL-ECM model, it is intended to examine the linkages between long-term equilibrium and short-term dynamics among macroenvironmental elements such as carbon intensity and financial development, financial innovation, stock market activity, and foreign direct investment. And while FDI is insignificant to offset it, the first three are proved to be long-term drivers of a drop in carbon intensity. Additionally, there is a brief dynamic adjustment between them. The study of carbon intensity reduction strategies while taking into account the function of the financial macroenvironment, particularly the financing environment, is a major contribution to the literature in China. In terms of creating a successful carbon financing system, indirect financing instruments represented by financial growth may be more important than direct financing ones represented by stock market activity.

**Keywords:** *Carbon Intensity, Financial Development, Financial Innovation Degree, Stock Market Turnover, ARDL-ECM*



**Assignment of Traffic in a Tolloed Network with Heterogeneous Time and Toll  
Budgets  
T. Bai**

**ABSTRACT**

For analyzing tolloed traffic networks with different time values and toll boundaries, a new network equilibrium problem was put forth. Both parameters are significant socioeconomic factors that are mostly controlled by an individual's income level, the purpose of their travel, and other socioeconomic factors. These factors have a direct impact on route choosing behavior and network flow pattern. However, no research has been done on how to handle both of them as two separate variables in an integrated model. Simpler models and approaches accommodating heterogeneous VoT have been explored extensively whereas those embracing either of the features appeared in the literature a few times. In order to define and address this challenge, this work offers a mathematical programming model and approach. The key problem complexity in the well-known Frank-Wolfe algorithm framework is how to effectively load travel demand into the network. We created a three-stage network loading process to address this issue: All Pareto-optimal paths are first found using a bicriterion label-correcting algorithm; all extreme Pareto-optimal paths are then quickly found in the second stage; and finally, all eligible extreme Pareto-optimal paths are given the proper demand proportions using a constrained parametric algorithm. In contrast to the straightforward situation defined just by user equilibrium, the numerical result produced from an exemplary example clearly demonstrates how diverse BoT and VoT modify the network flow pattern in a distinct way.

**Keywords:** *Network Equilibrium, Values of Time, Bounds on Toll, Demand Heterogeneity*

**R-based Analysis of Big Traffic Data for Urban Areas****X. Wang, and Z. Li****ABSTRACT**

A successful smart city will be one where businesses, residents, and government entities can respond to changing conditions and make informed decisions using real-time sensing and data analytics. The development of an intelligent transportation system and green transportation, both of which contribute to a smart city, depend heavily on huge traffic data. The broad concept of geography is reviewed, the spatial interaction discovery pipeline is demonstrated using traffic data visualization, and the generation and acquisition of data at the business level using web technologies are covered. Data technology (DT) has caused the demand for collaboration or integration in commercial data services. The paper suggests using open source software and open standards in the cloud and provides a list of potential tools and technologies for gathering, analyzing, and displaying large amounts of traffic data with R customization. In order to strengthen the interactive contact between the developer and the client, it designs an integrated platform known as business intelligence (BI), which uses both machine learning and graphical huge traffic data. Finally, a prototype R and Shiny system based on actual traffic data from Beijing serves as an illustration of the overall concept.

**Keywords:** *Big Data, Urban Traffic, Spatiotemporal, Urban Behavior, R*

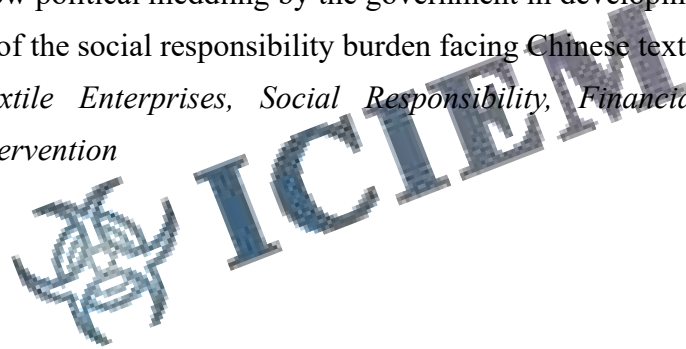
**The Empirical Study on Social Responsibility Affecting State-Owned Textile Companies' and Private Businesses' Financial Performance**

**X. Zhao, and H. Zhao**

**ABSTRACT**

Giving the community access to eco-friendly textiles is now both a global trend and a textile company's social obligation. What effect would the state-owned textile companies' adherence to their social obligations have on their financial performance? This article makes an effort to research this topic. The article discovers that Chinese textile companies' social responsibility lowers financial performance, especially for state-owned businesses, and is more pronounced in regions where government interference is more severe. The outcome of the quasi-DID is still reliable. It demonstrates how political meddling by the government in developing markets can be seen as a cause of the social responsibility burden facing Chinese textile companies.

**Keywords:** *Textile Enterprises, Social Responsibility, Financial Performance, Government Intervention*



**Dictionary Learning and Structural Clustering for Poisson-Gaussian Mixed  
Noise Removal**

**M. Li and C. Tang**

**ABSTRACT**

The main factors affecting the image quality obtained by the latest generation of charge-coupled devices are poissonian and gaussian noise. There has been a lot of interest in the field of noise suppression, although these studies have mainly focused on pure poissonian or Gaussian noise. The effectiveness of noise removal will increase with the right noise model. Since noise and signal may be effectively separated in a sparse domain, a denoising technique based on sparse coding will perform better if non-local repeating structure is used. The method for Poisson-Gaussian mixed noise reduction that we suggest in this study takes advantage of the imagery's self-similarity and the sparsity of the signal over a redundant lexicon. On a variety of imaging types, experiments are conducted to show how effectively and efficiently our technology outperforms the most advanced denoising technique.

**Keywords:** *Poissonian and Gaussian Noise, Image Acquisition, Dictionary Learning, Structural Clustering, Non-Local Self-Similarity*

**The "One Belt and One Road" Strategy's "Chosen of Logistics Enterprise Strategy" Case Study from Guangdong Province**

**K. Gao, X. Sun, X. Liu, and C. Yan**

**ABSTRACT**

We present a study on the strategic selection of logistics enterprises in Guangdong Province within the framework of the "One Belt and One Road" strategy, draw the logistics alliance and innovation strategy. The "One Belt and One Road" strategy brings new developing opportunities for the logistics industry, making the strategy chosen of logistics enterprises very important during the period. The analysis of the logistics alliance is divided into two categories: vertical and horizontal. The horizontal alliance strives to create a network of logistical services, while the vertical alliance promotes multi-enterprise cooperation. combining horizontal and vertical alliances in order to increase final customer value. The innovation dimension is primarily made up of management innovation and technological innovation, and the innovation form will be multi agent participation in interactive innovation. These characteristics of logistics enterprise innovation include external environment push-final customer pull and the multi agent interaction.

**Keywords:** *One Belt and One Road, Logistics Alliance, Interaction, Innovation*

**Responsible Innovation in Organisations: a study of Company Culture and  
Leader Credibility Affecting Employee Creativity**

**S. Ogbeibu**

**ABSTRACT**

Manufacturing companies are finding it harder and harder to innovate responsibly in emerging economies as a result of ongoing changes in competition and technological improvements. Supporting employee creativity as a tactic suited to encourage responsible innovation is a critical answer to this circumstance. Employee creativity and responsible innovation have a good association, according to earlier studies. However, organizations frequently encounter issues with their organizational culture (OC), particularly when there is a lack of employee confidence in their leaders. Although current research has indicated a good association between a leader's trustworthiness and the creativity of their workforce, nothing is known about how stable this relationship is across different OCs. Additionally, prior studies on the relationship between OC and employee creativity have produced contradictory results, failing to advance our understanding of how organizations might continue to engage in responsible innovation. As a result, we looked into how different OCs effect employee creativity and how trustworthiness in leaders influences their interaction. To do this, we conducted a quantitative analysis of a cross-sectional survey that was coded and included 222 participants from 54 Malaysian manufacturing companies. Partial least squares structural equation modeling (PLSSEM) was used to assess the survey data. Clan OC has the biggest positive link with employee innovation and places the most value on it, according to an analysis of the importance-performance map. Unexpectedly, it was discovered that employee creativity was negatively correlated with leader trustworthiness while positively correlated employee creativity was positively correlated with market and hierarchical OC. Our study provides new understandings into how various organizational cultures and trustworthy leaders affect employee creativity in the setting of a developing economy.

**Keywords:** *Company Culture, Leader Credibility, Employee Creativity*

**A Cases Study of Contract Flexibility Affecting Dispute Resolution Based on  
Governance Theory in China**

**B. Tang**

**ABSTRACT**

Construction disputes will inevitably arise. Massive losses brought on such disputes are so incredible that experts are working to find a solution. It is a useful approach to investigating the conflict issue from the standpoint of governance theory. The purpose of this study is to examine the features of contractual governance for conflicts. The governance structure (GS) and governance mechanism (GM), which are based on governance theory, make up the framework of contractual governance for disputes. To properly construct the contracts, the flexibility of GS and GMs is investigated in all its facets. A new conceptual model instructing governance picture for construction disputes is offered by a numerous case study and is mostly inspired by literature. The case study demonstrates that while the majority of GMs are designed flexibly, the GS determination is rigidly prepared and carried out. The flexible GMs are more likely to mediate conflicts, while the rigid GS benefits from a solid basis.

**Keywords:** *Governance Theory, GS, GM, Contract Flexibility*

**A Panel Data Analysis of CO<sub>2</sub> Emissions, Economic Development, Energy Use, Trade, and Urbanization in New EU Member and Candidate Nations**

**A. Kasman, and Y. S. Duman**

**ABSTRACT**

This study examines the causal connections between energy use, carbon dioxide emissions, economic growth, trade openness, and urbanization for a panel of new EU member and candidate nations between 1992 and 2010. In order to look into this link, panel unit root tests, panel cointegration methods, and panel causality tests are used. The Environmental Kuznets Curve hypothesis is supported by the primary findings. As a result, for the sampled countries, there is an inverted U-shaped link between environment and income. Additionally, the findings show that there is a short-run unidirectional panel causality that runs from GDP to energy consumption, from GDP, energy consumption, and urbanization to trade openness, from urbanization to GDP, and from urbanization to trade openness. Regarding the long-run causal relationship, the results show that the estimated coefficients of the lagged error correction term in the equations for GDP, trade openness, carbon dioxide emissions, and energy consumption are statistically significant, suggesting that these four variables may be crucial in the system's process of adjustment as it moves away from the long-run equilibrium.

**Keywords:** *Environmental Kuznets Curve, Energy Consumption, CO<sub>2</sub> Emissions, Economic Growth, New EU Member Countries*



**Does Financial Development Lead to A Rise in Energy Use? Tunisia's  
Industrialisation and Urbanization's Impact  
M. Shahbaza, and H. Lean**

**ABSTRACT**

The relationship between energy consumption, financial development, economic growth, industrialisation, and urbanization in Tunisia between 1971 and 2008 is examined in this research. For the investigation, Granger causality tests and the autoregressive distributed lag bounds testing approach to cointegration are used. The outcome reveals that in Tunisia, energy consumption, economic growth, financial development, industrialisation, and urbanization are all correlated over the long term. Between financial development and energy consumption, financial development and industrialisation, and industrialization and energy consumption, long-term bidirectional causalities are discovered. Therefore, the country should promote the development of a strong and sophisticated financial system that can draw investors, stimulate the stock market, and increase the effectiveness of economic activities. However, the promotion of urbanization and industrialisation must always be a part of the growth process. We shed more light on the significance that financial development, industrialization, and urbanization play in the process of economic development for decision-makers.

**Keywords:** *Energy Consumption, Financial Development, Economic Growth*

**Research on ESG's (Environmental Social Governance) Affecting Impact on  
Environmental Performance**

**G. Ahmad**

**ABSTRACT**

An investing approach called Environmental, Social, and Governance (ESG) concentrates on the three main components of sustainability: environmental, social, and governance factors. As investors explore for strategies to reduce risk and increase profits, it has grown in popularity and significance in the financial world. This entails assessing the company's water use, waste management, energy efficiency, and carbon footprint, among other things. Investors can help to ensure that their funds are being utilized to support firms that are taking action to lessen their environmental impacts by investing in companies with a solid environmental track record. The current study examines how environmental, social, and governance (ESG) practices affect the carbon performance of BSE 500 companies. ESG scores are calculated from the Bloomberg database for the years 2008 through 2022. According to the research, an incremental 1% rise in environmental spending is linked to a 0.325% drop in CO<sub>2</sub> emissions and a 0.548% drop in carbon emission intensity. Both developed and emerging regions see the varied effects of ESG investment. The advanced eastern region's environmental investments have significantly increased carbon productivity. However, their impact on carbon productivity has remained minimal. In contrast, environmental investments made in the central and western regions have led to a significant decrease in carbon emissions. One explanation for the disappointing results could be that ESG scores do not provide enough information about the real sustainability practices that have an impact on corporate performance. The top companies in this category are those with solid corporate governance frameworks, reasonable executive compensation, and open business practices. In general, ESG criteria offer investors a crucial set of standards to assess the portfolio.

**Keywords:** *Environmental Social Governance, Environmental Performance*

**Examining Private Actor Participation by Firm-Level Dynamics and Factors in  
Transnational Climate Governance and the Global 500**

**L. Hsueh**

**ABSTRACT**

In order to study the elements and processes that drive some organizations to participate in transnational climate governance but not others, this article focuses on the Global 500, which are the largest companies in the world by revenue. The likelihood that a firm participates in transnational climate governance (TCG) is higher, according to empirical findings based on multilevel mixed-effects analyses, when there is a policy supporter who champions sustainability policies and when a company adopts explicit sustainability practices, such as the incorporation of ESG (Environmental, Social, and Governance) principles. With a broad asset base and ISO 14001 environmental management certification, a corporation is more likely to engage in voluntary climate action and carbon disclosure. Additionally, involvement in TCG is linked to the degree of civil liberties that firms have access to in their individual countries of origin. According to a decomposition of the variance, the majority of the variance in TCG participation is explained by firm-level characteristics. The findings of this study have consequences for climate change governance and policies, which have a growing interest in nonstate and substate actors' ideas and practical climate solutions.

**Keywords:** *Decomposition of Variance, Firm-Level Analysis, Industry Self-Regulation, Transnational Climate Governance, Voluntary Carbon Disclosure, Voluntary Climate Action, Voluntary Programs*

**SECTION 7**

**Automation and Control Systems**



**A Study of Localized Stress in Defect Zone in a Rolling Bearing Using Explicit  
Dynamic FE Model****Z. Zhang, and W. Ding****ABSTRACT**

In this paper, the dynamic finite element model of a rolling bearing with a spot defect on its outer ring is calculated by means of ABAQUS. In this paper, the maximal Mises stress and the maximal contact pressure in the defect region are obtained. The influence of radial load, rotational velocity and initial defect size on the stress level is analyzed. It is found that higher stress is produced when the ball is passing through the defect. Radial load and defect size have obvious influence on the stress level of defect, but the lower rotation speed ignores the influence.

**Keywords:** *Defect, Rolling Bearing, Explicit Dynamic Analysis*



**The Design of the Complex Martial Arts Action of Humanoid Robots and the Study of Similarity**

**Z. Zhang, and J. Fan**

**ABSTRACT**

This paper presents a method of generating motion trajectory based on the "base segment". Firstly, the movement of human body is classified into a basic movement section, and the motion restriction is given, and the adjustment method for the stability of the complex dynamic action is discussed. Then, the similarity function of humanoid robot, which is modeled by human movement, is put forward, and the trajectory solution method which can satisfy the motion and dynamic stability is presented. Finally, through the Chinese kungfu "sabreplay" test on the humanoid robot BHR-2, the validity of the method is verified.

**Keywords:** *Humanoid Robot, Similarity, Rhythm, Dynamics Stability, Kinematic Constraints*



**The Study of Particle Filter Technology for Image Processing Based on Image  
H. Hu**

**ABSTRACT**

Particle filter, also known as the conditional probability density transmission algorithm, Sequence Monte Carlo method, SIS, SIR, ASIR, RPF, and other names, is an effective approach for addressing the Bayesian probability. A focus of research in the field of image processing has always been target tracking technology based on particle filter technology. The dynamic model of the particle filter describes the target's movement mode. If the model description deviates significantly from the actual movement mode of the target, the particles will undoubtedly be unable to accurately cover the targets' actual positions after the prediction process, and the accumulation of tracking errors may even result in tracking failure. This work proposes the two stages acceleration dynamic model (TSA), which consists of the free model and the conservative model, with a focus on the features of the aerial environment to ground target tracking. By adjusting the parameters, the free model can more accurately characterize the movement mode between the RW model and the NCV model by modeling the target speed as the non-zero mean gaussian markov. By replacing the target's average speed in the free model's gaussian markov process, the conservative model may calculate the target's current speed. The study's findings indicate that this model can more accurately identify targets with motion that moves at a highly varying speed across the image surface. This research suggests a two-step dynamic model based on these two models that can effectively address various target tracking issues.

**Keywords:** *Particle Filter, Target Tracking, Image Processing, Dynamic Model*

**Strength analysis of the Planetary gear set and Hybrid power coupling device****L. Yuan, R. Zhou, and K. Du****ABSTRACT**

The hybrid vehicle's power splitting and coupling system is called the power coupling device. This study focused on hybrid vehicles that use planetary gear sets as power coupling mechanisms since they are lightweight, incredibly economical, and reliable. The finite element approach is used to confirm the stress and strain of the power coupling device under the limit condition after the working principle of the power coupling mechanism has been examined and the non-interference simulation model of the mechanism has been constructed. The findings demonstrate that the power coupling device satisfies the requirements of the operating environment for the vehicle, which establishes the framework for structural optimization of the mechanism.

**Keywords:** *Power Coupling Device, Finite Element Method, Strength Analysis*





**Modeling Platoon Dispersion Using Traffic Flow Patterns****B. Sun, M. Wei, and C. Zhou****ABSTRACT**

The most effective amalgamation of theoretical and experimental work on the coordination of traffic signal control is Pacey's platoon dispersion model, which is based on traffic density. The practical applicability of Pacey's approach is, however, constrained by the challenge of getting density function in the field. This work offers a platoon dispersion model from the standpoint of traffic flow pattern to address the flaws in Pacey's model. Our main goal is to identify a relationship in traffic flow between neighboring crossings to predict the arrival flow rate of the downstream intersection using traffic flow data from the upstream intersection. For the downstream intersection's signal timing plans, the model can offer traffic statistics. Finally, a numerical example is shown to demonstrate how to coordinate the traffic signals at nearby junctions.

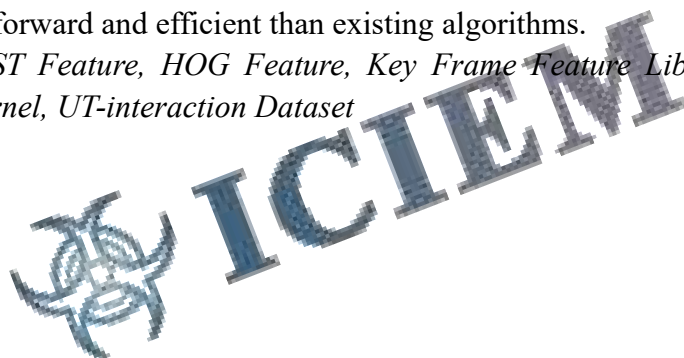
**Keywords:** *Traffic Engineering, Platoon Dispersion Model Pattern, Traffic Flow, Signal Coordination Control*



**The Study of Human Interaction Recognition Using Key Frame Feature Library Fusion Features****H. Zhang, S. Gao, and M. Jiang****ABSTRACT**

Human interaction recognition still has some problems, like low recognition accuracy and computational complexity. The research offers a novel and practical approach based on fixed characteristics of the key frame feature library to address the issue. First, the pre-processed videos' GIST and HOG features were retrieved. Second, the K-means method was used to cluster training movies with various action types in order to extract the key frame features for each action and create a library of key frame features. The frequency of several critical frames in each interactive video was calculated using a similarity metric, and interactive video representation was created as a statistical histogram. Finally, the SVM classifier based on histogram intersection kernel was used to achieve decision level fusion in order to get excellent results on the UT-interaction dataset. The suggested algorithm's proper recognition rate is 85%, which shows that it is more straightforward and efficient than existing algorithms.

**Keywords:** *GIST Feature, HOG Feature, Key Frame Feature Library, Histogram Intersection Kernel, UT-interaction Dataset*



## Action Recognition Using Skeleton's Key Frames and Weighted Fusion of Depth Images

Y. Xu, Z. Hou, J. Liang, C. Chen, L. Jia, and Y. Song

### ABSTRACT

In this study, a novel technique for recognizing human motion that combines bone maps and depth images is presented. Each depth image is represented by the automatic gradient feature correlation in 2D and 3D. Depth photos are used to extract a feature utilizing spatial and orientation auto-correlation. The similarity of each frame in the skeleton sequence is defined using mutual information, and the key frames are then extracted from the skeleton sequence. To compensate for the loss of temporal information in depth pictures, the skeleton feature was recovered from the key frames as complimentary features. Two extreme learning machine classifiers use each set of features as input and give each set a different weight. Different features can be more versatile when using different classifier weights. The fused result is utilized to determine the final class label. The suggested method's accuracy is 1.5% greater than the most recent action recognition techniques, according to tests on the MSR\_Action3D depth action dataset.

**Keywords:** *Depth Image, Skeleton Image, Action Recognition, Mutual Information, Weighted Voting*

**Analysis And Confirmation of the Mechanical Mechanism for Grab's Flat Digging**

**C. Xu, H. Xiao, S. Zou, and F. Zhu**

**ABSTRACT**

The key to developing the grab, enhancing the grab's structure, and achieving the automatic flat digging of grab dredgers is study on digging resistances. The mechanical analysis, experimental study, and theoretical calculations and calculations in the dredging process are the main topics of this article. In a mathematical model, the theoretical digging resistances in both the horizontal and vertical directions have been examined. The stresses on the hoist rope and closure rope have been measured with the assistance of experiments with flat digging. Determine the horizontal and vertical digging resistances next using moment balance. The research has been validated and offers technical support for flat digging in the dredging process since a satisfactory agreement has been reached between the theoretical calculations and the corresponding independent experimental data.

**Keywords:** *Excavating Resistance, Flat Digging, Mechanical Property, Theoretical Simulation, Experimental Study*

## Early Warning System for Aviation Safety Based on Set Pair Analysis and Changeable Fuzzy Sets

G. Min, J. Duanmu, J. Gao, and B. Zhang

### ABSTRACT

Around the world, the frequency of fatal airplane accidents is rising alarmingly. The creation of an early warning system for aviation safety is a challenging global issue with a difficult to predict solution. The typical flight system in aviation is a socio-technical system that is influenced by a wide range of elements. A two-level index system and evaluation grading standards were created using systematic and operability concepts. This paper proposes a new model for an aviation safety early warning based on set pair analysis (SPA) and variable fuzzy sets (VFS) theory, called the SPA-VFS model, which determines the relative membership degree function of VFS via the SPA method to simplify the analysis process. The aviation flight system has the characteristics of imprecision and uncertainty. Moreover, the weights of the indices were determined using the analytical hierarchy process (AHP). The safety conditions of 4 Flying Corps were then assessed using SPA-VFS, which also provided warning ratings. In order to confirm the accuracy and viability of the suggested model, SPA-VFS was also put up against two established techniques, namely fuzzy comprehensive evaluation (FCE) and grey comprehensive evaluation (GCE). According to the findings of a case study, the suggested SPA-VFS model for an early warning system for aviation safety is rational, trustworthy, and applicable. It also has the potential to be utilized for early warning systems in other industries.

**Keywords:** *Aviation Safety Early Warning System, Analytical Hierarchy Process (AHP), Set Pair Analysis (SPA), Variable Fuzzy Sets (VFS)*

**Research on Wireless Sensor Networks Based Port Management System****Localization****C. Tang, And M. Li****ABSTRACT**

Location is now the most widely used method for precise localization in ports. Due to the signal's susceptibility to noise and interference from other wireless systems, new specifications for wireless sensor networks between ships have been proposed. The strategy to lessen the interference is presented in this study. The notion of these source signals' statistical independence dictates that interference between signals should first be removed using independent component analysis (ICA). Second, approaches using Multiscale Energy Products (MEP) calculate the arrival time. Leading edge detection performance can be enhanced by taking use of let signal energies that change from coarse to finer time scales. Finally, we show that the suggested TOA estimation has superior performance and is a very effective approach for interference suppression when compared to the other two conventional methods.

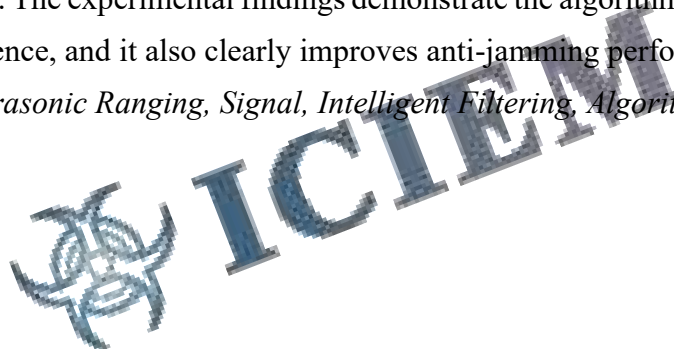
**Keywords:** *Time of Arrival (TOA), Wireless Sensor Networks, Multiscale Energy Products (MEP), Independent Component Analysis (ICA)*

**Ultrasonic Ranging Signal Algorithm Research for Intelligent Filtering  
Elimination  
Z. Wang**

**ABSTRACT**

The ultrasonic ranging currently has a threshold set for filtering. Long-distance ultrasonic measurement is not a good fit for this kind of technique. This work develops a two-step correlation-based approach for filtering ultrasonic range signals. The cross correlation function between the square envelope of the transmitted signal and the transmitted signal envelope is used to first correct the range of the ultrasonic wave. The transmission function of the ultrasonic range space filter is then investigated in order to reduce the algorithm's processing time. The projection function is intended to finish the filtering process. The experimental findings demonstrate the algorithm's strong capacity to filter interference, and it also clearly improves anti-jamming performance.

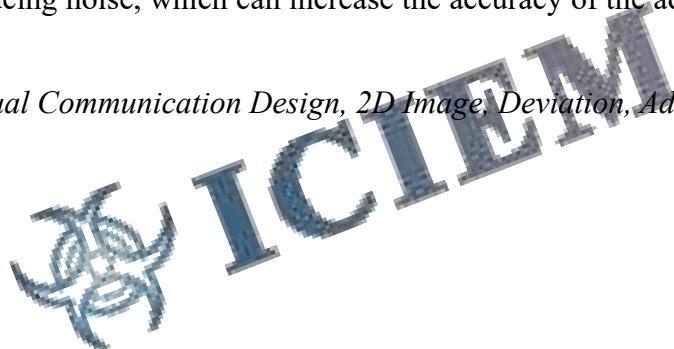
**Keywords:** *Ultrasonic Ranging, Signal, Intelligent Filtering, Algorithm Research*



**Visual Communication Design Research on Adaptive Correction Method of Two-dimensional Image Deviation****K. Cheng****ABSTRACT**

The adaptive correction of two-dimensional picture deviation is processed using a least squares method in this paper. The two-dimensional images obtained from the image are biased; as a result, the two-dimensional image must be corrected appropriately. The edge contour of the two-dimensional image is then recovered after the image has undergone pre-processing. The feature points are fitted into a straight line using the least squares approach, and the deviation in the two-dimensional image is fixed using bilinear interpolation. According to the experimental findings, the method is quick and effective in reducing noise, which can increase the accuracy of the adaptive correction method.

**Keywords:** *Visual Communication Design, 2D Image, Deviation, Adaptive Correction Method*





**MIMO Wideband Frequency Modulated Signal Intelligent Detection Algorithm  
in Complex Multipath Channel**

**J. Cai, Z. Zhu, and Y. Lu**

**ABSTRACT**

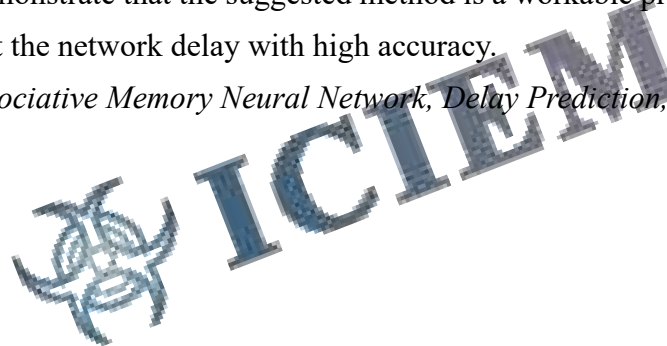
The orthogonal matching tracking-based intelligent detection technique of MIMO wideband frequency modulated signal has the drawbacks of high network congestion rate, high signal noise content, and huge memory space in complicated multipath channel. Based on the fractional Fourier transform, an intelligent detection approach for MIMO wideband frequency modulated signals in complicated multipath channels is proposed. With the introduction of hierarchical search into the signal detection process, the noise in the signal is evaluated. The signal detection procedure is finished with the signal normalization step. Studies reveal that the algorithm can successfully lower the signal's noise content while using little memory on the computer, minimizing the impact of detection on the computer network.

**Keywords:** *Complex Multipath Channel, MIMO Wideband Frequency Modulated Signal, Signal Intelligent Detection*

**Study of the Neural Network with Bidirectional Associative Memory for Delay Prediction****C. Wu****ABSTRACT**

In this paper, a bidirectional associative memory neural network-based delay prediction algorithm is developed. The algorithm first establishes and defines the delay function of router processing using RTT similarity. Then, in order to create the network delay prediction model, the random coefficient and other parameters of uncertain components like network congestion rate and network delay are determined. The normal distribution is then coupled with the bidirectional associative memory neural network technique, and the resulting model is used to derive the network delay law. The results of the experiments demonstrate that the suggested method is a workable prediction algorithm and can forecast the network delay with high accuracy.

**Keywords:** *Associative Memory Neural Network, Delay Prediction, Research*

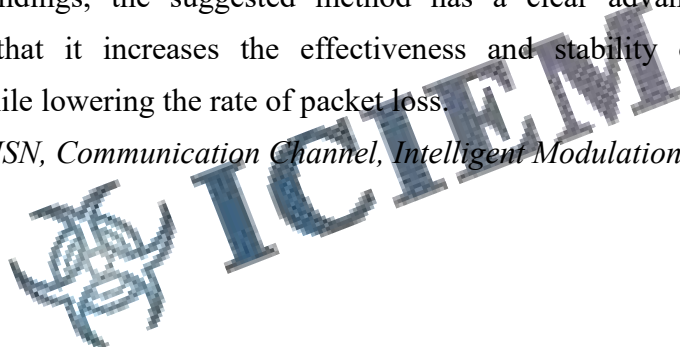


**Study of the WMSN Communication Channel's Intelligent Modulation  
Algorithm**  
**H. Xu**

**ABSTRACT**

This research proposes an intelligent direct sequence spread spectrum-based modulation technique for the WMSN communication channel. The cause of channel distortion is enumerated during the preliminary investigation of the WMSN communication channel. The communication channel model is built using the results of the receiving end's calculations for the amplitude response and frequency response, and the direct sequence spread spectrum technique is then utilized to derive the equalization control equation for WMSN channel modulation. According to the experimental findings, the suggested method has a clear advantage over other algorithms in that it increases the effectiveness and stability of channel data transmission while lowering the rate of packet loss.

**Keywords:** *WMSN, Communication Channel, Intelligent Modulation*



**Research on the Unbalanced Noise Denoising Algorithm Intelligent Fuzzy Image**  
**X. Yuan, and D. Chen**

**ABSTRACT**

An intelligent noise reduction technique for fuzzy images with imbalanced noise is presented in this study. To determine the threshold value, the image is first segmented using an algorithm based on inter class variance maximization. Next, noise is adaptively reduced in accordance with changes in the local environment in order to achieve the goal of intelligent noise reduction. According to experimental findings, the suggested approach has a better denoising effect than other algorithms. The visual impact is improved while the edge details are kept.

**Keywords:** *Unbalanced Noise, Fuzzy Image, Intelligent Noise Reduction, Fuzzy Function, Wavelet Coefficient*



**Wind-induced Vibration Response Control of High Structures: Computer  
Simulation of Reliability Algorithm**

**Q. Zhao**

**ABSTRACT**

In this research, a reliability control technique for the high-structure response to wind-induced vibration is presented. The power spectral density of motion equation, the structure displacement response under random wind load in frequency domain, the relationship between wind velocity and wind pressure, and the load of wind effect on the structure are calculated based on the modeling parameters and high structure model built by ANSYS, and the model is analyzed by various variation modes. The experiment examines if the simulation results are reliable. The outcomes of the computer simulation demonstrate excellent reliability and good consistency with the real-world condition.

**Keywords:** *High Structure, Wind-Induced Vibration Response Control, Computer Simulation*



**SECTION 8**

**Information Systems**



**Research on Mobile Learning Models and The Development of a System Using  
the WeChat Public Platform**

**M. Li, H. Wang, and M. Chen**

**ABSTRACT**

The rapid advancement of wireless communication networks and mobile terminal technology has made personalized learning and lifelong learning the present educational development's main foci. More and more individuals are using smart, portable mobile devices for on-the-go learning. WeChat has been used in various fields of education in the past, but less mobile learning has been designed and developed using the WeChat public platform. In this work, we conduct some study on mobile learning based on the WeChat public platform using the high school chemistry mobile learning platform as an example. First, we build a mobile micro-class learning mode appropriate for the WeChat public platform based on the ADDIE teaching design mode and the fundamental connection of curriculum creation in mobile environments. A mobile learning platform for high school chemistry was subsequently created based on the WeChat open platform in this manner. The platform employs the WeChat public platform's development approach, utilizing a third-party platform for development and enhancing WeChat's public platform's functionality. Finally, the platform is used for teaching practice, and effective teaching results have been attained.

**Keywords:** *WeChat Public Platform, M-Learning, Learning Model, Micro Video*

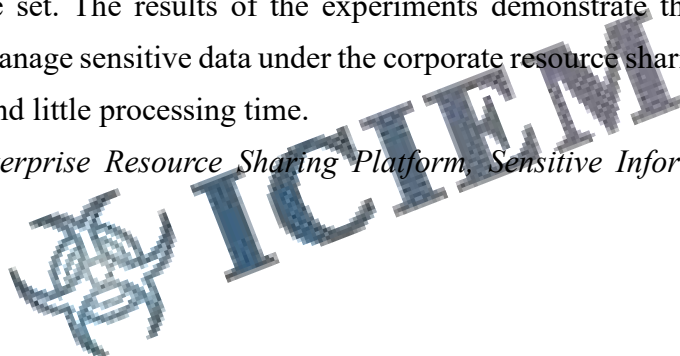
**Linear Tree Thinking-Based Design of Enterprise Massive Sensitive Information Management Algorithm**

**B. Yang**

**ABSTRACT**

It is challenging to establish effective management due to the secrecy of sensitive information held by businesses in large quantities. The traditional management algorithm suffers from significant inaccuracy and time-consuming issues. In this research, a linear tree thinking-based method for enterprise-wide, sensitive information management is proposed. It is created an MMBST linear data structure. MMBST creates a suitable information management line tree and divides sensitive information into fixed-size information blocks. To balance the data, priority and sensitivity probabilities are set. The results of the experiments demonstrate that the suggested algorithm can manage sensitive data under the corporate resource sharing platform with high accuracy and little processing time.

**Keywords:** *Enterprise Resource Sharing Platform, Sensitive Information, Efficient Management*

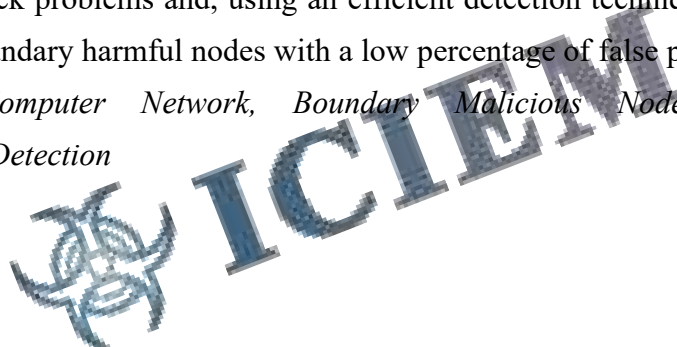




**Research on a Computer Network's Boundary Malicious Node Detection Method****W. Huang****ABSTRACT**

In most cases, computer networks are arbitrarily installed in places with no underlying network infrastructure. Computer nodes that have been exposed to a hostile attack environment are more susceptible to unidentified attacks, which can lead to mistakes. Traditional node detection techniques have a slow detection speed and are challenging to operate properly without human involvement. This research proposes a multivariate classification-based technique for boundary malicious node detection. Prior to it, the context and goals are discussed. The detecting technique is then researched. The findings of the experiment demonstrate that this method can immediately recognize unexpected attack problems and, using an efficient detection technique, complete the detection of boundary harmful nodes with a low percentage of false positives.

**Keywords:** *Computer Network, Boundary Malicious Nodes, Multivariate Classification, Detection*

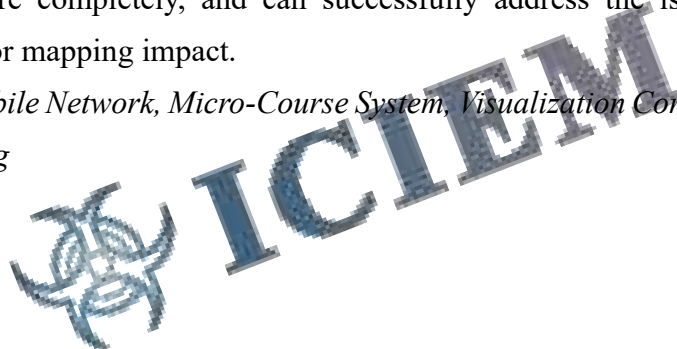


**Research on Micro-course System Based on Mobile Network Visualization  
Construction Algorithm**  
**Y. Kang, L. Ma. and G. Gong**

**ABSTRACT**

A new visualization construction technique for micro-course systems is proposed based on the issue that the module in the visualization of micro-course resources has a slow decomposition rate and inadequate mapping. The algorithm used to dissect the properties of the micro-course system module is based on the linear limit histogram. The completed micro-course system visualization construction research fuses and maps the disassembled modules using the hue mapping algorithm. The experimental findings demonstrate that the algorithm has a high degree of viability, can comprehend the course's structure completely, and can successfully address the issues of sluggish running and poor mapping impact.

**Keywords:** *Mobile Network, Micro-Course System, Visualization Construction, Micro-Course Mapping*



**SECTION 9**

**Internet Industry**



**The Simulation Model of Simulation Evolution of Emergency Network Public Opinion****R. Wang, X. Wu, and J. Gao****ABSTRACT**

Along with the application and popularity of the network, the scholars pay more attention to closely follow the development of the Internet public opinion on the emergency. As the dissemination carrier and platform of public opinion on emergencies, the network makes its evolution process more complex and uncertain increasing the impact of emergencies. Based on Netlogo model database, we can simulate the evolution process of Internet public opinion to avoid the inertia train of qualitative analysis. Based on 5 series of experiments on network size, density, speed and link reconstruction, we get the effect of the four factors on the evolution. Furthermore, the proposed measures can be more scientific and rational to control the process.

**Keywords:** *Network Public Opinion, Emergency, Evolution, Simulation Model*



**Shop Scheduling Based on Genetic Algorithms and Its Application****H. Zhao, and F. Kong****ABSTRACT**

Shop scheduling is an important factor affecting production efficiency. The research and application of efficient scheduling method and optimization technology plays an important role in improving production efficiency and reducing production cost in manufacturing enterprises. Existing studies have shown that the improved genetic algorithm solves the limitations of genetic algorithm, and the objective function can meet the customer's demand for shop scheduling. Future studies should focus on the combination of genetic algorithm and other optimization algorithms. In order to overcome the shortcomings of early convergence of genetic algorithm and solve the problem of local minimization in the search process, an improved cyclic search genetic algorithm was proposed for the mixed flow shop scheduling problem, and the chromosome coding method and corresponding operation were given. It has the property of inheriting the best individual of the preceding generation, and can avoid the occurrence of the local minimum. Furthermore, cyclic and cross operation and mutation operation can enhance the diversity of the population, and then obtain the best individuals rapidly, which proves the validity of the algorithm. The experiment shows that the proposed algorithm can avoid the problem of local minimum, and the convergence speed is fast.

**Keywords:** *Shop Scheduling, Genetic Algorithm, Local Minimization, Cyclic Search*

**Big Data Technology in Water Management Standard Establishment and Amendment****Y. Bai, X. Bai, L. Lin, and J. Huang****ABSTRACT**

When used in the development and revision of water management standards, the big data technique is a fundamental process that combines the composition, consultation, release, implementation, and supervision of the standard with the goal of resolving challenges encountered in the standard implementation supervision, as well as mobilizing businesses. The "standards of intelligent water management" refer to the application. "Intelligent standards of water management" encourage more participation from businesses while simultaneously fostering technology advancements in water management and the reform-upgrading of water application so that the standards that were originally created by people may now actually help people. The paper builds the integrated solution of intelligent water management standards from three perspectives, including basic data resource platform, unified data platform, and data resource utilization. It also describes the integration framework of the solution from three levels, including data integration specifications, portal integration application construction, and data integration application construction. This is based on the entire life cycle process of the standard development. The significance and viability of intelligent water management standards are carefully examined in this research.

**Keywords:** *Water Management, Standard, Big Data*

**Simultaneous Distillation Extraction with Response Surface Methodology for the Detection of Flavor Components in Tobacco****X.XU, X. Li, S. Huang, Y. Zhou, H. Jia, and X. Li****ABSTRACT**

Although flavor components play a significant role in the quality of tobacco, current technology and unstable environmental conditions make it difficult to detect flavor components. Simultaneous distillation extraction (SDE) technique was cited in earlier research as an effective method for taste component detection. Due to the vast differences in their test settings, it is difficult to define the ideal parameters for taste component detection. In this study, the major variables that affect the amount of flavoring chemicals extracted, such as the ratio of material to solution, distillation time, dosage of NaCl to tobacco, dosage of CH<sub>2</sub>Cl<sub>2</sub> to tobacco, and bath temperature, were thoroughly discussed. Additionally, response surface approach is used to determine the ideal SDE operating parameters, with the ideal outcomes being as follows: 1.12:1 was the material to liquid ratio, 3.23:1 was the distillation time, 1.05:1 was the NaCl dosage to tobacco, 1.92:1 was the CH<sub>2</sub>Cl<sub>2</sub> dosage to tobacco, 60°C was the bath temperature, and 2.39 mg/g of flavorings were extracted. This approach may have a significant educational value for engineering to identify flavor components in tobacco.

**Keywords:** *Flavoring Substances, Tobacco, Simultaneous Distillation Extraction, Response Surface Methodology*

**Collaborative-based Expensive Optimization Algorithm for the Water Supply  
Network Pollution Source Identification Problem**

**X. Yan, K. Yang, C. Hu, and W. Gong**

**ABSTRACT**

It is vital to install water quality sensors at key nodes or water sources of the water supply network to achieve real-time monitoring and stop water pollution incidents from resulting in severe disasters and losses. However, it is difficult to precisely identify the pollution source and forecast the location of pollutants, injection time, injection length, and injection quality when a pollution incident happens using the data gathered by the water quality sensor. The identification of pollution sources in water supply networks is revealed to be an expensive optimization problem in this research using the currently prevalent pollution source identification method - simulation optimization model. The identification of pollution sources is transformed into a challenging optimization task. The problem's peculiarities are taken into account as a collaborative expensive optimization approach is suggested. This method suggests a better approach for each individual variable to drive the algorithm's search direction based on the properties of the water supply network. For positioning accuracy, the algorithm makes best use of a surrogate model for the Gaussian process. Finally, the reliability, effectiveness, and stability of the suggested method are confirmed through simulation analysis.

**Keywords:** *Pollution Source Identification. Expensive Optimization Algorithm. Gaussian Process Surrogate Model. Collaborative Algorithm. Water Supply Network. Simulation-Optimization*



**Study of Interference Signal Control Algorithm for Mechatronics Electrical  
Control Platform**

**Q. Zhou**

**ABSTRACT**

This paper proposes a direct-expansion measurement and control interference signal control algorithm based on compression perception to address the issue of the traditional interference signal control algorithm's poor control performance caused by the direct-expansion measurement and control signal sampling. Based on the properties of the direct-expansion measurement and control signal, the algorithm builds the corresponding sparse base, analyzes the normalized residuals and change rule of the direct-expansion measurement and control signal and interference signal under the sparse base, reconstructs the direct-expansion measurement and control signal through the sparse coefficient, and achieves adaptive control by combining the normalized residuals. The experimental findings demonstrate the effectiveness of the suggested method in controlling the interference signal, as well as the increased detection probability and superior error effect.

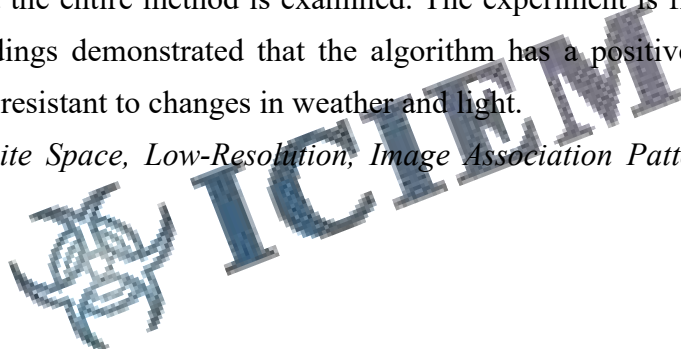
**Keywords:** *Mechatronics, Electrical Control Platform, Interference Signal, Control Algorithm*

**Analysis of a Finite Space Low Resolution Image Correlation Pattern  
Recognition Algorithm**  
**Y. Li, and G. Li**

**ABSTRACT**

A low-resolution image correlation pattern identification technique based on block-centric symmetric local binary model and weighted principal component analysis algorithm is developed since traditional correlation pattern recognition algorithms cannot reliably detect low-resolution images. First, using the block CS-LBP operator, the feature of the low-resolution image is extracted. The feature is reduced using the weighted PCA operator, and the classification feature is then obtained. Second, the nearest neighbor classifier chooses the best classification class, the recognition rate is determined, and the entire method is examined. The experiment is finally put to use. The testing findings demonstrated that the algorithm has a positive effect on ORL detection and is resistant to changes in weather and light.

**Keywords:** *Finite Space, Low-Resolution, Image Association Pattern, Recognition Algorithm*



**Network Attack Data Mining Research Using a Fast Association Rule Mining  
Algorithm**

**J. Song, H. Xie, and Y. Feng**

**ABSTRACT**

In this paper, a quick association rule mining approach for network attack data is proposed. The current risk data provided by network attack data lacks predictability. The concept of interest degree and approximation is introduced to improve the membership function, which can establish the network attack data association rules to achieve quick data mining, and based on the genetic algorithm, the related data is used to introduce the frequency of network attack events into the association rules. The experimental findings demonstrated the accuracy and efficiency benefits of the suggested algorithm.

**Keywords:** *Network Attack Data, Association Rules, Mining Algorithm, Fuzzy Theory*



**Efficient Multi-thread Data Interaction Algorithm for Resource Sharing  
Platform  
T. Wang**

**ABSTRACT**

In this research, an effective interactive algorithm for multi-threaded data on a platform with shared resources is proposed. This approach offers a proposal for an allocation condition control for multi-threaded data transmission. And on this basis, the multiple virtual machine terminals can access data packets transmitted for the multiple switches in priority in a multicast or broadcast transmission, realizing efficient interaction of multi-thread data under resource sharing platform, through the efficient combination of lost packet in the process of multi-thread data transmission. The suggested algorithm has good interactive performance, according to experimental findings, and can increase throughput and transmission interaction efficiency while lowering the packet loss rate.

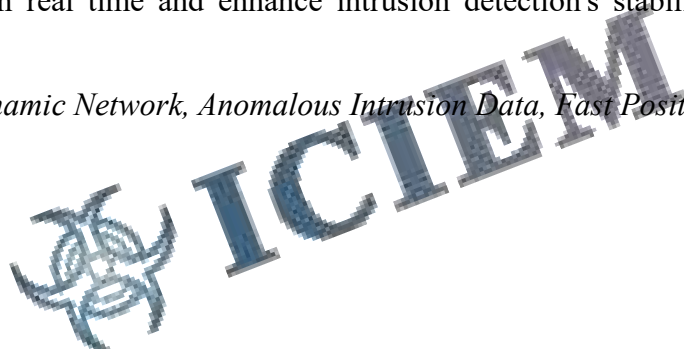
**Keywords:** *Resource Sharing Platform, Multi-Threaded Data, Efficient, Interaction*



**Complex Dynamic Network Invasion Data Fast Location Algorithm****F. Yuan, and H. Guo****ABSTRACT**

The problem of low positioning efficiency when the lowest information criterion is employed to find the abnormal intrusion data is the basis for a new algorithm for detecting the abnormal intrusion data of complex dynamic networks based on ultrasonic TDOA. The network's intrusion detection region is built throughout this procedure, and the adjacency matrix and graph theory are used to obtain the root intrusion matrix. In order to find the intrusion node, the ultrasonic TDOA measures the distance between the nodes, and for quick placement, three-dimensional centroid positioning is also obtained along with the network intrusion data. The suggested technique can locate intrusion data in real time and enhance intrusion detection's stability, according to experiments.

**Keywords:** *Dynamic Network, Anomalous Intrusion Data, Fast Positioning*



**Research on Large Database Based High Risk Intrusion Data Mining Algorithm****H. Zhang, and Q. Zhang****ABSTRACT**

The accuracy of data mining as it is now practiced is subpar. So, based on selection and mutation mechanisms, this research offers a fuzzy clustering data mining approach for SFLA. The algorithm gathers the intrusion data initially before extracting the features. The research of data mining method in high risk intrusion is then completed using the fuzzy clustering SFLA algorithm. The proposed technique increases the precision of data mining, according to experimental findings.

**Keywords:** *High Risk Intrusion Data, Data Mining, Data Clustering, Hybrid Frog*



**Research on Database Feature Information Fast Retrieval Algorithm****J. Zhang****ABSTRACT**

A quick feature information retrieval approach based on Naive Bayes is suggested to increase the retrieval accuracy of databases. First, the database's data structure is examined, and then the semantic correlation degree feature extraction algorithm is developed. So that the information may be promptly retrieved, the feature extraction results are processed by clustering, and the interference data is handled through noise reduction and filtering. The suggested approach offers improved accuracy in database retrieval, according to experimental results.

**Keywords:** *Database, Feature Information, Fast Search Algorithm*



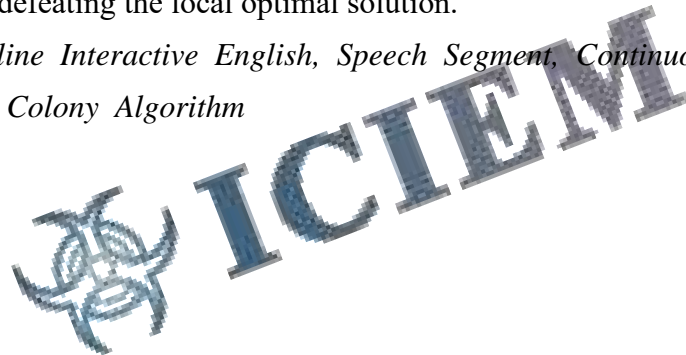
**The Development of Continuous Recognition Algorithm for Online Interactive  
English Speech Segment**

**D. Zhao**

**ABSTRACT**

This research suggests a continuous recognition technique based on an artificial bee colony algorithm for online interactive English voice segments. In the beginning, the speech signal is pre-weighted, divided into frames, given a window, and given endpoint detection, among other things. It is decided to use the powerful MFCC feature parameters. To implement the continuous recognition of the voice segment, an artificial bee colony algorithm is used. The outcomes demonstrate how effective the algorithm is at optimizing parameters. It has the ability to increase the recognition rate while simultaneously defeating the local optimal solution.

**Keywords:** *Online Interactive English, Speech Segment, Continuous Recognition, Artificial Bee Colony Algorithm*







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