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10 – 12, March 2017
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Editor-in-Chief
Dr. Rajkumar Sugumaran

Editors:

Kokula Krishna Hari Kunasekaran, Daniel James & Saikishore Elangovan

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PREFACE

The CoreConferences 2017 held on 10th – 12th March, 2017, in collaboration with Association of Scientists, Developers and Faculties (ASDF), an International body, at Crowne Plaza Changi Airport, Singapore, Asia.

CoreConferences 2017 provides a chance for Academic and Industry professionals to discuss the recent progress in the area of Multiple. The outcome of the conference will trigger for the further related research and future technological improvement. This conference highlights the novel concepts and improvements related to the research and technology.

The technical committee consists of experts in the various course subfields helped to scrutinize the technical papers in various fields, support to maintain the quality level of the proceedings of conference which consist of the information of various advancements in the field of research and development globally and would act as a primary resource of researchers to gain knowledge in their relevant fields.

The constant support and encouragement from Dr. S. Prithiv Rajan, ASDF Global President, Dr. P. Anbuoli, ASDF International President and Dr. K. Kokula Krishna Hari, ASDF International General Secretary helped a lot to conduct the conference and to publish the proceedings within a short span. I would like to express my deep appreciation and heartfelt thanks to the ASDF team members. Without them, the proceedings could not have been completed in a successful manner. I would like to express my sincere thanks to our management, student friends and colleagues for their involvement, interest, enthusiasm to bring this proceeding of the conference in a successful way.

Dr. Rajkumar Sugumaran,

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Development Based on Monitoring Data for the Area of Dense Energy Consumption

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Abstract: Accident likelihood is growing due to a correlation for gas and electricity installed in the area of dense energy consumption like traditional market and underground shopping centre. In order to prevent and respond accident risks related to gas and electricity in this area, it should be monitored and predicted for factors of gas leak or electricity by developing safety management system. In this study, the method of gas leak prediction model development was proposed in the area of dense energy consumption. Two methods of prediction model development for gas leak risks are before and after gas leak. As an analysis result of method for prediction model, the case of after gas leak was selected through reasonable interpretations. Because of no data of gas density data according to time during gas leak, gas leak simulations were carried out to obtain gas density variation data at gas detector position by using computational fluid dynamics (CFD) simulation. The method of prediction model development was established through characteristic analysis for gas density data obtained from CFD simulations. Also, application for prediction model development method was reviewed.



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A Study on Application of Artificial Neural Network to Predict Concrete Strength by Using Early Age Tests & Bayesian Theory Approach

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Abstract: An artificial neural network is a computational system, which imitates the human brain in both structure and functions. Artificial neural network has been a very popular topic in various fields of science and engineering in recent decades. One of the common applications of ANN in construction field is to predict concrete strength. The problem with any neural network is it requires a certain amount of data to be trained properly and to achieve expected results. This fact supports Bayesian theory, which suggests that additional information or background evidence refines any hypothesis to a more accurate level. In this research, at first a feed forwarded back propagation neural network is used to predict concrete strength, using early stage concrete strengths. The focus of this study is to show that how an additional input data of early stage concrete strength can help to predict a more precise final concrete strength of 28 days. Finally, this study demonstrates Artificial Neural Network also complies with the Bayesian theory, when it comes to better prediction of concrete strength. The outcome of this research could be used for improving concrete mix design and in decision making process by concrete mix designers.

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The Contemporary Understanding of Language and Meaning in Wittgenstein's Philosophy

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Abstract: Ludwig Wittgenstein (1889 – 1951) was considered one of the 20th Century's most important philosophers. He was an Austrian-British philosopher who worked primarily in logic, the philosophy of mind, and the philosophy of language. Wittgenstein's *Tractatus* is regarded as a significant philosophical work of the twentieth century which identifies the relationship between language and reality. It is an attempt to state in a general way the essence of all languages and the essence of the relation between language and reality. He is not at all concerned with the language of daily life and its connections with the empirical world. His focal attention is on the underlying essence of language which has been covered by its superficial appearances. Essence therefore, is the logical structure of language. It is evident that search for something essential and search for something ideal are not different but same. For Wittgenstein, language is a practical human activity - a form of social practice. The paper focuses to show language and meaning through language-game. Language practiced in different contexts, such as, story-telling, translating, quarrelling, advising, ordering and so on are different from one another and none is identical with mere description. Explanations of one practice of language overlooking a whole host of other uses make our approach to language grossly one sided and highly unrealistic and artificial. To consider that language has only one use seems to be a myth if we look at the various uses of language. Language performs innumerable functions which cannot be accommodated into one category of any kind.



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Optimum Mix-Design for Cementless Cold Recycling Asphalt Base Coarse Mixture using Test Field Pavement

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Abstract: In this study, the optimum mix-design was developed for cementless cold recycling asphalt base coarse mixture. And test pavement was performed to verify the mix design procedure of cementless cold recycling asphalt mixtures.

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An Analysis of Safety Disaster Networks in Construction Sites using S.N.A.

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Abstract: In this study, safety disasters that occurred on construction sites were analysed by occupation type using the data collected from 5 metropolitan cities by the Korea Occupational Safety and Health Agency (KOSHA), and the safety disaster networks of key occupation types were analysed using the centrality and clustering techniques of S.N.A. analysis. If management measures are developed based on the key causes of safety disasters of the individual occupations above, they are expected to contribute to the reduction of safety disasters that occur on construction sites.



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Numerical Analysis on the Flexural Strength of Longitudinally Stiffened Plate Girders

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Abstract: This study proposed an equation for buckling coefficient of compression flange in longitudinally stiffened plate girders. The buckling coefficients were estimated through eigenvalue analysis on the doubly-symmetric and mono-symmetric sections. The proposed buckling coefficient equation for the stiffened girders can be used to define the slenderness limit for noncombat flange under AASHTO LRFD bridge design specifications. Nonlinear analysis was conducted in order to confirm the validity of suggested buckling coefficient equation.

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A Study on Level of Service (LOS) Evaluation Method Based on Video DB : Focusing on Pedestrian Level of Service (LOS) Satisfaction Survey Method

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Abstract: Korea Railroad Service has developed greatly since 300km/h high-speed railway service began in 2004. Railway became to be used by many citizens instead of the buses and airlines that connected the existing cities and the existing railway station that took its place in downtown has performed its role as important city infrastructure as well as role as traffic facility. Korea Railway Design Guidelines specifies the Railroad Station Level of Service (LOS) as Class B. However, the changed environment of railroad station passenger facilities was not considered and appropriateness verification was not performed. In this respect, this study aims to provide the railroad station passenger facility Appropriate Level of Service (LOS) User Satisfaction Survey method through video DB. To achieve this, this study manufactures video DB depending on the degree of congestion by pedestrian state classified by LOS, analyses the reference value (personnel) that can be used to check the pedestrian state appearing in LOS directly, and check the results through simulation. Based on this, the evaluation model using video DB is presented together with the pedestrian state satisfaction survey method.



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Stochastic Line of Balance Method for Repetitive Construction Projects

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Abstract: Since existing LOB scheduling methods are deterministic methods, they are hard to handle uncertainties at repetitive projects. Meanwhile, principle of LOB method is natural rhythm that allows crews to continuously engage in each unit. This paper proposes a line of balance method with considering uncertainty and natural rhythm involved in activity durations. The proposed method allows schedulers to effectively dealing with the uncertainties of a repetitive project. A case study is demonstrated to verify and validate the capability of the proposed method in a repetitive construction project planning.

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Activity Overlapping Method for TCT Analysis

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Abstract: This paper presents a method that identifies an optimal activity overlapping strategy to meet job site specific needs by using rework cost-slope. The procedures to compute the solution are provided in pseudocode algorithm. The method has been developed to (1) consider the dynamic changes of critical path(s), (2) handle overlapping of the activities in a merge event, (3) analysis the Time–Cost trade-off using rework cost slope. The method is coded into Concurrent Construction Scheduling system that allows practitioners to make more informed decision in accordance with the site-specific condition involved in the overlapping of critical activities. Test cases verify the validity of the computational method and the usability of the system.



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Developing a Framework for Cost Benefit Analysis of Smart Cities

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Abstract: With an increasing population density and a desire to improve the well-being of citizens, smart city development is on the rise. Information and Communication Technologies form the backbone of this development for enhancing efficiency. Smart city projects emerge in fields such as transport, communication, health care, business and finance, utilities, security, environmental control, provision of government services, leisure and even disaster prevention/warning. Whilst the overall move is generally welcome, the benefits of smart city projects are often exaggerated and users are sometimes beset with significant social and external costs (e.g., cyber-attacks) not envisaged at the planning stage. Hence, a new CBA Framework is imminently necessary for decision makers for more smart cities to flourish.

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Assessment of Futuristic Development of Vizhinjam Transshipment Port using UDPFI Guidelines

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Abstract: Ports around the world have developed over the years owing to a number of growth drivers. In many cases, one of the key growth drivers seems to be the city surrounding the port. Cities provide a number of key functions that support ports. Empirical evidence suggests that availability of social infrastructure, along with manpower support is crucial functions of a port city that can influence the growth of the port substantially. So the development of port and city should go hand in hand. By the development of the Vizhinjam transshipment port, Vizhinjam, now a semi urban area will attain the status of a global city. The study focuses in the 3 Gram Panchayaths which are in close proximity to the proposed port. The existing condition is analysed and the additional requirements due to the induced development of the port are assessed. An attempt has been made here to assess the futuristic development in the core 2 km area by understanding the existing land use, demography and infrastructure available. UDPFI guidelines have been used to identify the gap in the facilities required as the port develops.



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Comparison of Fluoride Content in Water Samples of Different Sources Using Fluoride Sensing Mobile Application in Nalgonda District of Telangana State, India

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Abstract: In major parts of the world, Surface and ground water are the reliable sources for various purposes. Fluoride is often called a double-edged sword has a great impact on human health. When fluoride is present in optimal concentrations (0.5-1.0 mg/l) in water, it is beneficial for calcification of dental enamel, especially for children below eight years of age, where as in higher dosages causes dental and skeletal fluorosis. This project utilized a device called Akvo Caddisfly, which is affordable, portable, and gives instant results. The caddisfly is composed of android app, coupled with a mixing chamber. It uses the phone's camera sensor and pre-determined calibration curve to detect color changes obtained from mixing of the reagent with the contaminated sample. To determine fluoride content in water samples, Zirconium Xylenol orange reagent was used. Samples around 240 were collected from different water sources of high Fluoride prone region of Nalgonda District, Telangana State, India, tested with fluoride sensing mobile application. For cross-checking the standardization of Akvo Caddisfly device, A few resulted values are compared with the values of standardized testing method called Ion Selective Electrode Method. The results showed slight deviation in values. Thus, the Akvo Caddisfly is a highly suitable device in the real field for testing water with accuracy which enables to access with great ease, helps people to understand their standards of lives and develops potential to adopt changes.

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Auction versus Dealership Markets: Impact of Proprietary Trading with Transaction Fees

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Abstract: In this study, we consider a one-period financial market with a monopolistic dealer/broker and an infinite number of investors. While the dealer who trades on his own account (with proprietary trading) simultaneously sets both the transaction fee and the asset price, the broker who brings investors' orders to the market (with no proprietary trading) sets only the transaction fee, given that the price is determined according to the market-clearing condition among investors. We analyse the impact of proprietary trading on the asset price, transaction fee, trading volume, and the welfare of investors. Results show that proprietary trading increases both the trading volume and the transaction fee, and improves social welfare. Our study effectively demonstrates how proprietary trading affects market equilibrium and welfare of investors.



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The Choice of Exit: Influence of Private Equity Investors and Buyout Entry

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Abstract: The choice of exit method between IPO and acquisition is an inevitable decision faced by entrepreneurs and private equity investors. Hence, it is important to determine what factors influence this choice of exit method. The existing literature addresses four categories of factors which influence this choice: industry-related factors, market-timing variables, deal-specific factors and demand for funds factors. However, in the presence of private equity investors, this decision becomes more complicated. We extend the literature by introducing a new category of factors, 'private equity investor characteristics' and test if this category has a significant effect on the choice of exit method. We also test if type of entry has an influence on the exit method. We find that private equity investor characteristics play an important role in the choice of exit method. The existence of a large syndicate of private equity investors in the same firm increases the probability of an IPO exit but the presence of a foreign private equity investor reduces this probability. Moreover, unlike in the US, the cost of debt does not affect the choice of exit method in India. We further consider specific exit methods like strategic sale, financial sale and buyback and find consistent results. We find that in buyout transactions, the probability of an IPO exit is less than that of a strategic sale. Finally, we present a unique finding that the probability of a buyback as opposed to an IPO is higher if a firm is in the real estate sector.

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An Empirical Research of the Relation between the FDI Spillovers and the Regional Financial Development Structure of China

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Abstract: Based on the provincial panel data of China from 2000 to 2014, the paper applies double-threshold regression model to examine the relation between the threshold effect of the financial development structure and the foreign direct investment (FDI) spillovers on economic growth in different regions of China. It is revealed that there are two thresholds existing in the FDI spillovers process in different regions of China. The total effect of the FDI spillovers on economic growth has a same trend with the financial development structure changes. Based on the empirical results, some policies on how to develop regional finance and how to introduce FDI to promote regional economic growth of China are recommended.



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Is there any Evidence of Canine Welfare Improvements? Application of the Animal Welfare Kuznets Curve to Canines in Japan

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Abstract: The purpose of this study was to examine if there is evidence of canine welfare improvements over the past several decades in Japan. When considering owners' treatment of and attitudes toward animals kept in homes, there are two possible scenarios for canine welfare improvement: steady improvement and an inverted U-shaped improvement. To examine these two scenarios (steady improvement or inverted U-shaped change), we applied an Animal Welfare Kuznets Curve. Because we observed an inverted U-shaped relationship for most of the cases we examined, we conclude that attitudes towards animals kept in homes play an important role in changing canine welfare.

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Modelling the Psychology of Writing and Reading Online Customer Reviews

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Abstract: *There has been a hot discussion on the influence of online customer reviews, but few studies cover the psychological effects behind review writing behaviour and review reading behaviour. The aim of the authors of this paper was to identify possible information processing rules and psychological model behind the review behaviours. To realize this, a review of an extensive literature search has been performed. And based on related psychological theories, it has discovered 4 major heuristics working behind review behaviours, including anchoring effect, availability heuristic, affect heuristic and conjunction fallacy.*



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Fraud Detection in Workers' Compensation Insurance: A Random Forest Approach using Public Enterprise Data

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Abstract: *Insurance fraud detection plays an important role in protecting the profitability of insurers and the insured people. The prevailing approach to detect insurance fraud used variables created by the opinions of domain experts and applied data mining and machine learning techniques. However, prior research is subject to three limitations, summarized as a dearth of research on public insurance, financial variables, and algorithms that can estimate the extent of the fraud. Therefore, we propose a fraud detection model by providing a concept of estimating the extent of public insurance fraud with workers' compensation insurance premium. This research plans to use data obtained from several public enterprises, and by applying random forest model with multiple financial variables, the workers' compensation insurance premium will be estimated. The quantitative outcome to be provided by the proposed approach enables decision makers in public enterprises and the government to offer finer policies for the citizens.*

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Modelling the Change in Soil Carbon of Broadleaf and Coniferous Species in Response to Climate Change

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Abstract: Climate change by increasing concentrations of greenhouse gases, particularly carbon dioxide, has led to increase attention to the soil organic carbon stocks. In this study the effects of land cover change, on soil organic carbon stocks of the Darab Kola forest, north of Iran, was investigated by a simulation approach using RothC model. In addition, the effects of climate change on soil organic carbon stock was studied. The following land covers were investigated: *Cupressus sempervirens* (CS), *Quercus castaneifolia* (QC) plantations and a natural forest (NF). Future climate change scenarios were generated from the baseline climate with two GCM models (Global Climate Model): GISS-E2-H, and CNRM-CM5, for two Representative Concentration Pathways (RCP 2.6 and RCP 8.5). Simulation study indicated that soil carbon storage will decrease from 2020 to 2099 and will be affected by climate and land cover change. Also *Quercus castaneifolia* plantation was more sensitive to climate change scenarios (-1.53%–17.06%).



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A Scheduling Technique for Time Triggered Multiprocessor Systems

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Abstract: The introduction of digital control adds functionality, reduces cost and weight, and introduces scalable reliability. This facilitates applications in safety critical systems having fault tolerant capabilities. To overcome problems related to fault tolerance in hard real time systems, Time triggered architectures are used. The schedulability in these systems becomes apparent because of its multiprocessing structure. Simple scheduling architecture may not be sufficed, hence optimization techniques are adopted. Significant attributes of the problem are taken in the algorithms to better results. An adaptive dynamic genetic algorithm is proposed to allocate tasks to the different nodes in an optimized way during the execution. For solution to such a multiprocessing system, multiple travelling salesman problem features are used. The results found to be most promising for adoption and execution.

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Examining the Initial Implementation of Community-Based Flood Early Warning System (CBFEWS) In Barangay Consolation, Cagayan De Oro, Philippines after Typhoon Sendong

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Abstract: Shortly a few years after Typhoon Sendong (Washi) devastated Barangay Consolation, Cagayan de Oro in the Philippines, the Community-Based Flood Early Warning System (CBFEWS) in the community was initially implemented. This system was composed of three methods: the recorrida, text brigade, and interpersonal communication from the barangay officials as early warning approaches during impending floods. This qualitative study sought how the residents described their experience during this initial implementation vis-à-vis their experience with the flooding brought by the typhoon. Based on the themes that emerged from the narratives of the participants, there was a strong emphasis on communal coping in the neighbourhood when typhoon Sendong struck the community. This experience with the disaster has established their social relationship, which put the CBFEWS in their barangay on the outside. In addition, the residents' local knowledge of the river, after their experience with Sendong, has also played a significant part of their decision on whether to evacuate or not even after warning messages were already given by authorities. Because of these, it recommends that the barangay consider incorporating these two – collective action of the residents and their local knowledge – into the design of the CBFEWS.



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A Study on the Monitoring Criteria for Early Warning System of Reservoir (Fill Dam)-based USN (Ubiquitous Sensing Network)

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Abstract: It is difficult to provide effective measures for disaster prevention as the current monitoring system to prevent disasters taking place in national infrastructure facilities like reservoirs still remains at the level of data accumulation. In this study, the technical specifications of the specialized monitoring system for the failure modes of Korean reservoirs (fill dams) are proposed and the monitoring criteria for the early warning system of reservoirs are provided, in order to expand the application of the accumulated data of the disaster prevention system and introduce the Ubiquitous Sensing Network to the present monitoring work.

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An Experimental Study on the Cost and Capacity Effects of Contingency Routes under Adverse Weather Conditions within ASEAN Region

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Abstract: The ASEAN region is often prone to adverse weather conditions, especially in the Philippines which is frequently affected by convective weather such as thunderstorms and typhoons. Such convective hazards often result in cancellations and delays of flights. This evidently reflects reduction in airspace and airport capacity during such adverse weather conditions. In this paper, we have selected the Singapore and Manila city-pair from the list of city-pairs that frequently see cancellation or delay of flights due to convective weather in The Philippines. The corresponding ATS route between Singapore and Manila which will be affected under such conditions was also identified. Considering the factors that affect new route designs, a new contingency route was simulated to accommodate these affected flights, in such a way that this new route is efficient enough to remain unaffected during adverse weather conditions. This paper only addresses en-route flights and en-route sector capacity and does not focus on approaching and departing flights and airport or terminal capacity.



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The Green Campus Strategies of Aalto University in Finland through Abroad Field Survey

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Abstract: The purposes of this study are to report the strategies of an advanced green campus example and to list up their categories and elements as the fundamental materials for further researches and promotion of green campuses in Korea. For the research, we selected Aalto University which is one of the leading figures with sustainable approach and a founding member of Nordic Sustainable Campus Network (NSCN). We conducted a literature review and a field survey including research meeting and field trip with the energy efficiency team of Aalto University, and field investigation. The abroad research trip was fulfilled from August 17 to 26, 2016. In Aalto University, social responsibility and sustainability are the fundamental values and strategies of all activities. The most distinctive effort for green campus in Aalto is 'ECOCAMPUS 2030 project' which makes the university itself as the energy self-sufficient campus by 2030. The university will use only renewable energy produced by photovoltaic, solar heat, small scale wind power, geothermal heat & cooling, heat pump, and small scale CHP through the progress with 'reduction of potential for consumption', 'evaluating production potentials', and 'roadmap to a comprehensive regional energy solution'. Also, diversified sustainable approaches such as the campus wide master planning and the facilities renovations have been carried out for reduction of CO2 emission and promotion of healthy environment. As a result, the green campus strategies of Aalto University are operated in 12 multilateral categories: administration, networking, education, researches, energy, campus wide planning, transportation, buildings, procurement, waste & recycling, food & health, and practice & events.

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Development of a Fleet Management System for Effective Earthwork Operations

Sung-Keun Kim

Abstract: Earthwork that is a basic operation for all types of civil and architectural works affects construction time, cost, and productivity. It is executed by various construction equipment as a group and is usually performed by equipment operator's heuristic and intuition. According to recent statistics, the average rate of equipment operation has not increased in the last 10 years in South Korea, even multi-functional equipment has used in construction sites. Many experts insist that the equipment clustering that takes no account of the real-time conditions of earthworks, the poor skills of equipment operators, and the lack of real-time access to necessary information for effective earthwork can cause the low average rate of equipment operation and the high fuel consumption. To solve this problem, the fleet management system for construction equipment is suggested for operation planning, equipment allocation, equipment path control, and information exchange. The purpose of this research is to suggest core methods for developing a fleet management system for multiple construction equipment. The methods include 3D solid model generation, soil distribution planning, task package generation and scheduling, and equipment fleet operation. Nine primitive objects are suggested for the 3D solid modeling of a construction site, and the Octree parametric model with transportation algorithm is applied for generating a soil distribution plan. Task packages that are a basic work unit of matching a cutting area to filling areas are automatically generated and optimally scheduled. Equipment allocation is carried out based on real-time work process and site conditions. Real-time information on equipment moving path is provided through the GUI (Graphic User Interface) of the fleet management system. A case study is performed to verify the effectiveness of the fleet management system for the given earthwork operations by comparing existing work method with methodology suggested in this research. The result of the case study shows that the fleet management system shortens working time and increases working volume per hour, which can raise the average rate of equipment operation and reduce carbon emission by curtailing fuel consumption of equipment.



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Disaster Impact Assessment & Application of Reservoirs, Using Public Data

Seona Jung

Abstract: This study conducted disaster impact assessment (DIA) on the downstream areas of the reservoirs in Gyeonggi-do, selected among the 14,323 reservoirs nationwide that are under control of local governments. There are 229 reservoirs located in Gyeonggi-do, and a GIS was used to set the range of the downstream areas for these reservoirs. For the designated downstream areas, the public data was used to build a database on the number of households, cultivated areas, the total floor area of buildings, and the area of the infrastructures. As the characteristics and units of each data were different, the data was standardized through the z-score to comprehensively evaluate the disaster impact in the downstream areas of the reservoirs. For that, each data was given equal weight. The resulting analysis shows that 14 of the reservoirs in Gyeonggi-do are older than 60 years, and that there are a great number of households, buildings, and cultivated areas in the downstream areas. Therefore, along with maintenance and reinforcement after a precise diagnosis of the reservoirs, precautions to minimize damage to the downstream areas when a reservoir collapses are urgently required. This study is an assessment of the relative impact of disasters on downstream areas upon the collapse of a reservoir, using public data. It is expected that the results of this study may be used to establish the management policies for reservoirs and downstream areas.

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Proposal of Server Design Standards of Reservoir (Dam) Failure Forecasting System

Baeg Lee

Abstract: The loss of safety for reservoirs brought about by climate change and facility aging leads to reservoir failures, which results in the loss of lives and property damage in downstream areas. Therefore, it is necessary to provide a Reservoir (Dam) Failure Forecasting System for downstream residents to detect the early signs of failure (with sensors) in real-time and perform safety management to prevent and minimize possible damage. Web-based server design standards of the reservoir failure forecasting system are proposed in order to actively respond to the user's work changes, various sensors, and business logic, and increase the system usability by reducing logic changes and client maintenance through minimal interface changes. Comprehensive system directions of the failure forecasting system have been proposed through analysis of similar cases. The standards are highly secure in accordance with the e-Government standard framework and based on open source programs to minimize maintenance costs. The selected solutions for the server design standards are Java and JavaScript as programming language, Apache Spark as data logger, CURBRID as DB management, single table with metadata management as DB table, Jboss as WAS server, and Apache as WEB server.



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A Feature Selection Approach for the Network Intrusion Detection System Based on the Artificial Neural Network

In-Seon Jeong¹, Seung-Jae Lee², Seung-Ho Kang³

Abstract: As sophisticated cyber-attacks using innovative techniques appears, it is difficult for the traditional intrusion detection system based on the simple rules to detect the novel type of attacks such as advanced persistent threat (APT) attack. Many recent researches have been focused on the application of machine learning techniques to the intrusion detection system in order to detect previously unknown attacks. In the case of using the machine learning techniques, however, the performance of the intrusion detection system largely depends on the feature set which is used as an input to the system. Generally, more features increase the accuracy of the intrusion detection system whereas they cause a problem when fast responses are required owing to their large elapsed time. In this paper, we present a network intrusion detection system based on artificial neural network, which adopts a multi-objective genetic algorithm to select the Pareto-optimal feature set such that satisfies two trade-off relationship requirements: accuracy and fast response. The comparison between the proposing approach and other previously proposed approaches is conducted against the NSL_KDD data set for the evaluation of the performance of the proposing method.

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