Foreword and Editorial

International Journal of Software Engineering and Its Applications

We are very happy to publish this issue of an International Journal of Software Engineering and Its Applications by Science and Engineering Research Support soCiety.

This issue contains 39 articles. Achieving such a high quality of papers would have been impossible without the huge work that was undertaken by the Editorial Board members and External Reviewers. We take this opportunity to thank them for their great support and cooperation.

In the paper “IEEE 802.15.6 WBAN Beaconing for Wireless USB Protocol Adaptation”, an IEEE 802.15.6 wireless body area networks (WBAN) medium access control protocol is developed to support a wireless USB (WUSB) application as a protocol adaptation layer (PAL). Even though we can avoid colliding packets using CSMA/CA, hazard of beacon collisions still remains in the WUSB over WBAN networks. Further, in order to solve beacon conflict problem, we introduce a multi-channel beaconing (MCB) for avoidance of beacon collision. The proposed MCB can minimize the possibility of beacon collision by efficiently managing the multiple available channels in a hybrid manner combining proactive and reactive method.

Paper “Software Measurement and Software Metrics in Software Quality” discusses software measurement process must be a good oriented methodical process that measures, evaluates, adjusts, and finally improves the software development process. The main contribution of this work is the easy and extensible solution to software quality of validation and verification in software develop process. Authors use formal approaches in order to describe the fundamental aspects of the software. This formalization supports the evaluation of the metrics or measurement level themselves. They discuss several metrics in each of five types of software quality metrics: product quality, in-process quality, testing quality, maintenance quality, and customer satisfaction quality.

The paper “Specification and Automated Detection of Code Smells using OCL” states that the words Code smells mean certain code lines which makes problems in source code. It also means that code lines in bad design shape or any code made by bad coding habits. There are a few studies found in code smells detecting field. But these studies have their own weaknesses which are detecting only particular kinds of code smells and lack of expressing what the problems are. This paper defines code smells by using specification language OCL and use these models in auto detection. To construct our new code smells model, we first transform java source into XMI document format based on JavaEAST meta-model which is expanded from JavaAST meta-model. The prepared OCL will be run through OCL component based on Eclipse plug-in. Finally the effectiveness of the model will be verified by applying on primitive smell and derived smell in java source code.

In the paper “On A New High Quality Speech Coder using Non-uniform Sampling and the Rectified Harmonics”, to encode the speech quality with reduce the redundancy within samples that resulted from uniform sampling method like PCM, uniform sampling or non-
linear sampling coding methods can be considered. However, it is well known that when conventional sampling methods are applied directly to speech signal, the required amount of data is comparable to or more than that of uniform sampling method in noisy. To overcome this problem, a new non-uniform sampling methods is proposed, in which non-uniform sampling is applied to the low-pass filtered speech signal and the remaining signals are compensated by the rectified signals with various harmonics.

Paper “A Green Model for Sustainable Software Engineering” presents a discussion that Information Communication Technology (ICT) has a strong impact on sustainable development due its rising demands for energy and resources needed when building hardware and software products. Most of the efforts spent on Green ICT/IT have been dedicated to addressing the effects of hardware on the environment but little have been considering the effects of building software products as well. Efficient software will indirectly consume less energy by using up less hardware equipment to run. The contributions in this paper are devoted to building a two level green software model that covers the sustainable life cycle of a software product and the software tools promoting green and environmentally sustainable software. In the first level, a new green software engineering process is proposed that is a hybrid process between sequential, iterative, and agile development processes to produce an environmentally sustainable one. Each stage of the software process is then further studied to produce a green and sustainable stage. Either green guidelines or green processes are proposed for each software stage in the engineering process. Authors add to the software life cycle the requirements stage and the testing stage. They also include in the first level a complete list of metrics to measure the greenness of each stage in terms of the first order effects of ICT on the environment for a green software engineering process. No effort has been placed before in designing a green software engineering process. The second level explains how software itself can be used as a tool to aid in green computing by monitoring resources in an energy efficient manner.

In the paper “Semi-automated Classification Scheme-based Massive Science and Technology Data Management”, in the field of science and technology, a lot of research has recently been done for collecting and analyzing information, for example, examination of global research trend, detection of emerging signals and searching for leading researchers from science and technology literature. Since the science and technology literature information collected for the analysis has been produced for the purpose of each information source, the information is differently constructed and expressed. Therefore, it is necessary to integrate and manage the different information with the same structure and expression format. To this end in this study, examination is made of methods of standardizing the data processing process and data format, and of implementing interoperability of data in different format. Examination is also made of a method of semi-automation through machine learning for even more automated data management. It is expected this study will contribute to improving integration of heterogeneous databases and efficient and easy management of contents in different fields and domains.

The paper “Implementation and Performance Evaluation of the WS-DAIR Interface for AMGA” discusses about the WS-DAIR which is the OGF proposed recommendation for access to relational database on the Grid. AMGA is one of first two reference implementations with which interoperability was tested for WS-DAIR standard ratification, in addition to OGSA-DAI. This paper present a reference implementation model of the WS-DAIR interface for AMGA, and show some results of performance studies on the WS-DAIR.
interface with real Grid applications; WISDOM and Belle II. It provides very simplified WS-DAIR implementation model on data services and data resources, and supports most features of the existing AMGA implementation including replication, Grid accessibility, fine-grained access control, hierarchical directory structure and heterogeneous backend database support. The performance study showed that the WS-DAIR access patterns and the message formats affect performance of the WS-DAIR service significantly. One issue found from the test results was that all the access patterns defined in the WS-DAIR specification may be inadequate to transfer large sized data in some applications.

The paper “Verification of Requirements Extraction and Prioritization Based on Goal Oriented Use Case Approach by using Use Case Points” states that to collect and analyze the requirements to make the products that customers want is an important starting point in the requirements engineering stage. In the requirement engineering is focus on building a qualitative system through identification and extraction of value requirements. A lot of researches for complete requirements, but they are difficult to determine correct extraction requirements. A purpose of this paper is that a goal approach is graft on to use case approach to reach a target system through goal-oriented requirements. For this, Authors suggest that the extraction and prioritization of requirements for fitting on the goal approach, and then to make a change an existing value based approach to show the prioritization of requirements based on goal-oriented requirements. It helps to make a target product customers want from extracting a highly importance of use cases and requirements. Beside it gets a benefit of the prioritization of test cases by prioritization of all requirements, and it is possible to measure coverage of test cases quantitatively.

The Authors of “From AADL to Timed Automaton - A Verification Approach” states that the AADL is considered as one of the most powerful language for modeling the embedded systems. In this work, we propose an approach for the verification of the AADL architecture by using of the timed automata formalism. Indeed, the AADL architecture cannot be directly analyzed by model checking. An alternative for achieving that is to use the model driven engineering technology to extract an analysis model so that the properties can be verified using a model checker toolbox. The goal of this effort is to insure some properties of the AADL models using the Uppaal model checker.

In the paper “Cloud-based Home Media System Model: Providing a Novel Media Streaming Service using UPnP Technology in a Home Environment”, home media services are gaining in popularity with the ever-increasing availability of a wide variety of personal media devices. A number of media devices support UPnP technology for providing media services in a home network. UPnP technology is used to share media content among multiple media devices connected to a single network. However, UPnP-based home media services have a few problems. First, personal media devices should have sufficient storage space to keep a large amount of media content data. Additionally, the devices must have sufficient computing power to properly provide media streaming services. Moreover, for media streaming services using UPnP, the users have to utilize their devices with great care, remembering the name, available services, and functions of each device. To resolve these problems, this paper proposes a system model designed to store and manage media content in a cloud-based media server, namely, a cloud server. To ensure an easy-to-use media service, this paper also proposes a UPnP-based service model to provide media streaming services by extracting the most appropriate media renderer for playing the media content. The proposed
system can provide the user with improved home media services in conjunction with cloud computing and UPnP technologies.

The paper “Deriving Multi-Agent System Behavior” presents a MDA approach to develop multi-agent system with the derivation of the behavior of a given system agent from its global requirements. The suggested approach is based on the definition of an appropriate requirements meta-model (Computational Independent Meta-Model CIMM) and the definition of a target design meta-model (Platform Independent Meta-model PIMM). The CIM models are specified using UML activity diagram extended with collaborations to describe the system global behavior. The agent’s behavior model (PIM) is in the form of distributed UML state machines. Automatic model transformations between these two models have been designed in order to govern the derivation process. A real application of telediagnosis in neuroscience has been developed using this approach.

Paper “Smart Museum Based on Regional Unified App” states that in a society undergoing rapid changes, future museums will contribute to human culture by means of smart-museum technology that promotes active interaction with the public. Several museums in New York have already begun distributing free mobile applications for this purpose. Likewise, the National Palace Museum of Korea has developed an application to provide visitors with helpful information related to its exhibitions. Apps developed so far, however, are concentrated in exhibition information, experimental programs, or the collection information of an individual museum. If the Jongno museum unified app, which could be universally used in Jongno district where museums are concentrated develops and contains information about different museums, it would reduce the cost and provide useful information to visitors. Based on location information and the regional route, this app would be comprised of information concerning admission, opening hours, exhibitions, collections, trial and educational programs. Information about the routes connecting museums would also be provided. The Jongno museum unified app would contribute to the possibility of a new form of smart museums where local museums are linked together.

In the paper “Successive Optimization of Interval Type-2 Fuzzy C-Means Clustering Algorithm-based Fuzzy Inference Systems”, a design methodology of interval type-2 fuzzy c-means clustering algorithm-based fuzzy inference systems (IT2FCMFIS) is introduced. An interval type-2 fuzzy c-means (IT2FCM) clustering algorithm is developed to generate the fuzzy rules in the form of the scatter partition of input space. And the individual partitioned spaces describe the fuzzy rules equal to the number of clusters. The consequence part of the rule is represented by polynomial functions with interval set. To optimally construct of fuzzy model, real-coded genetic algorithms with successive optimization are exploited.

The paper “Advanced Tagging and Semantic-Annotation Methods for the Semantic-based OpenAPI Retrieval System” developed the OpenAPI retrieval system applying semantic web technologies as the typical information retrieval method had. The semantic web technologies applied in the system are tagging and semantic-annotation. However, these methods are difficult for the non-technical general users to use and the probability of failure is high. To solve these problems we suggest improved methods for the tagging and semantic-annotation. Tagging turn human-readable service description to machine-readable one by adding tags into the page. Through the use of XHTML and DTD modification, auto-completion and auto-view are enabled. Semantic-annotation means to input related semantic information into parameters in the service description. The java-based tool providing methods of target parameters
selection and the ontology viewer is developed for annotating easily. Tagging and semantic-annotation are applied and tested through the test-bed system. These improvements enabled non-technical general users to applying semantic information to the OpenAPI retrieval system.

The Authors of “Automatic Selection of Functional Indexes for Object Relational Mapping System” presents a discussion that functional indexes are an important tool for database tuning, often not appreciated by programmers and system administrators. In practice, a programmer can only advise the deployment team such such indexes. Only a few very expensive systems have tools for the analysis of performance and automatic creation of functional indexes. The authors decided to provide the ability to define `functional indexes at the stage of application development by supplying the appropriate API in object-relational mapping level, and implemented it as an extension for Hibernate. The interfaces proposed by the authors were developed with the functional indexes generator for selected DBMS: PostgreSQL, Oracle and IBM DB2. In addition, to facilitate the work of programmers, HQL query analysis algorithms detecting the usefulness of functional indexes in queries have been developed.

Paper “Vendor or Client: What are the Important Factors for SDO Project Success?” presents SDO (Software Development Outsourcing) projects that have been consistently increasing and expanding but also have many failures. In order to improve SDO performance, the factors affecting SDO performance are investigated in this study. SDO has relational risk as well as performance risk in nature, and the factors affecting the SDO performance caused by these mixed risks are drawn from the prior studies. With field survey targeted client IS personnel who experienced SDO, 214 survey questionnaires are collected and analyzed.

In the paper “Implementation of Port Logistics Information System using e-Government Standard Framework”, Country according to the rapid development of IT technology with the introduction of e-government information systems are managed efficiently. However, using the framework of different specifications of e-government system has been developed. The development of these methods, such as redundancy and interoperability problems occurred. This paper utilized e-government standard framework for the port logistics information systems proposes to design and implement. Based on a standard framework by implementing information systems to reduce human and material resources, and ease of writing source code, avoid duplication, reuse, and interoperability is guaranteed.

The paper “Power System Topology Modification for Fault Current Reduction Using a Tabu Search Algorithm” discusses the topology optimization of power systems for reduction of fault current level. The countermeasures of interest are bus splitting and line opening which modify power network topology. When the selected measures are applied, the magnitudes of Thévenin impedances at the critical locations would be increased and hence the fault current levels might get lower to the acceptable level. In this paper, a Tabu search on the solution space with binary variables was adopted as the solution technique to find adequate topology changing schemes to satisfying the fault level security criteria.

The paper “Regression Testing of Object-Oriented Software: Towards a Hybrid Technique” proposed a hybrid regression testing technique and associated tool for object-oriented software. The technique combines, in fact, the analysis of UML models to a simple static analysis of the source code of the modified program. The basic models we use are use cases model and corresponding UML statechart and collaboration diagrams. The goal of the
static analysis of the source code is to identify changes that are not visible in design models. The developed tool identifies the modified (and/or impacted by modifications) use cases and selects the appropriate test cases from an existing test suite. New (JUnit) test cases, covering new scenarios or those whose structure has been modified after changes, are generated when necessary. In this way, the technique supports an incremental update of the test suite. The selected JUnit test cases, including the new ones, are automatically executed. A case study is reported to provide evidence of the feasibility of the approach and its benefits in terms of reduction of regression testing effort.

The Authors of “Nonlinear Modeling Using Fuzzy Neural Networks Based on Scatter Space” introduces a design of fuzzy neural networks based on scatter space for nonlinear modeling. To design the networks, they partition the input space in the scatter form using fuzzy c-means (FCM) clustering algorithm which generates the fuzzy rules in the premise part of the proposed networks. The partitioned spaces express the fuzzy rules of the networks. Through this method, they are able to handle the high dimension problem. The consequence part of the rule is represented by polynomial functions whose coefficients are learned by standard back-propagation algorithm. The proposed networks are evaluated with the nonlinear process. Finally, this paper shows that the proposed networks can be utilized for high-dimension nonlinear process.

The paper “Necessity of the Introduction of Panel Survey and Its Problem: Focused on Leisure Studies” states that introduction of panel survey into the leisure studies can meet the causal relationship over time, which previous studies have suggested its limit. Also, it enables to understand and analyze the changing patterns and trends of leisure activity in the rapidly changing Korean society. This study aims to examine the meaning and characteristics of panel survey in the leisure study, its application method, and future problems.

In the paper “Lessons for Software Modeling from “Architecture 101” Movie”, in software modeling, it is difficult to properly arrange the modeling of system structure and behavior as the traversal between software models usually lacks a clear progression path. Taking an interdisciplinary approach, this paper tackles the problem by borrowing ideas from a successful movie “Architecture 101”. The commonalities between the movie and modeling are studied. The result is a proposal for multi-modeling construction. The benefits include more explicit guidance in software development. And the progression from model to code is made more productive.

The paper “An Improvement Technique for Simulated Annealing and Its Application to Nurse Scheduling Problem” states that the simulated annealing was perceived as a useful method for many intractable problems. However, it needs additional strategies to cope with time complexity due to an initial state and search space reduction. This work suggested an efficient transition rule and applied it to a nurse scheduling problem. It uses a cost matrix to reduce a set of candidates, which results in performance improvement.

Paper “Study on Cellular Iterative Location Algorithm with Uniform Noise” presents a discussion that in order to realize location in cellular networks, the location model with uniform noise based on AOA is established when seven base stations are available. Then a maximum likelihood estimation (MLE) method is proposed and realized by an iterative algorithm under this model. Finally, the simulation result of the iterative algorithm as
compared to least squares estimation (LSE) algorithm under this AOA model is shown that the iterative algorithm is less error and more robust to noise disturbance than LSE algorithm.

The paper “Fast and Low cost GF($2^8$) Multiplier design based on Double Subfield Transformation” describe the design method of the efficient GF($2^8$) multiplier using double subfield transformation. First, the GF($2^8$) field elements to the GF($2^4$) field elements are transformed. And then, again transform the GF($2^4$) field to the GF($2^2$) field. This double transform generates the very fast and cost effective GF($2^8$) multiplier. The Multiplier can be used for the Reed Solomon Error correction and Encryption/Decryption on the digital communication channel.

The paper “Implementation of a Prototype Personal Live Broadcasting System” introduces the implementation of a personal real-time live broadcast system. This system is comprised of three main components: the caster program, data manipulation program, and management program. The caster program is a client program running on the end user's personal computer equipped with a webcam. This program provides a convenient environment (cue sheet, prompts, reference image, buttons to control broadcasting) in which the user can create his video contents easily. The data manipulation program receives user's webcam video stream, combines the stream with the reference image and texts, then outputs HDMI, SID or RTSP as the manager directs. The management program manages broadcasting schedules, cue sheets, and users. User registration, user information modification, and deletion of a user are handled by the management program. A producer creates a broadcasting schedule (cue sheets) with the management program. One of the distinguished features of our personal real-time live broadcast system is its less than 1 second delay time.

Paper “An Approach for Measuring Quality of Web Service” presents Quality of Web Service (QoWS) measure which is crucial for selecting web services to take part in seamless and dynamic integration of business applications on the web. However, since QoWS are often influenced by several factors, traditional approaches are not very efficient and effective in measuring QoWS. The authors introduce in this study a novel QoWS measure approach to efficiently measure QoWS for web service recommendation and selection. The core of this approach is to take the five factors, that is, price, latency, accessibility, accuracy, and reputation into QoWS measure.

In the paper “Extracting Key Technology Using Advanced Fuzzy Clustering”, most companies that have developed their own technology have registered and patented the results. As a result, patent and technology management (PTM) has become important to companies needing to improve their market competitiveness. Using the PTM process, a company can develop a new product that is competitive in their market. First, the key technology (KT) a company uses to develop new technology needs to be known. This paper proposed a method of extracting the KT for new product development and effective PTM. The proposed method uses advanced fuzzy clustering, which groups patents into clusters according to their technological difference.

The paper “Development of Database System for Clinical Management of Patients with Coronary Artery Disease” deals with the development of database system for clinical management in patients with coronary artery disease. The pairwise t-test was done to compare the before and after intervention effect for the health promotion practice of cardiac patients by the information application. The present research showed that practice rate of health
promotion using database system in an effort to reduce inefficiency and improve reliability of information. By the adoption of this database system, the medical information can be effectively connected with other database system.

The paper “A Rough Computing based Performance Evaluation Approach for Educational Institutions” deals with performance evaluation of various organizations especially educational institutions is a very important area of research and needs to be cultivated more. This paper proposes a performance evaluation for educational institutions using rough set on fuzzy approximation spaces with ordering rules and information entropy. In order to measure the performance of educational institutions, an evaluation index system is constructed. Rough set on fuzzy approximation spaces with ordering is applied to explore the evaluation index data of each level. Furthermore, the concept of information entropy is used to determine the weighting coefficients of evaluation indexes.

The Authors of “Systems Features Analysis (SFA) and Analytic Hierarchy Process (AHP) in Systems Design and Development” tries to address the problem of deriving the different features of a system and then having a way of making informed decisions about them based on their level of importance to the whole system as well as to each other depending on several given factors. The use of Systems Features Analysis (SFA) to derive the features and Applied Hierarchy Process (AHP) to decide on their importance fits the given situation and they are described in this paper. These tools are successfully applied to two system development cases, a whole system and some components of a system respectively, which showed their effectiveness and usefulness. An AHP-based software called SuperDecisions is utilized to immediately use AHP in the software design and development process in the shortest possible time.

In the paper “An Extended UML Metamodel for Efficient Application Design and Development”, Information Systems are becoming more complex as time passes and this complexity needs to be managed. Moreover, the complete matching between applications requisites and delivered software systems is one of the most important elements in software development, since cost effectiveness, efficiency and customer satisfaction are the key of success. In order to achieve these goals, many designers and analysts are applying Model-driven Engineering and UML modelling to their projects, which is gaining an important relevance in the Information Technology environment. This article proposes an extension to the standard UML metamodel with the scope to improve the development process and to grant a high quality of the software delivered to the customers. The metamodel extension contains a collection of elements, with a proper semantic and a set of rules to link them in order to create robust and expressive models, which can be transformed almost seamlessly into code with the help of a Java framework developed in conjunction with the custom UML profile.

The paper “Towards a Next Generation Distributed Middleware System for Many-Task Computing” investigate concepts and technologies of MTC and propose guidelines for building an efficient and effective middleware system to fully support MTC applications. Throughout our short survey about challenges, systems and applications of MTC, Authors argue that a next generation distributed middleware system must effectively leverage distributed file systems, parallel processing frameworks, decentralized data/compute management systems, and dynamic load balancing techniques to solve the most challenging and complex scientific problems.
Paper “Concretization of the Structural and Behavioral Models based on model Transformation Paradigm for Heterogeneous Mobile Software” states that most model transformation approaches expressed to transform the static model structures of a system, but not involved with the behavioral model. The previous model transformation also focused on the structural model, especially class diagram, which was restricted to generate a detailed code. To solve this problem, a model transformation is proposed with both structural and behavioral models, that is, a message sequence diagram with a class diagram for developing heterogeneous software. This approach makes it possible to generate detailed codes through the static & behavioral expression of a system.

In the paper “Semi-Parametric Approach for Software Reliability Evaluation Using Mixed Gamma Distributions”, Authors proposes a semi-parametric software reliability model (SRM) based on a mixed gamma distribution, so-called the mixed gamma SRM. In addition, they develop the parameter estimation method for the mixed gamma SRM. Concretely, the estimation method is based on the Bayesian estimation and the parameter estimation algorithm is described by MCMC (Markov chain Monte Carlo) method with grouped data.

The paper “Benefits and Challenges of Social Networks in Kazakhstan” states that ever since their introduction, social networks have attracted millions of users and play very significant and important role in world’s communication system. Social networks are now becoming a useful to develop business, social and educational spheres in the country, but also can have their own limitations and problems. The primary goal of this research is to reveal attitudes of Kazakhstan social network users to worldwide and domestic resources, their preferences, and to investigate the question of further domestic networks development. Current position of domestic Kazakhstan social networks is weak and requires improvements. Further integration and development can bring benefits to businesses, educational sphere and to the whole society. Benefits of strong social network extend to the level of individual person, giving new opportunities and options. This study is expected to make contributions for Kazakhstan based social network services (SNS) to explore potential opportunity to extend their services and enrich policies and practices in implementing theirs businesses.

The Authors of “Redundant Data Removal Technique for Efficient Big Data Search Processing” presents a discussion that the ranch industry has grown bigger. In Australia, ranches have very large number of livestock commodities: cattle, lambs, and muttons. To manage such a very large scale commodities, they need to install sensor network with MapReduce of Hadoop; since the sensor network generates a huge amount of data. The ranch is divided into several patterned regions and a lot of hubs are installed in there for retrieving the sensor data. However, when the sensor moves to an overlapped area among some hubs, the sensor data are transmitted to all hubs covering the area. Obviously, these data is redundant. Therefore, removal technique is proposed to delete the redundant data and to efficiently process the data on the map phase. In order to detect redundancy, the data will be compared using some parameters, and then the detected redundant data will be deleted according to some rules.

Paper “Design of Fuzzy Respective Space-Based Neuro-Fuzzy Networks for Pattern Recognition” introduce the design of fuzzy respective space-based neuro-fuzzy networks for pattern recognition. The proposed networks are realized by partitioning of the fuzzy respective input space to generate the fuzzy rules. The respectively partitioned spaces using
fuzzy respective input space express the rules of the networks. The consequence part of the rules is represented by polynomial functions. The coefficients of consequence part of the rules are learned by the back-propagation algorithm.

In the paper “Assignment of Starting Offsets for Periodic Activities with Occupation Time Unit 1 and a Restricted Sufficient Condition for Some Practical Cases”, Author handles a problem to assign the starting offsets of a collision-free schedule in a certain form called a well-formed gcd notation. Each activity in an activity set recurs with its own period. If more than one activity occurs at the same time slot, it is a collision. If a schedule can be constructed as a well-formed gcd notation, the schedule is known to be collision-free. This paper introduces a well-formed gcd notation and presents an algorithm to assign the starting offsets of a collision-free schedule. It also proposes a restricted form of a sufficient condition for detecting a collision-free periodic schedule, which can be decided in a tractable time constraint.

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Haeng-kon Kim, Catholic University of Daegu, Daegu, Korea
Jinan Fiaidhi, Lakehead University, Canada

Editors of the July Issue on
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