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.

The paper “Spatio-Temporal Lite DBMS for u-GIS” deals with the spatio-temporal lite DBMS that provides spatio-temporal data types and spatio-temporal operators by extending spatial data types and spatial operators specified in OpenGIS “Simple Features Specification for SQL,” provides an arithmetic operation coding compression method reflecting the characteristics of spatio-temporal data, and supports spatio-temporal index for efficient spatio-temporal data search in flash memory, which is a mobile storage device.

Paper “Factors of Characterisation and Urban Content” discusses a character that is regarded as an essential element for storytelling, revealing the concept of a content piece. The character is freely created through an author’s imagination, but methodology is required to make it a concrete figure. This paper explores the elements that make characterisation possible and find ways to represent characters. It further investigates whether the methodology can be applied to digital content, which occupies an important position in the urban computing arena. The ‘DuGong’ character in the 2012 Expo in Yeosu, Korea, serves as a good example.

The paper “An Efficient Multi-agent System for E-health Functionalities” states that in recent years Agent technology has had a significant growth in all fields, especially in the field of E-health. Agent-oriented software engineering based on agent-oriented methodology is a novel phenomenon in the field of software engineering, which nowadays, is used in the production of distributed systems. Using New communication technologies, distributed systems and intelligent Agents are also considered as a novel phenomenon in medicine. This paper aims to analyze the Agent-oriented Software engineering, Agent Oriented Programming, Multi Agent System as well as providing agent-based system for the hospital by the utilization of agent characteristics.

In the paper “A Power-Efficient Mechanism of IEEE 802.15.6 WBAN for Wireless USB Support”, 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). Further, Authors propose a Power Efficient Mechanism (PEM) technique based on the WUSB over WBAN protocol. The proposed time synchronization technique reduces power consumption. It is executed using the WUSB over WBAN protocol at each sensor node.
Paper “A Novel Container ISO-Code Recognition Method using Texture Clustering with a Spatial Structure Window” presents a novel container ISO-code recognition method which uses vertical edge information, a spatial structure window, and texture clustering. The vertical edge information is extracted using a top-hat transform. The candidate region and type of ISO-Code is obtained using a Spatial Structure Window (SSW) which wraps around the vertical edges. The ISO-Code is extracted using texture clustering by the K-Means algorithm which is then recognized by a Back-propagation Neural Network (BP).

In the paper “Concurrent Data Mining and Genetic Computing Implemented with Erlang Language”, Authors deals with the discovery process of data mining concerns an automatic extraction of interesting patterns and correlations from a large database. These patterns can reveal implicit relationships among set of objects that lead to the generation of actionable rules to be used for financial forecast, medical diagnosis, and many other useful applications. Current studies in data mining and genetic computing concentrate on how to effectively find all objects frequently co-occurring or correlated. For a massive database, parallel method is a solution for the scalability problem. This paper presents the design of parallel methods to the genetic algorithms, clustering, and association mining tasks. The implementation of the proposed method is based on the concurrent functional programming paradigm using the Erlang language that handles parallelism via a message passing mechanism.

The paper “An Improved Location Estimation Method for Wifi Fingerprint-based Indoor Localization” discusses about the accurate indoor localization which is a challenging task due to the absence of GPS. Among numerous proposals, Wifi fingerprint-based localization is one of the most promising approach, since most buildings are nowadays equipped with Wifi access points for wireless network coverage. Due to the nature of Wifi access points in which any user can deploy and manage their own, fingerprints from some access points lead to estimation errors. Location estimation algorithms should consider these factors and be able to locate users with low error distance. Finding the nearest neighbor using Euclidean distance in signal space is most widely used method in estimating location. However, this paper shows that Euclidean distance is prone to error when unstable access points are present. Also, Euclidean distance does not differentiate strong signals and weak signals, which can also mislead location estimation. A different way to determine the nearest neighbor is proposed, which penalizes signals from unstable access points, and signifies strong signals compared to weak signals.

The paper “Development of Educational Contents in Multicultural Education for Marriage Immigrant Women – Focused on Educational Capital –” aims to develop educational contents for marriage immigrants by analyzing the programs of the multicultural family support centers and developing the curricular appropriate for them. A number of the programs intend to intensify social welfare for the marriage immigrants by promoting Korean proficiency. Therefore, it is essential to establish a comprehensive educational system for marriage immigrants, who are more likely to face complex circumstances in a variety of fields such as child-caring and job hunting. In this context, this study suggests that the measures for expanding education capital should help marriage immigrants sustain their cultural identity and heighten self-esteem.

The Authors of “Dynamic Congestion Control Algorithm for Vehicular Ad-hoc Networks” states that Vehicular Ad Hoc Network (VANET) has received increased attention from scholars and industries in recent years. Meanwhile, Congestion control remains the major
concern for VANET application due to its characteristics such as bandwidth limitation, fast change of topology and lack of central coordination. Researchers have proposed a number of solutions to overcome these challenges and also to reduce congestion in VANET environment. These solutions are based on packet generation rate, transmit power control, utility function, carrier sense threshold or a combination of them. In this paper, the existing congestion control approaches is classified into three main classes, namely, proactive, reactive and hybrid. Besides, we propose and implement an algorithm by which carrier sense (CS) threshold or MaxBeaconingLoad (MBL) value can be assigned dynamically for fine-tuning the Distributed Fair transmits Power Adjustment for VANETs (D-FPAV) congestion control approach.

In the paper “A New Distributed Caching Technique for Accelerating the Web Query Processing”, because of the fast growing volume of web documents during the past decades, the efficiency of the web search engine has become more crucial than ever. Such efficiency can be estimated with both factors of the query relevance of search results answered and the financial cost for query processing. Between them, the ways for improving query relevance of web searches have been intensively studied in the research topics like hyperlink-based ranking, topic-sensitive document classifications, and semantic-awareness in rank evaluations. However, there have been not studies that provide an efficient solution to cut the financial cost of query processing, while retaining high query relevance. In this light, Authors propose a distributed cache scheme and a server-clustering technique that can be used to reduce the query processing cost.

The paper “A Meta-Model Transformation between DDS and DBMS Representation of Data for DDS-DB Integration” provides an integral solution for data distribution and database management in the real-time applications space. This paper outlines a mapping between DDS and DBMS meta-model and DDS-DB integration mechanism for supporting data persistence. The prototypes of mapping tools have been implemented.

Paper “Design of Augmented Object Compositing System based on Diminished Reality” states that recently that the contents get various due to spread of prosumer and contents can be shared with others due to appearance of SNS, the private internet broadcasting services become activated gradually. For this reason, they were used to the editorial broadcasting base virtual studio system to support more high quality broadcasting than traditional methods like real-time personal broadcasting using PC and web-cam. However that such services provide various broadcasting environments only through background image and cannot provide the suitable contents for the broadcasting, it decreases the immersion of the users and cannot present the reality of broadcasting service. Therefore this paper suggests and designs the structure of improved augmented objects composition system using real-time object removal technique.

In the paper “Critical evaluation of two UML profiles for Distributed Embedded Real-Time Systems Design”, the successful implementation of Service-Oriented Computing (SOC) for the development of Distributed Embedded Real-time Systems (DERTS) in the recent years has proved the importance of service-orientation over previous paradigms. However, efforts are still needed on systematic service-oriented design of DERTS, especially on the modeling of DERTS. Several UML profiles are proposed for modeling of embedded real-time system and SOC separately. However, a holistic modeling solution, covering both the domains, is still missing. Therefore, a thorough investigation of existing UML profiles is necessary before proposing the holistic modeling solution. In this regard, this paper
investigates two UML profiles: MARTE and SoaML profiles from the view of service-oriented development of DERTS. The paper highlights the portions of the two profiles that can be adopted and provides some suggestions that can be used for service-oriented modeling of DERTS.

The paper “Exemplar Based Image Inpainting on a Projection Framework” presents an exemplar based inpainting method on a projection framework. A kernel based projection is adopted to detect dominant gradient in the neighbor regions of the restoration target. The priority function which determines the patching order is redefined based on the projection framework. In addition, considering the observation that similar patches are usually found near the reference points, a distance based weighting is added to the similarity metric between two patches. It reduces the artifact effects caused by exhaustive patch searching. It improves the plausibility of the restoration especially when global structures are involved in the target region. The experimental results show that the proposed method enhances the plausibility of restored regions, especially when global structures are overlaid on the target region.

The Authors of “Performance Improvement for Web based Simulation Service on EDISON_CFD” presents a discussion that e-AIRS (e-Science Aerospace Integrated Research System), the trial service of EDISON_CFD, is employed to support CFD lectures 2011. In this paper, to support stable system, e-AIRS performance improvement such as resource reorganization, job assignment control, stable simulation list loading, and waiting time are presented. To show the improvement effect, before and after of e-AIRS performance are described and users’ feedback between 1st and 2nd semester 2011.

Paper “Secure Business Transaction Models for Trading Game Contents Based on ebXML Applying Web Service Security Standards” presents ebXML (Electronic Business using eXtensible Markup Language) as an e-business standard developed by UN/CEFACT and OASIS, which enables enterprises to exchange business messages, conduct trading relationships, communicate data in common terms and define and register business processes using Web services. Web service security technologies emerging recently have extensibility and flexibility suitable for security implementation such as encryption, digital signature, access control and authentication. This paper proposes ebXML business transaction models for trading game contents that allow trading partners to securely exchange business transactions by employing Web service security standard technologies.

In the paper “Optimized Software Test Management Using Risk Based Approach”, Test Management is the process of managing the software test life cycle (STLC) of the application under test (AUT). It starts with test planning activity and ends with test results reporting. The objectives of test management are to manage requirements dynamically, effectively utilize the 'testing cycle' time and efficient use of testers in terms of their productivity. Test management tool known as 'Quality Center (QC)’ is widely used for managing the STLC of the project. Test case prioritization techniques schedule test cases for execution in an order that attempts to maximize some objective function. A variety of objective functions are applicable; one such function involves rate of fault detection — a measure of how quickly faults are detected within the testing process. An improved rate of fault detection during regression testing can provide faster feedback on a system under regression test and let debuggers begin their work earlier than might otherwise be possible. This paper has presented a method of choosing risk-based test cases. The risk analysis is based on a practical risk model, and is similar to that used by some organizations.
The paper “A Scalable Integration Testing Approach considering Independent Usage Pattern of Global Variables” discusses about embedded systems that are used to design and control variety of complex system. Now-a-days embedded system has been used in every aspect of our daily life such as automobiles, home appliances, cell phones, security system etc. It is also being used in highly safety critical system like aerospace, medical devices, military equipment etc. Usually in embedded system there are different modules which have a real time interaction between each other. The best and easiest way to make this relationship is by global variables. But in embedded software global variables potentially causes many issues such as lack of access control, implicit coupling and dependencies with different module of the source code. Large number of integration module and its associated global variables introduce the problem of scalability. This paper propose an automated test case generation approach to solve dependency problem considering the definition-use of global variable and generate scalable test cases according to feasible test sequences.

The paper “Patent Analysis Using Bayesian Network Models” presents a discussion on technology management is important to both companies and nations. Recently, economic competitiveness for both depends on technological prowess. Patents are a representative index of technological competitiveness because a patent document has diverse and detailed information about developed technologies. Hence, patent analysis is an efficient tool for technology management activities such as R&D planning and technology marketing. This paper proposed a patent analysis method using Bayesian network models. A Bayesian network is a graphical model representing the relationships between variables. International Patent Classification codes are used as the variables of a Bayesian network model to obtain the technological associations between codes.

The Authors of “An Algorithm and a Tool for Comparing Ontology Versions” developed and implemented COMP algorithm. An algorithm that provides an approach to compare ontologies versions. COMP performs all tasks automatically and the intervention of the user is not required. The objective is to underline the interest of having a tool for the analysis of the differences between versions of ontology of the same domain. They presented a tool named CVO based on COMP algorithm that helps handling and comparing ontologies in OWL. The domain of study relates to the medical field of the breast cancer disease.

The paper “Hybrid Model Based Testing for Mobile Applications” discusses the characteristics of automotive model-based development processes, the consequences for test development and the need to reconsider testing procedures in practice. It introduces the test tool HMBT (Hybrid Model Based Testing) which masters the complexity of model-based testing in the automotive domain. To illustrate this statement a small mobile applications case study is presented. HMBT is based on graphical test models that are not only easy to understand but also powerful enough to express very complex, fully automated closed loop tests in real-time.

In the paper “Interference Aware MAC scheduling for Collision Avoidance using Energy Detection Scan”, advances in MEMS (Micro Electro Mechanical Systems), microprocessors, and wireless technologies, have accelerated deployment of network-capable computing devices attached to various objects over the world. These devices should be small in size and have a characteristic of extremely low power consumption. Therefore, in 2004, IEEE 802.15.4 has been established as a global standard for LR-WPANs. After that, the phenomenal popularity of this standard has also led to indiscreet deployment of other WPANs.
Therefore, LR-WPANs can suffer from collision by other WPAN devices. In order to solve collision problem in IEEE 802.15.4, this paper introduce a novel channel scheduling scheme which is an adaptive method with fast recovery. The proposed scheme can minimize the possibility of beacon collisions by efficiently managing the multiple available channels in a hybrid manner combining proactive and reactive methods.

The paper “Results of Coding Rules Testing of Train Control System Software” states that recently, the railway system is advancing to be intelligent according to the development of computer technology, and especially, many functions of train control system which are cores to the railway system are being operated by the software. Accordingly, the source code testing to validate safety of the railway train control system software becomes to be more important, and related international standards highly recommend (HR: Highly Recommended) inspections on the source code also. For this purpose, studies in relation to the development of source code validation tool were started from several years ago in Korea.

Paper “Development of BYOD Strategy Learning System with Smart Learning Supporting” deals with the proliferation of mobile devices such as laptops, tables and smartphone, the BYOD trend is increasingly spreading in schools learning, transforming the way students learn and how, where and when they consume educational information. This study is to develop system that supported smart learning interaction and evaluation learning using advantage of BYOD devices. The developed system can be managed learners and classes in the server. Using the App for tablet PC or SmartPhone, the learning evaluation, real-time interaction and feedback is possible. The schools adopting a BYOD strategy are numerous benefits for schools and for students, the generation of students being exposed to mobile devices basically from birth, will be reborn as a system to support learning.

The paper “The Study of AMGA RAP-based Web Application” presents a discussion regarding the ARDA Metadata Catalog Grid Application (AMGA) web application that has been widely used; however, it has drawbacks such as easy-to-use interface, no direct building of the Virtual Organization Membership Service (VOMS) proxy and no maintenance after AMGA server version 1.3. In response, Authors adapted a new development procedure and toolkit from Graphic User Interface (GUI) client, a Client/Server (C/S) program, to a web application to manage the both Eclipse Rich Client Platform (RCP) and Rich Ajax Platform (RAP) at the same time. The AMGA web application provides many interesting features for manipulation of collections, metadata schema, entries, access control, user/group information, federation and others. Additionally, this web application includes a powerful SQL query editor that enables users to make complicated sentences under specific query conditions. This paper describes the implementation of the AMGA web application focusing on the transformation of AMGA Manager using Eclipse RCP to a RAP-based web application.

The paper “Situation Based Dynamically Adaptive Workflow” discusses the workflow that has been useful in business area for a long time since it helps business process be well defined and be automated. Recently, its use becomes broader and its original model becomes changed. Recent technology such as smart phone and positioning system brings about more dynamic situation to where the workflow can be adopted. The workflow is not routed by the predefined path and condition. Due to this reason, real-time workflow or dynamic workflow is more frequently discussed. The real-time workflow supports not only fixed routing but also dynamic routing according to the environmental context changed in real-time. The paper
introduces the concept of dynamic workflow model which is to route the work flow in terms of efficiency or capacity of resources.

Paper “Parallel Acceleration on Manycore Systems and Its Performance Analysis: OpenCL Case Study” presents an OpenCL (Open Computing Language) as a heterogeneous programming framework for developing applications that executes across a range of device types made by different vendors which efficiently maps to both heterogeneous and homogeneous, single or multiple device system consisting of CPUs, GPUs and others types of devices. OpenCL provides many benefits in the field of high-performance computing and one of the most important aspects is its portability. This paper presents a comparison of the performance of OpenCL executing a matrix multiplication over a manycore CPU and GPU with performance analysis.

In the paper “Performance Analysis of Loss Recovery Latency in Reliable Multicast Protocols using Active Parity Encoded Services”, providing an efficient and reliable multicast for data dissemination applications on a large scale is a challenge, especially when the applications require a very short delivery delay and high throughput. The combination of a local recovery approach based on active services with those using FEC/ARQ gives rise to a new class of reliable multicast protocols called APES “Active Parity Encoding Services”. This paper carries out a comparative study between reliable multicast protocols belonging to this class in terms of loss recovery latency.

The paper “Future Smart Device Development Architecture” states that the spreading use of wireless internet and smartphone accelerates the growth of location-based service and mobile-cloud computing. However, mobile computing devices such as smartphones, personal media players, pose challenges due to its intrinsic nature of battery capacity, constraints of wireless networks and device limitation. First, a fundamental challenge arises from power-inefficiency of location awareness. The location-based application is one of killer applications in smartphone. Usually, the locations-based applications steadily consume power for a long time. So, an energy efficient location-based service was proposed. Second, another challenge arises from power-inefficiency in terms of mobile-cloud computing. The framework reduces power dissipation by substituting less-power-intensive sensors, when the smartphone is in static state such as being put on a table in an office. The substitution is controlled by finite state machine with user movement detection strategy. The core technology of our framework is based on web service and SOAP protocol because the web service is the best fit for the framework that is not depending on a certain smart-phone OS platform.

The paper “SMTL Oriented Model Transformation Mechanism for Heterogeneous Smart Mobile Models” suggests Smartphone Model Transformation Language (SMTL) oriented model transformation mechanism for heterogeneous smartphone. SMTL is defined which easily manipulates more input model in SMTL engine. Through invoking operation in SMTL engine, it is directly mapped with API in Eclipse modeling Framework (EMF). In addition, design to use XPath as XML technique instead of OCL to search data in source model.

The Authors of “Interactive Mirror System based on Personal Purchase Information” defines virtual fitting system as the system that coordinates the clothes that the customers want on their virtual avatars and it can be the representative interactive digital signage, and the virtual fitting systems that adopt the augmented reality method are researched currently. That the information on the products of the brands that adopt the system can be checked only,
the coordination with other brands or other clothing products cannot be carried out and it has the
problem that the personalized coordination information cannot be acquired because the
coordination between the existing clothing products and newly-purchased clothing products
cannot be performed in order to coordinate the clothing product using the existing system,
 basic coordination knowledge or the information like recent fashion trends should be secured,
however it is difficult to perform the proper coordination now that most of users do not
possess appropriate coordination knowledge in general. In this paper, virtual reality-based
interactive mirror system that provides the personalized coordination information was
suggested to solve the problem of existing interactive mirror system that performs virtual
coordination work.

In the paper “Improving the Performances of Software for Rating Patent Technology: a
Korean Case Study”, Korean governments have established the infrastructure of technology
evaluation as one of ways to promote technology transfer and commercialization because of
fast growing demands of technology evaluation. Thus, they are in the middle of developing a
web-based automatic evaluation tool called K-PEG and operating it in order to secure the
speed and the objectivity of technology evaluation. This paper investigates the structure of K-
PEG, the representative online automatic evaluation system of patents, and diagnoses its
performance qualitatively. The paper also explores ways of K-PEG improvement by
presenting qualitative evidences for them on the basis of both in-depth interviews and focus
group interview.

The paper “Visualizing and Analyzing the Structure of AspectJ Software under the Eclipse
Platform” discusses that Software is naturally intangible and abstract which makes the
understanding task difficult. There is a growing need for visualizations that improve the
comprehensiveness of its structure, behavior and evolution. Graphically visualizing abstract
concepts provides a way to raise the abstraction level and therefore, to reduce the software
complexity. The graphical visualization has an important contribution by presenting the
software under an abstract synthetic view that gives a quick idea of its content, logic,
structure and its entities' relationships. It is widely accepted that it can represent a valuable
support during the development and maintenance processes. As AspectJ is a relatively new
language with powerful specific constructs, it deserves support tools to visualize its software
systems.

Paper “Advance Convergence Characteristic Based on Recycling Buffer Structure in
Adaptive Transversal Filter” proposes a new tap-weight-updated RLS algorithm for an
adaptive transversal filter with data-recycling buffer structure. Authors prove that the
convergence speed of the learning curve of an RLS algorithm with a data-recycling buffer is
faster than existing RLS algorithms at mean square error versus iteration number. Also, the
resulting rate of convergence is typically an order of magnitude faster than the simple LMS
algorithm.

In the paper “Designing of Framework for Mobile Applications Assets Management”,
Authors developed an easy-to-customize framework to enhance the reusability. The aim of
the customizing environment is to store the meta information in the framework repository to
support the reuse of our MAM (Mobile Assets Managements) framework. The framework
repository contains the structural characteristics and the behavior characteristics of
components, as well as interactions among the components. In this paper, the framework-
customizing toolkit for mobile applications has been constructed. It helps the process of the
framework reuse to be systematic by supporting the following: (1) understanding the framework itself, (2) refining the components, (3) changing the related components automatically, and (4) configuring the mobile applications.

The paper “Domain Specific Language for Collaborative Determination of Separation Minima between Aircrafts” developed a domain specific language called Aeronautical Rules Script Language (ARSL). The language is particularly designed for collaborative environment aiming at determining separation minima required between aircrafts at planning phase. ARSL can be used as a formal language for configuring air traffic rules and information sharing. As a domain specific language, ARSL is easy to understand and maintain for aeronautical domain experts. The language has been implemented and integrated into the Collaborative Decision Making (CDM) project of Aeronautical Radio of Thailand to help integrate the major elements essential for defining safety longitudinal aircraft separation.

The Authors of “MOF based Code Generation Method for Android Platform” presents a discussion that the existing code generations methods focus on UML Class diagram, which easily represents code structure such as class, method, attribute, but just possibly generate a skeleton code. This paper describes the application of UML Message Sequence Diagram (MSD) for representing interactive behavior among objects, and generate more sophisticated Java Code for Android Platform. They also propose code generation method based on Meta Object Facility (MOF) using model transformation technique.

Paper “A Software Cost Model with Reliability Constraint under Two Operational Scenarios” extends the reliability constrained cost minimization (RCCM) model by Helander, et al., (1998) from two view points: time non-homogeneous property on software failure-occurrence process and gap between testing and operational phases of software product. The expected cost minimization with reliability constraint is formulated as a non-linear minimization problem under alternative scenario on the operation. Authors develop an effective optimization algorithm based on the Kuhn-Tucker conditions and provide an illustrative example on how to design component-based software.

In the paper “Selected Block Size-Based Spectral Domain Scrambling”, the pay-per-view (PPV) TV industry is growing fast. The purpose of PPV is to earn revenue from subscribers. However, due to illegal accessing issues, the providers come up with protection method. The protection process from piracy is studied in this paper. The proposed method is based on frequency domain.

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