Guest Editorial

Recent Trends in Convergence-based Smart Healthcare Service

Sang-Yeob Oh[a], Supratip Ghose[b], Kyungyong Chung[c], Joong-Kyung Ryu[d] and
Jung-Soo Han[e],*
[a]*Department of Interactive Media, Gachon University, Seongnam, Korea*
[b]*Department of Computer Science and Engineering, University of Information Technology and
Sciences, Dhaka, Bangladesh*
[c]*Department of Computer Information Engineering, Sangji University, Wonju, Korea*
[d]*Department of Computer Software, Daelim University, Gyeonggi-do, Korea*
[e]*Division of Information and Communication, Baekseok University, Seoul, Korea*

People today have become more interested in disease prevention and health promotion, rather than disease treatment, and have shown a tendency to get various types of information from diverse media and try to apply it to themselves. Numerous and varied health information web sites have been developed and are now operating. However, they do not seem to actually be effective for users' healthcare needs and health promotion, not only because of the limitations of web-based information, but also due to a lack of customized healthcare services. In the current ubiquitous environment, health information support services have generally been developed in a format of inputting bio-information into a computer for network-based transmission. For that reason, they are, in fact, quite inconvenient and inefficient. In this regard, what is urgently required is to develop a method to supply smart healthcare using convergence technologies [1–7]. Therefore, novel techniques, architectures, algorithms, experiences regarding multimedia applications, and industry services should be considered. Some of these research areas are listed below.

- Health computing for convergence
- Bioelectronics, biomechanics, telemedicine
- Medical imaging, bio-imaging
- Surgical technology, medical physics
- Innovative applications for convergence healthcare
- Artificial organs, biomaterials
- Medical information technology
- Medical and hospital informatics

*Corresponding author: Jung-Soo Han, Division of Information and Communication, Baekseok University, Munam-ro, Dongnam-gu, Cheonan-si, Chungcheongnam-do, Korea. E-mail: jungsoo.han.k@gmail.com.

 – Telemedicine, e-health, and home care methods
 – Public health services
 – Agent technology in convergence healthcare
 – Artificial intelligence methodologies for smart healthcare

This special issue is devoted to one of the hottest topics in convergence-based smart healthcare services, and is expected to be cited widely in the areas of technology and healthcare.

In this issue, Lee et al. present a comparison of manual lymph drainage and ultrasound therapy for legs swollen from wearing high-heeled shoes. The proposed method compares the effect of manual lymph drainage with ultrasound therapy. This study showed that manual lymph drainage and ultrasound treatment had statistically significant effects on leg swelling caused by wearing high-heeled shoes, whereas no significant difference was found from intervention. SeongRan Lee introduces predictors associated with efficient health information management in cardiac surgery patients. This study aims to investigate the factors influencing efficiency in health information management for cardiac surgery patients in order to provide basic data for development of intervention programs to prevent cardiac disease. It is useful to determine whether there are differences regarding health behaviors among patients who have had cardiac surgery. Lee et al. present a chiropractic approach to genu varum (bow-leggedness). This research began with the basic idea of proper joint mobility, creating proper body posture. One aspect is to make sure to exam both legs separately during biomechanical examination of bowed legs, because one leg may be different from the other. In conclusion, after the bowed-leg adjustment via chiropractic manipulation, one can see a shift in the center of gravity in line with ideal orientation, which will create a balanced postural orientation.

An et al. introduce the use of three-dimensional computed tomography (CT) images in dental care for children and adolescents in Korea. The purpose of this study was to investigate the current use of three-dimensional CT in pediatric dentistry in Korea. Institutions in Korea that provide training in pediatric dentistry were surveyed via the Korean Dental Association to identify CT equipment used in this specialty. The articles report that cone beam computed tomography has the advantage of being able to provide high-resolution images of anatomical structures of the maxillofacial area, and thus is useful for diagnosing diseases of that area in pediatric dentistry. Jung et al. present technical approaches with a natural dye extracted with mordants from *Phytolacca Americana* L. berries. This study is the first systemic report on staining silk fabrics with *Phytolacca Americana* L. berries and mordants, and suggests application of natural products for the fiber industry. For that purpose, five different mordants were applied to induce more interesting colors. Staining may be sensitive to the pH range, however, in this study, areas for pH were very dramatic. Further study is predicted for staining silk using various pH levels in boiled water.

Cho et al. introduce a Monte Carlo simulation for correlation analysis of average glandular dose with breast thickness and glandular ratio in breast tissue. The proposed method overcomes the limitations of the unified phantom for average glandular dose (AGD) measurement, and correlation was drawn out using the Monte Carlo simulation by measuring AGDs from a variety of breast thicknesses. This is expected to be used as basic data to determine this guideline and the target values of glandular doses. SangSub Park presents a comparison of chest compression quality between the modified chest compression method with the use of a smartphone application and the standardized traditional chest compression method during cardio-pulmonary resuscitation. The result of the study demonstrated that the standardized chest compression method in accordance with the guideline is more appropriate for skills in education and training. Kim et al. show the effect of a 12-week prop Pilates exercise program on body stability and pain for fruit farmers with musculoskeletal disorders (MSDs). The goal of this research was to find

out the body stabilization and pain-relieving effects of a prop Pilates exercise program on fruit farmers suffering from MSDs.

Park and Choi introduce an analysis of the relationship between accident and injury occurrence and the absence or presence of adults in South Korea. The proposed method is to allow safety to be maintained in one's daily life by ensuring an understanding of information about accident and/or injury occurrence and ensuring the person is conducive to reducing absences due to injury in career and school life. The purpose is to offer basic data for a program to prevent accidents and injuries. Kim and Choi present psychometric properties and a factor structure for a second-language reading-motivation questionnaire. The purpose is to investigate the psychometric properties and factor structure of popular second-language reading-motivation questionnaires developed by Setsuko Mori. Exploratory factor analysis (EFA) was conducted with the SPSS 18.0 statistics software package following recommendations made by Fabrigar et al. Before conducting the EFA, skewness and kurtosis tests were executed on the items to examine the distribution of the data. Lee and Lee introduce a dynamic stepping information process method for mobile bio-sensing computing environments. They propose a dynamic process design and execution method as a plan to fundamentally solve this problem. The proposed dynamic process configuration can select each computing station dynamically depending on the mobile user's environment.

Yu et al. show the effect of transcutaneous electrical nerve stimulation on postural sway from fatigued dorsi-plantar flexor muscles. The purpose of this study is to find the differences impacting postural sway depending on the visual input's existence when transcutaneous electrical neural stimulation is applied to the dorsiflexor and plantarflexor muscles after fatigue-causing movement. Joo et al. present a study on the correlation between patients' physical characteristics and an effective dose of liver computed tomography. They suggest indicators to be considered in the protocol for setting up equipment and minimizing patient doses by identifying the effective dose and the correlations of each company's equipment according to a patient's body characteristics in liver CT. Junyeon Lee introduces motion artifact reduction from a photoplethysmograph (PPG) using a cyclic moving average filter. They propose a cyclic moving average filter that uses similarity in the photoplethysmogram. For the method, they control the volume of the input signal to decrease the influence of the PPG signal, and detect an accurate motion artifact reference signal.

Oh et al. examine whether sound with flicker noise (1/f properties, or 1/f sound) affects stress-induced electroencephalogram (EEG) changes. Twenty-six subjects who voluntarily participated in the study were randomly assigned to the experimental or control group. The results indicated that the mental arithmetic task effectively induced a stress response measurable via EEG. Youl-Hun Seoung evaluates the relative speed (RS) of latent images in relation to changes in fading time and storage temperature of imaging plates (IPs) in computed radiography systems. The results of this study reveal the following insights. RS decreases depending on changes in the storage temperature of the IPs. He also recommends long-term storage of IPs at temperatures as low as 20°C, at which point the latent image information in the IPs can be minimized. Lee and Yoon introduce a study of the dietary habits and eating-out behaviors in college students from the Cheongju area. General aspects of the research subjects were estimated with basic statistics. To examine the differences in the distribution of the general aspects of the research subjects, a chi-squared test was carried out on their dietary habits and eating-out behaviors, and then the results of their dietary habits and eating-out behaviors by age, residential type and residential areas were suggested.

In Sun Yoon explains how the narrative structure of the Story of Sim Cheong exists on two levels: the narrative structure of the surface and the narrative structure of the unconsciousness, in my terminology. There is an ideology of Korean society that emphasizes filial piety in this story, and the story of the girl

being sacrificed for the sake of her father in the name of the father illustrates well the patriarchal social structure of kinship systems where women are reduced to objects of exchange between male lineages. Im and Lee introduce the effects of art and music therapy on depression and cognitive function in the elderly. The study was conducted with one group, using a pre- and post-testing method, to examine the effects of art and music therapy on depression and cognitive abilities. The results confirmed that art and music therapy programs are effective in reducing the degree of depression.

Choi and Yu correlate gratitude disposition in middle school students with regard to gender differences. The purpose of this study was to identify factors influencing gratitude disposition by gender differences. Cronbach's alphas for the eight asset subscales are 0.87 (support), 0.77 (empowerment), 0.73 (boundaries and expectations), 0.52 (constructive use of time), 0.75 (commitment to learning), 0.78 (positive values), 0.83 (social competency), and 0.89 (positive identity). The results of the study provide strong evidence that positive identity plays an important role in contributing to gratitude disposition in both boys and girls. Choi et al. show the difference and importance of sacral slope and pelvic sacral angle that affect lumbar curvature. They propose improvement of excessive lumbar lordosis and the need for, and possibility of, therapeutic methods via an exercise method for more aggressive management during the growth phase and control of a sacroiliac joint that is considered no longer controllable as the patient becomes an adult after the growth phase. Their method considers the fact that the upper sacral base slope of the sacral vertebrae is determined in accordance with the fusion state of the sacroiliac joint before the growth phase, suggesting, in particular, use of the measured value from a prostate-specific antigen test.

Lee et al. present effects of yangsaeng according to the lifestyles of middle-aged Korean men and women and their health perceptions. This study was conducted on Korean middle-aged subjects at a stage of physical, psychological, and social change and transition. This study's objectives were to get to know the subjects' yangsaeng levels as well as to find out the effect of various factors on health perception. This thesis also provides basic data to develop and diffuse a yangsaeng program applied to a method of healthcare management. Choi and Oh provided a paper titled "2nd Dimensional GC-MS Analysis of Sweat Volatile Organic Compounds Prepared by Solid Phase Micro-Extraction." The purpose of this study was to provide the quantitative distribution profile of sweat volatile organic compounds (VOCs) that could be used to differentiate individuals. The highly specific and precise analysis technique, solid phase micro-extraction followed by two-dimensional gas chromatography coupled with time of flight mass spectrometric analysis, was applied to maximize the chromatographic resolution and reliable identification of the VOCs. The results suggest that characteristic volatile profiles of human sweat emanations could provide valuable information to forensic scientists.

Kim et al. present a comparative study on the attitudes of female seniors and female university students toward seniors. They checked differences in the two groups for each variable to identify factors that affect attitudes toward senior citizens. The seniors group had more favorable attitudes, and recognized health conditions, ego-integrity, and self-efficacy better than the female university student group. Seong-Ran Lee proposes factors influencing clinical stages in women patients with rectal cancer. This paper provides basic information and data on the improvement of health management programs for rectal cancer patients. This study also provides basic data for educational and publicity programs directed at ordinary people in order to prevent cancer by making a comparative analysis of rectal cancer stages in terms of rectal cancer-related characteristics, confirming lifestyle factors that cause rectal cancer.

This fine collection of papers was accumulated through fruitful collaboration. We gratefully acknowledge and express our heartfelt appreciation to all authors for their excellent contributions to this special issue. We also want to thank all the members of the ICCT, ICDPM Program Committee and anonymous reviewers for their help in identifying novel papers and for their careful reading of earlier drafts to select

25 high-quality papers out of 63 papers submitted – a 39% acceptance rate. Furthermore, we would like to thank Professor Emeritus P.F. Niederer, editor-in-chief of the *International Journal of Technology and Health Care*, for his valuable remarks and help throughout the publication process for this special issue.

References

[1]   E. Y. Jung, J. H. Kim, K. Chung, D. K. Park, Home Health Gateway based Healthcare Services through U-Health Platform, Wireless Personal Communications, Vol.73, No.2, pp.207-218, 2013.

[2]   K. Chung, Recent Trends on Convergence and Ubiquitous Computing, Personal and Ubiquitous Computing, 2013. Doi: 10.1007/s00779-013-0743-2

[3]   S. Y. Oh, K. Chung, Target Speech Feature Extraction Using Non-Parametric Correlation Coefficient, Cluster Computing, 2013. Doi: 10.1007/s10586-013-0284-5

[4]   J. H. Kim, K. Chung, Ontology-Based Healthcare Context Information Model to Implement Ubiquitous Environment, Multimedia Tools and Applications, 2011. Doi: 10.1007/s11042-011-0919-6

[5]   S. Y. Oh, K. Chung, Traffic Hazard Prediction based on Neighbor Nodes for Vehicle Safety Communications on Highway, Multimedia Tools and Applications, 2013. Doi: 10.1007/s11042-013-1514-9

[6]   J. H. Kim, J. K. Kim, D. Lee, K. Y. Chung, Ontology Driven Interactive Healthcare with Wearable Sensors, Multimedia Tools and Applications, 2013. Doi: 10.1007/s11042-012-1195-9

[7]   J. H. Kim, J. K. Ryu, Recent Trends on High-performance Computing and Security, Cluster Computing, Vol.16, No.2, pp.207–208, 2013.