Naoyuki Kubota
Tokyo Metropolitan University, JAPAN

Honghai Liu
University of Portsmouth, UK

Guest Editorial

Special Issue on Computational Intelligence for Community-Centric Systems

Recently, the rate of elderly people is increasing in the population. As illustrated in Figure 1, the prediction for 2025 states that the number of elderly people will be approximately 1.2 billion, and their rate in the more developed region will be about 28.2% [1]. Furthermore, the number of the death in isolation is also increasing. More elderly people live alone, without a tight contact with local communities, though QOL (quality of life) is critically related to human relationship and much of the information needed is usually provided by local communities. More prevalence of accessible devices like smartphones and tablets, of social networking services that enables communities to have stronger bonds among community members, and of information on the Internet that are often essential for their survival, assumes more effective and efficient employment of information technologies. Therefore, the importance of their support with community-centric systems is increasing as a new paradigm in highly aging society.

In the *American Heritage Dictionary*, community is defined as 1) A group of people living in the same locality and under the same government, 2) A group of people having common interests, 3) A group viewed as forming a distinct segment of society, 4) A group of organisms interacting with one another and with the environment in a specific region. Each member of a community gains a personal and social identity by sharing common beliefs, values and standards. Social media have played an important role in creating, sharing, and exchanging information and ideas within a community. These can be extremely useful in disaster situations.

The number of the people affected by and killed in disasters is increasing. Figure 2 shows different types of disasters and the total number of the people killed in disasters in the last decade [2]. The number of the people killed by earthquakes is large. Figure 3 shows the number of killed people by the Great East Japan Earthquake [3]. The number of those killed who are older than 60 years is much larger than that of other people. If social media and local information transfer systems are available in disasters more flexibly and efficiently, we can exchange and share disaster and rescue information in local communities very quickly. As a result, much more people will be saved. Tokyo Metropolitan University started a special research project on disaster countermeasures for a strong Tokyo inland earthquake, addressing on the recovery and construction period following the disaster prevention, mitigation and rescue response period [4]. This cross-sectional research project is composed of eight main research units on Energy, Hygienic Environment, Telecommunications, Dwelling Space, Quality of Life, Community Development, Local Disaster Prevention, and Development of Disaster Resilient Society. Various types of assistive technologies need to be developed from the human-centric and community-centric points of view to realize such information support.

The emerging synthesis of information technologies, network technologies, intelligence technologies, and mechatronics technologies is one of the most promising approaches towards information support for the next generation.

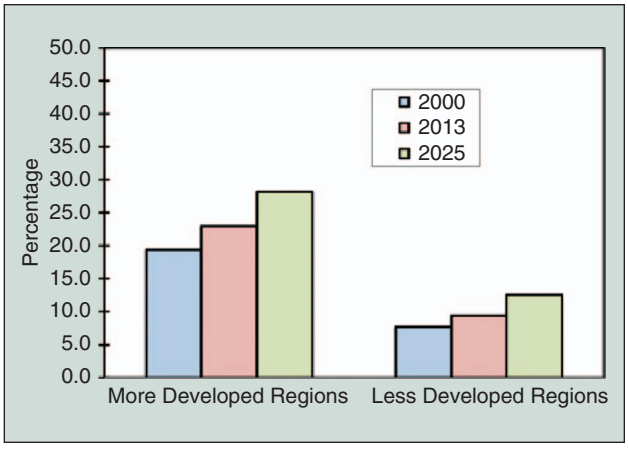

FIGURE 1 Increasing rate of elderly people.

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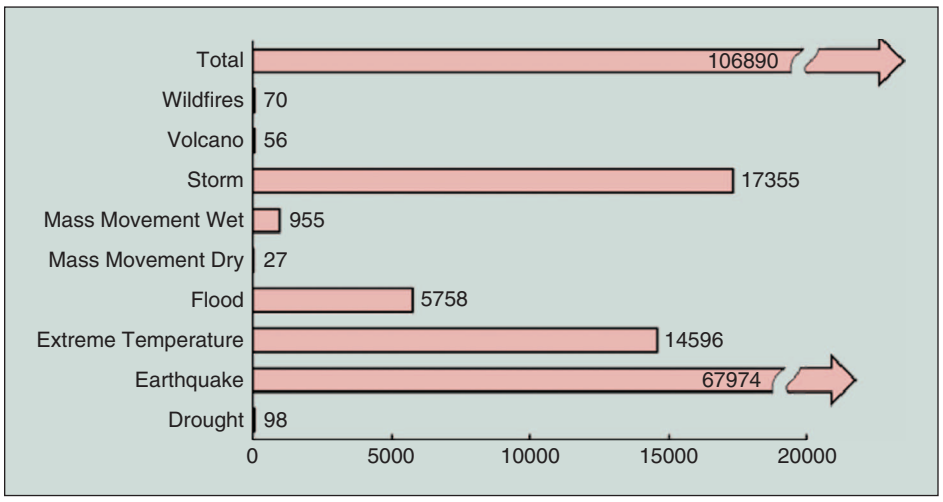

FIGURE 2 The number of killed people by disaster types in 2002–2011.

Human-centric systems can enhance the accessibility and usability of complicated systems and devices supporting human activities, communication, and interactions. Furthermore, the concept of human-centric approaches can improve QOL, in particular, information support, physical care, and mental care to maintain autonomy and independency in activities of daily living (ADL). QOL is deeply related with QOC (quality of community). If QOC is improved, the members of a community will feel the improvement of QOL. This means that the coupled improvement of QOC and QOL is very important. If the improvement of QOL is done by the bottom-up construction, QOC can be considered as a top-down constraint to the human daily life. Another issue is that demands in improving QOL and QOC can differ from region to region and from community to community. Novel techniques are necessary for solving the problems related to QOL and QOC. Computational intelligence (CI) can be a promising direction to solve the problems, because CI can deal flexibly and adaptively with the features of target problems.

This special issue focuses on CI for community-centric systems as a new paradigm including enhancement of QOL and QOC, analysis and visualization of community, healthy society, social communication, social computing, social intelligence, community creation, community monitoring, decision-making and mutual assistance in community, group dynamics, community support systems, disaster information systems, disaster prevention systems, disaster mitigation systems, social networking services, mobile technologies and ubiquitous computing for community, assistive devices, and community-centric robots.

For this special issue, three papers have been accepted from 17 submissions through two-round peer reviews. The first article "Context-Aware Personal Information Retrieval from Multiple Social Networks" by Xiaogang Han et al., proposes a Context-aware Personal Information Retrieval (CPIR) algorithm based on both the participatory and implicit-topical aspects of the context to improve the retrieval performance. In this paper, they study the problem in the online conversation context and investigate how to automatically retrieve the most context-relevant previously-seen web information without intervening users. Based on data analysis using CPIR, it is found that the personal web information (PWI) of all the participating users can be used to expand the query and improve implicit PWIs ranking, both of which can help improve the retrieval performance.

The second article "Landmark-Based Methods for Temporal Alignment of Human Motions" by Pablo Fernandez de Dios et al., presents a general framework for comparison of fitness performances in the context of basic stand-up physical activities. Elderly communities in nursing homes are usually involved in activities on rehabilitation, daily exercises and health tracking. A series of multi-class C4.5, support vector machines, Naive Bayes and AdaBoost classifiers are used for key body pose prediction in human activities. Next, a cluster analysis is used to refine the obtained results. The proposed method improves performances compared to dynamic time warping and hierarchical aligned cluster analysis.

The third article "Muscle Fatigue Tracking with Evoked EMG via Recurrent Neural Network: Toward Personalized Neuroprosthetics" by Zhan Li et al., applies a nonlinear autoregressive exogenous recurrent neural network (NARX-RNN) model for identification and prediction of muscular dynamics with evoked electromyogram (eEMG) induced by functional electrical stimulation.

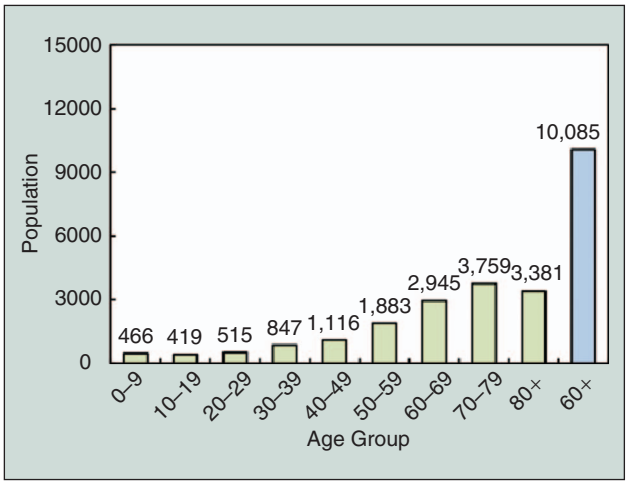

FIGURE 3 The number of killed people by the Great East Japan Earthquake.

The proposed NARX-RNN model could show robust identification performance by keeping its accuracy and stability. Furthermore, the general importance regarding motor function modeling based on computational intelligence is introduced along with its potential impact in the rehabilitation domain. The issue toward personalized neuroprosthetics is discussed in detail with the potential role of CI-based identification and the benefit for the motor-impaired patient-community.

In summary, each of the three papers for this special issue highlights a subset of the challenging and novel applications of computational intelligence to community-centric systems. We would like to express our sincere thanks to all the authors and gratitude to reviewers for extending their cooperation in preparing and revising the papers. Special thanks go to Professor Hisao Ishibuchi, Editor-in-Chief of *IEEE Computational Intelligence Magazine*, for his invaluable suggestions and advice throughout the entire process of this special issue. We hope that this issue will inspire others to work on this exciting new frontier of computational intelligence for community-centric systems.

References

[1] World population ageing: 1950–2050. United Nations. Dept. Economic and Social Affairs. Population Division. Univ. California, Oakland, CA. [Online]. Available: http://www.un.org/esa/population/publications/worldageing19502050/

[2] EM-DAT: The OFDA/CRED—International Disaster Database. Centre for Research on the Epidemiology of Disasters. Université Catholique de Louvain Brussels, Belgium. [Online]. Available: www.emdat.be

[3] (2012). Elderly persons' damage situation of the Great East Japan Earthquake. Annual Report on the Aging Society (Summary) FY 2012. Cabinet Office. Government of Japan. [Online]. Available: http://www8.cao.go.jp/kourei/english/annualreport/2012/2012pdf_e.html

[4] [Online]. Available: http://www.tokyo-sangaku.jp/ura-symposium/

Editor's Remarks

(continued from page 2)

what a "Community-Centric System" would be. However, all may agree that communities are important in our busy and stressful daily lives. I hope that the current *CIM* issue will play a leading role in the future development of the research field of "Community-Centric Systems." I also hope that the *CIM* will foster your sense of unity with the CI community. I am looking forward to enjoying such a sense of unity with you at this year's major CIS conferences such as WCCI 2014 and SSCI 2014.