

Guest editorial–Wisdom Web of Things (W2T)

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With rapid development of the Internet of Things and cloud computing, a new world, called ‘hyper world’, is emerging by coupling and empowering humans in the social world, information in the cyber world, and things in the physical world. The notion of ‘Wisdom Web of Things (W2T)’ is a novel vision for computing and intelligence in the post-WWW era with data, connection and service explosions, recently put forward by a group of leading researchers from the fields of Web Intelligence (WI), Ubiquitous Intelligence (UI), Brain Informatics (BI), and Cyber Individual (CI) [1, 2]. The W2T is an extension of the wisdom Web in the IoT/WoT (Internet/Web of Things) age. The ‘wisdom’ means that each of things in the IoT/WoT can be aware of both itself and others so as to provide the right service to the right object at the right time and in the right context. Fast-evolving Web intelligence research and development initiatives are now moving towards understanding the multifaceted nature of intelligence in depth and incorporating it at Web scale and in a ubiquitous environment. As inspired by the material cycle in the physical world, the W2T focuses on the data cycle, namely ‘from things to data, information, knowledge, wisdom, services, humans, and then back to things.’ A W2T data cycle system is designed to implement such a cycle, which is, technologically speaking, a practical way to realize the harmonious symbiosis of humans, computers and things in the emerging hyper world.

This special issue presents some of the best work being done worldwide that deals with the fundamental issues, new challenges, and potential applications of W2T.

Akihiro Eguchi, Hung Nguyen, and Craig W. Thompson’s article “Everything is Alive: Towards the Future Wisdom Web of Things” presents the EiA project, which is broad, encompassing Ubiquitous Intelligence, Cyber-Individual, Brain Informatics and Web Intelligence.

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By providing two case studies, the authors show how W2T related technologies can be integrated together and fit into a seamless data cycle.

The work presented by Yang Gao, Mufeng Lin, Ruili Wang, “Adaptive Support Framework for Wisdom Web of Things” discusses self-adaption as a key issue in the W2T framework and system, which has three important components including an adaptive requirement description language, forward reasoning and backward planning capability, and a knowledge base evolution mechanism.

“From the Internet of Things to Embedded Intelligence” by Bin Guo, Daqing Zhang,

Zhiwen Yu, Yunji Liang, Zhu Wang gives an outline of embedded intelligence (EI) under the W2T vision and provides the EI architecture to augment existing IoT with user awareness, ambient awareness and social awareness, which will nurture novel W2T applications.

In “Creation and Growth of Online Social Network—How do social networks evolve?” Katarzyna Musial, Marcin Budka, Krzysztof Juszczyszyn deal with the problem of analysis of people behaviours and interactions in the online world as well as how these behaviours change over time is a crucial element when it comes to create and compose personalised services in the W2T applications.

“Effective Detection of Sophisticated Online Banking Fraud on Extremely Imbalanced Data” by Wei Wei, Jinjiu Li, Longbing Cao, Yuming Ou, Jiahang Chen describes an online banking fraud detection system as a typical use case of the broad-based W2T methodology, in which online banking customers (in the social world), things (in the physical world), and computer systems (in the cyber world) are integrated into an entity to realize their harmony and symbiosis by using an effective W2T data cycle.

In “Riding the Tide of Sentiment Change: Sentiment Analysis with Evolving Online Reviews,” Yang Liu, Xiaohui Yu, Aijun An, and Xiangji Huang examine the problem of developing adaptive sentiment analysis models for online reviews, which falls into the domain of opinion mining, and can be considered as an effort along the general direction of the W2T data cycle to integrate social, cyber and physical worlds.

“Ontology-based Context Modeling for Emotion Recognition in an Intelligent Web” by Xiaowei Zhang, Bin Hu, Jing Chen, Philip Moore addresses an ontology-based context model, which enables context definitions to be created with semantics for emotion recognition using EEG, and completes the process that the loop body of the W2T data cycle is fully executed. A realistic use case shows the usefulness of the proposed modeling method.

Lastly, Hong Yu, Jingsha He, Ting Zhang, Peng Xiao, Yuqiang Zhang’s article “Enabling End-to-End Secure Communication between Wireless Sensor Networks and the Internet” investigates the limitations of current IP-based technologies when being applied to W2T applications, and proposes an enhanced scheme to enable end-to-end secure communication for W2T, specifically for end-to-end security between WSNs and the Internet.

We hope this special issue will serve as a valuable source for researchers and practitioners in Wisdom Web of Things (W2T).

References

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2. WI-IAT 2011 Panel on Wisdom Web of Things (W2T): fundamental issues, challenges and potential applications. <http://wi-iat-2011.org/>