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Web and Wireless Geographical Information Systems

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Preface

These proceedings contain the papers selected for presentation at the 17th edition of the International Symposium on Web and Wireless Geographical Information Systems held in Kyoto in May 2019 and hosted by Kyoto Sangyo University.

The symposium is intended to provide an up-to-date review of advances in both theoretical and technical development of Web and Wireless Geographical Information Systems (W2GIS). The 2019 edition was the 17th in a series of successful events beginning with Kyoto 2001, and mainly alternating locations annually between East Asia and Europe. This was the third time the event was held in Kyoto, Japan. It provides an international forum for discussing advances in theoretical, technical, and practical issues in the field of wireless and internet technologies suited for the dissemination, usage, and processing of geo-referenced data.

W2GIS is organized as a full two-day symposium, recognized as a leading forum for the dissemination and discussion on the latest research and development achievements in the Web GIS and wireless domains. The submission process was successful this year, attracting 37 papers from almost all continents. This demonstrates not only the growing importance of this field for researchers but also the growing impact these developments have in the daily lives of all citizens. Each paper received three reviews and was ranked accordingly. The accepted 14 papers are all of excellent quality and cover topics such as web technologies and techniques, paths and navigation, web visualization, and novel applications. The proceedings also include a keynote abstract about five-dimensional world maps from the invited speaker Yasushi Kiyoki.

We wish to thank the authors who contributed to this workshop for the high quality of their papers and presentations and the support of Springer LNCS. We would also like to thank the Program Committee for the quality and timeliness of their evaluations. Finally, many thanks to the Steering Committee for providing continuous advice and recommendations.

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"5-Dimensional World Map" A SPA-based Semantic Computing System for Global Knowledge-Sharing, Integration, Analysis and Visualization Towards Environmental Artificial Intelligence

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Abstract. Humankind, the dominant species on Earth, faces the most essential and indispensable mission; we must endeavor on a global scale to perpetually restore and improve our natural and social environments. One of the essential computations in environmental study is context-dependent semantic-computing to analyze the changes of various situations in a context dependent way with a large amount of environmental information resources.

The 5D World Map System and the Mathematical Model of Meaning technique (MMM) create new analytical system environments with the SPA concept (Sensing, Processing Analyzing and Actuation) and semantic computing. We have proposed the 5D World Map System, as "Global & Environmental Knowledge Creation and Sharing System", to collect and facilitate various social and natural-environmental information resources which are characteristics of natural phenomena, social infrastructure, disaster, traffic, water and energy supply.

The collaborative research activities are promising for approaching to the global architecture of a multi-visualized knowledge analysis and sharing system "5D World Map System" applied to "environmental semantic computing." The basic dimensional space of this system consists of a temporal (1st dimension), spatial (2nd, 3rd and 4th dimensions) and semantic dimensions (5th dimension), representing a large-scale and multiple-dimensional semantic space that is based on MMM.

This system is effective to make a progress of "Cyber-Physical integration" for detecting and analyzing natural and social environmental phenomena. The 5D World Map System is globally utilized as a Global Environmental Semantic Computing System, in SDGs 9, 11, 14, United-Nations-ESCAP: (https://sdghelpdesk.unescap.org/toolboxes). This dimensional space in 5D World Map memorizes and recalls various multimedia information resources (images, video, sound and text) with temporal, spatial and semantic correlation computing functions, and creates multiple views, applied to various "environmental information resources."

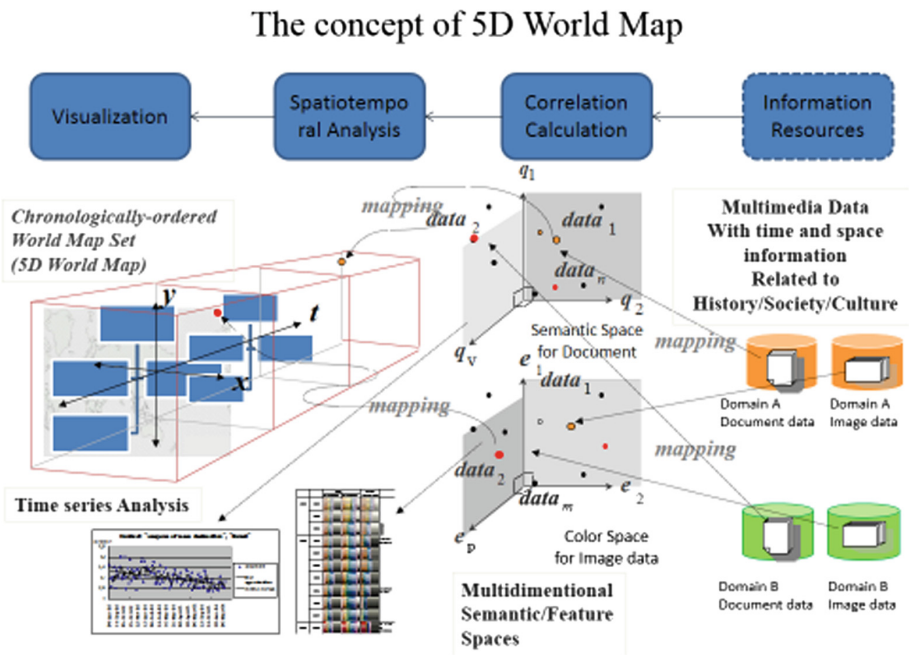**Keywords:** Global environmental analysis · Semantic computing · Multimedia system · Data mining

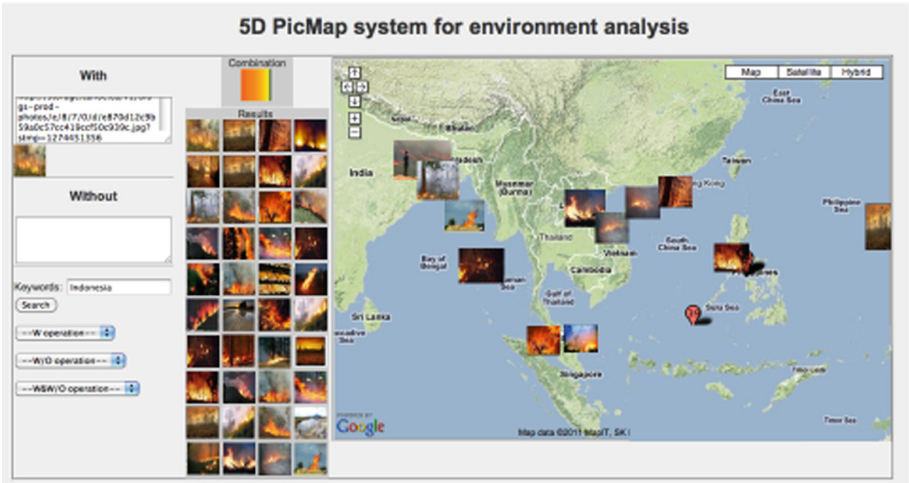**Fig.1.** 5D World Map System for world-wide viewing for Global Environmental Analysis

Fig. 2. Global Environmental Analysis of "Forest Fire" in "5D World Map System"

References

1. Kiyoki, Y., Kitagawa, T., Hayama, T.: A metadatabase system for semantic image search by a mathematical model of meaning. ACM SIGMOD Rec. **23**(4), 34–41 (1994)
2. Kiyoki, Y., Kitagawa, T., Hayama, T.: A metadatabase system for semantic image search by a mathematical model of meaning. In: Sheth, A., Klas, W. (eds.) Multimedia Data Management – Using Metadata to Integrate and Apply Digital Media–, McGrawHill (1998)
3. Kiyoki, Y., Ishihara, S.: A semantic search space integration method for meta-level knowledge acquisition from heterogeneous databases. Inf. Model. Knowl. Bases **14**, 86–103 (2002). IOS Press
4. Kiyoki, Y., Sasaki, S., Trang, N.N., Diep, N.T.N.: Cross-cultural multimedia computing with impression-based semantic spaces. In: Düsterhöft, A., Klettke, M., Schewe, K.D. (eds.) Conceptual Modelling and Its Theoretical Foundations, LNCS, vol. 7260, pp. 316–328. Springer, Heidelberg (2012). 10.1007/978-3-642-28279-9_21
5. Kiyoki, Y.: A Kansei: multimedia computing system for environmental analysis and cross-cultural communication. In: 7th IEEE International Conference on Semantic Computing, Keynote Speech, September 2013
6. Sasaki, S., Takahashi, Y., Kiyoki, Y.: The 4D world map system with semantic and spatiotemporal analyzers. Inf. Model. Knowl. Bases **XXI**, 18 (2010). IOS Press
7. Suhardijanto, T., Kiyoki, Y., Barakbah, A.R.: A term-based cross-cultural computing system for cultural semantics analysis with phonological-semantic vector spaces. Inf. Model. Knowl. Bases **XXIII**, 20–38 (2012). IOS Press
8. Kiyoki, Y., Chen, X., Sasaki, S., Koopipat, C.: Multi-dimensional semantic computing with spatial-temporal and semantic axes for multi-spectrum images in environment analysis. Inf. Model. Knowl. Bases **XXVI**, 20 (2016). IOS Press

Contents