
**Motivation**
Spatial information technology and its applications are important and used in a wide variety of fields. Maps and mapping have been evolving fast recently, however there is a big question on the present direction of map evolution based on the environment of modern technology, culture and society. To explore the big question, the commission of ubiquitous mapping has researched on human-centered design for IT tools and services to develop human’s spatial capability. Our main achievement will be explained from the following two aspects.

(A) Constructing the theories on ubiquitous mapping

[Original aim]
Place the notion of Ubiquitous Mapping based on real-world map interaction and ICT-based content awareness mapping services in the domain of Theoretical Cartography; examining (1) Primal mapping between geomea (real, graphic and language spaces) and human (cognitive space), and (2) Secondary or ICT-based mapping between geomea (real, graphic and language spaces) and geodatabase. Develop the theory of Map Evolution on ICT enabled social-cultural environment, by (1) Clarifying similarity and difference in comparing variant systems to establish an evaluation scheme, (2) Revealing significant factors such as ubiquity and egocentrism for Map Evolution on ICT, and (3) Creating map evolutional tree diagrams representing natural selection of maps in past, current and future according to real ICT-based ubiquitous mapping services and socio-cultural environment of different regions and countries.

[Achievement]
The commission have held meetings and constructed the theories on ubiquitous mapping. Some of the result are open in public as follows,


[Steering members:]
Chair: Masatoshi Arikawa (Akita University (2018-2019), Univ. of Tokyo (2015-2018), Japan)
Vice-chair: Yuefeng Liu (Institute of Remote Sensing and GIS, Peking Univ., China)
Secretaries: Min Lu (Center for Spatial Information Science, The University of Tokyo, Japan (2015-2018)), Ruchien Si (Center for Spatial Information Science, The University of Tokyo, Japan (2018-2019))
Advisors: Takashi Morita (Honorary professor of Hosei Univ., previous chair), Yoshiki Wakabayashi (Tokyo Metropolitan Univ., Japan)
Executive Committee liaison: Monika Sester

(9) Activating and leading a research community on ubiquitous mapping in the world

The commission are organizing regional workshops including site observation to comprehend contemporary situation of ubiquitous mapping. Particularly, this commission focuses on East Asian modern cultures such as visual style and storytelling tailored for various user groups in Cartography, which is important as a growing economic-center and clarifies the regional differences between Eastern and Western situations of Cartography. We will investigate the diversity and soundness in the evolution of Cartography in the world.

[Achievement]
We have held the following international symposium and workshops on ubiquitous mapping.

1. The exhibition workshop on history of interpretation of the world and Japan through maps and globes was held on Oct. 21st, 2016 at Kashiwa Campus Library of the University of Tokyo as an IMY event organized by Honorary Professor Osamu Nishikawa and the commission of Ubiquitous Mapping in cooperated with Center of Special Information Science, Kashiwa Campus Library and DNP (Dai-Nippon Printing Co., Ltd.). In addition to historical analogue maps, atlases and globes, an interactive digital historical globe of Behaim (1492) on a tablet computer was also exhibited in public as an highresolution 3D digital archive created by DNP and BnF (Bibliothèque nationale de France).
2. There was a pre-conference in the conjunctions with ICC2017 at College of William and Mary, Williamsburg, Virginia from June 30th to July 1st, 2017 co-organized by ICA three commissions, Maps and Internet, Education and training, and Ubiquitous Mapping.
3. We held an outdoor workshop for children and their parents to create their own original maps around Kashiwanoha Area of Kashiwa City, Japan using mobile mapping and geofencing applications on Nov. 23, 2017. It was cooperated with Urban Design Center of Kashiwanoha, Kashiwa City, Japan.
4. We held an outdoor workshop for children and their parents to learn local history of the world war two around Kashiwa Airport using mobile mapping and geofencing applications in Kashiwa City, Japan on Feb. 17, 2018. (right) An interface of the original smartphone application for recording trajectories and user generated spatial content for the workshop.
5. We organized a special session on “Spatiotemporal Knowledgebase” as collaboration with ICA commission of Ubiquitous Mapping, Center of Spatial Information Science, the University of Tokyo, and Center for Southeast Asia Studies, Kyoto University in PNC2017 Annual Conference on Nov. 7 to 9, 2017 in National Cheng Kung University, Tainan City, Taiwan. The mission of the Pacific Neighborhood Consortium (PNC) is to facilitate information exchanges among institutions of higher education in the Pacific Rim through computing and communications technology.

We organize a workshop for life long education to learn the principle of GPS and geofencing using smartphones as part of Open University of Japan at Akita University on July 21, 2018 in Akita City, Japan. The number of the participants is 17. The average age of the participants about 52 years old.