Field Informatics

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Editor

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Field Informatics Research Group

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Preface

Field is defined here as "a spatiotemporal area that is difficult to grasp via any analytical and/or engineering approach due to the coexistence of various individuals and entities, which results in the unexpected occurrence of seemingly accidental events thus necessitating our continuing commitment and care" (Osamu Katai). *Field informatics* aims to provide solutions to various problems arising in the field from the standpoint of informatics.

The components of field informatics are *description*, *prediction*, *design*, and *transfer*, and the methods for these components range widely. Because field informatics is a new research area, it lacks a founding method. We consider that various methods of various origins will be applied to realize description, prediction, design, and transfer in the field. For example, let us consider the social goal of revitalizing hilly and mountainous areas amid increasing depopulation. Though all agree that creating a new business model in these areas is important, it is not easy to find an effective way of attracting people to hilly and mountainous areas. By using field informatics, however, situations can be *described* with remote sensing (Chap. 1), biologging (Chap. 2), human sensing (Chap. 3), and ethnography (Chap. 4); the effects of various options can be *predicted* with system dynamics (Chap. 5) and multiagent simulations (Chap. 6), and solutions can be *designed* using methods such as inclusive design (Chap. 7) and participatory design (Chap. 8). In addition, the experience gained can be *transferred* by case writing (Chap. 9) and outreach communication (Chap. 10).

Field informatics can be applied to *nature observation*, *social participation,* and *innovation*.

Field informatics for natural observation is an extension of fieldwork, and uses both theories and methodologies to analyze information from fields scientifically. Field informatics can generate key technologies such as remote sensing and biologging to solve global problems such as food shortages and environmental degradation. The role played by informatics in natural observation involves collecting and accumulating data, and verifying and utilizing them in accordance with the intended purpose.

Although many species are in danger of extinction, no effective countermeasures are being taken for economic reasons. Faced with such problems, field informatics tries to help endangered species and humans coexist, observing the biosphere with various technologies. The field, as a place of natural observation, is also a venue for the productive and social activities of people. Mutual learning in concert with the people living there enables us to interpret phenomena. Here, the field is a real society, in which a range of factors intertwine in complex fashion. For example, agriculture, forestry, fishing, and livestock industries are affected by the environment, and also social systems such as politics and economy. Their problems and improvements can only be understood by viewing the field as a system consisting of natural and social activities.

Field informatics for social participation is a place where there is inherent value and people who protect that value. The new science required here involves modeling the complex and diverse phenomena arising in the field and transferring the resulting model to practitioners. Therefore, field informatics transcribes the words and deeds resulting from the actions of people and involves analysis and generalization. The obtained model must be shared by practitioners in the field in an understandable form.

However, only a subset of information in the field can be detected, managed, and controlled. Therefore, if simply used by someone unaware of this limit, a misunderstanding may arise in that the world becomes expressed only in terms of the obtained information. Qualitative studies based on social sciences are to be applied in parallel with information technology. Furthermore, people in the field are forced to actively participate in dealing with accidental events that are hard to control. Therefore, information should be seen as dynamic and active rather than static and passive.

Field informatics for innovation involves designing and realizing an information system that contributes to the human community through its application in different fields. In other words, it creates innovation via the mutual learning of the designers and users of information technology. From this perspective, the field is a site where new narratives are generated with the support of technical feasibility in the near future rather than those for mere observation. Field informatics for innovation incorporates technological progress during the development period, and creates a scenario that can be realized in the near future.

Resistance to new technology is often observed in the field. Also, the limits of explanations, which are due to the complexity of information systems, make it difficult to establish communication between researchers and people in the field. For example, pursuing the cause of software failure sometimes reveals a trivial manmade mistake. It is not always the case that the field is an easy place for computer scientists to get involved. However, in the future, since a large portion of innovations will be born in the field, more attention must be paid to it.

This book targets graduate students seeking tools and approaches for natural observation, field workers engaging in activities on social participation, and researchers and engineers pursuing innovation. Field informatics can be of benefit to not only students or researchers but also to those in other positions. For example,

individuals in charge of government can utilize the methods of field informatics to form consensus and develop activities. Nonprofit organizations can use field informatics to conduct social programs more effectively. Those with sites such as agriculture, forestry and fisheries, hospitals, and so on can use field informatics to understand and solve various problems.

The members of the field informatics research group in Kyoto University who contributed to the work represented in this book are as follows: Nobuaki Arai, Hiromitsu Hattori, Toru Ishida, Shigeo Matsubara, Kazuyuki Moriya, Yuu Nakajima, Junichi Okuyama, Tetsuro Sakai, and Takaaki Tsuji of the Department of Social Informatics; Osamu Katai of the Department of Systems Science; Yutaka Yamauchi of the Graduate School of Management; Hajime Kita and Yuichi Nakamura of the Academic Center for Computing and Media Studies; and Takayuki Shiose of the University Museum. Reiko Hishiyama of the Department of Industrial and Management Systems Engineering, Waseda University, also joined the research group. The specialties of the members range from informatics, engineering, agriculture, and sociology to pedagogy. The fields targeted by each member also differ, ranging from environment conservation to social education for international cooperation. Specifically, the research activities of the biosphere in Southeast Asia—large-scale traffic simulations, participatory "mono-zukuri (the spirit to produce excellent products)" workshops, inclusive design workshops, distance learning, and intercultural collaboration—are included. Our research group, with such practical research activities as its background, is consolidating the various methods described herein as field informatics and providing lectures open to the public.

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July 1, 2012

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Author Biographies

Nobuaki Arai is an Associate Professor in the Department of Social Informatics, Kyoto University. He holds a Doctor of Agriculture from Kyoto University. He launched the Southeast Asia Sea Turtle Associative Research (SEASTAR) project in 2000. In the SEASTAR project, he is promoting sea turtle migration research, dugong biological studies and Mekong giant catfish tracking, mainly in Thailand. He is a chairperson of the Japanese Society of Biologging Science.

Hiromitsu Hattori is an assistant professor in the Department of Social Informatics, Kyoto University. He was a Research Fellow of the Japan Society for the Promotion of Science from 2004 to 2007. From 2004 to 2005, he was a Visiting Researcher in the University of Liverpool, UK. In 2006, he was a Visiting Researcher in the Massachusetts Institute of Technology, USA. His main research interests include autonomous agents and multiagent systems. He has been working on multiagent-based simulation and human behavior modeling.

Reiko Hishiyama is a professor in the Graduate School of Creative Science and Engineering in Waseda University, where she directs the Intelligent Information System laboratory. She received her Doctor of Informatics in 2005 from Kyoto University in Japan. She taught at Kyoto Women's University, before joining the faculty of Waseda University. Her current research interests include artificial intelligence, autonomous multiagent systems, knowledge representation, autonomy-oriented computing and related areas. The topic is viewed as an interdisciplinary field where computer science intersects with organization science, sociology, psychology, and other fields.

Toru Ishida is a professor in the Department of Social Informatics, Kyoto University. Until 1993, he was a research scientist in NTT Laboratories. He spent some time at Columbia University, Technische Universität München, Université Pierre et

Marie Curie, the University of Maryland, Shanghai Jiao Tong University, Tsinghua University, and Hong Kong Baptist University as a visiting/invited scholar/professor. He was made an IEEE fellow in 2002 for contributions to autonomous agent and multiagent systems. He currently studies social informatics and is running research projects related to digital cities and intercultural collaboration.

Shigeo Matsubara is an associate professor in the Department of Social Informatics, Kyoto University. From 1992 to 2006, he was a research scientist in NTT Communication Science Laboratories, NTT. He received his Ph.D. degree in Informatics from Kyoto University. During 2002–2003, he was a visiting researcher at the University of California, Berkeley. He was also an advisor in the NICT Language Grid project from 2006 to 2007. His research focuses on multiagent systems and information economics. He has published in the Artificial Intelligence journal and other academic journals.

Kazuyuki Moriya has been a professor in the Graduate School of Informatics, Kyoto University since 1998. From 1982 to 1991, he was an assistant professor in the Faculty of Agriculture, Miyazaki University. He was an associate professor in the Faculty of Agriculture, Kyoto University from 1991 to 1998. He received his Ph.D. in Agriculture from Kyoto University in 1990. His major field was animal science, especially population genetics of domestic animals, but recently his research interests include agricultural system analysis, animal movement analysis using GPS and environmental learning. He is a vice-president of the Society of Beef Cattle Science, a director of the Japanese Agricultural System Society and a director of the Japanese Society of Animal Breeding and Genetics.

Yuu Nakajima is an assistant professor in the Department of Social Informatics, Kyoto University. He was a Research Fellow (DC1) of the Japan Society for the Promotion of Science from 2006 to 2009. From 2009 to 2010, he was a Researcher in the Department of Social Informatics, Kyoto University. He received his Ph.D. degree in Informatics from Kyoto University. His research interests include large-scale multiagent systems, agent modeling and multiagent-based simulations.

Yuichi Nakamura received his B.E. degree in 1985, and his M.E. and Ph.D. degrees in Electrical Engineering from Kyoto University in 1987 and 1992, respectively. He worked as an assistant professor in the University of Tsukuba from 1993 and then as an associate professor since 1999. He is currently a professor in Kyoto University. His research interests and activities include human–computer interactions, video analysis, and video utilization for knowledge sources.

Junichi Okuyama received his Ph.D. degree in Informatics from Kyoto University in 2007. He has been a GCOE (project) Assistant Professor at the Department of

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Tetsuro Sakai is a professor in the Department of Social Informatics, Kyoto University. Until 1998, he was a professor in the Graduate School of Agriculture, Kyoto University. He received his Ph.D. in Agriculture from Kyoto University in 1986. His major field was forest science, especially forest management and planning. Recently his research interests include mountainous region issues and wooden cultural properties. He is a director of the Japanese Agricultural System Society and an executive director of the Japan Forest Engineering Society.

Takayuki Shiose got his doctoral degree from the Graduate School of Engineering, Kyoto University in 2004. He received master's and bachelor's degrees in Precision Engineering from Kyoto University in 1998 and 1996. From 2000 to 2002 he was an assistant professor in Kobe University, and from 2002 to 2008 an assistant professor in the Department of Systems Science, Graduate School of Informatics, Kyoto University. Currently, he is an associate professor in the Kyoto University Museum. His research interests include communication design and inclusive design. Academic awards received include the Best Paper Award at the 7th IEEE International Workshop on Robot and Human Communication (1999).

Takaaki Tsuji completed the Ph.D. program without dissertation in the Graduate School of Education at Kyoto University in March of 2007. After that he worked as a postdoctoral fellow in the Center for Human Activity Theory at Kansai University. From April 2008, he was a Global COE Assistant Professor in the Department of Social Informatics at Kyoto University. He is currently an associate professor and a vice director in the center for evaluation, Akita University. His research focuses on higher education and university evaluation. He has conducted research to analyze students' experiences in remote learning and cooperative learning via activity theory and situated learning theory. Recently, he has engaged in practical research on faculty development, and he is producing a series of video teaching materials on this topic.

Yutaka Yamauchi is a Senior Lecturer in Kyoto University, Graduate School of Management. Prior to joining GSM in September 2010, he was a researcher at Palo Alto Research Center (PARC), a Xerox Company. He obtained Master's and Bachelor's degrees in Computer Science from Kyoto University and a Ph.D. in Management from UCLA Anderson School. His research revolves around the question of what it means to know in organizations. Specifically, he has been studying knowledge sharing, learning, and change.