Editorial

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Biographical notes: Akinori Abe is a Senior Researcher at NTT Communication Science Laboratories. He obtained his Doctor of Engineering (PhD) from the University of Tokyo in 1991, with a thesis entitled *A Fast Hypothetical Reasoning System using Analogical Case*. His main research interests are abduction (hypothetical reasoning), analogical reasoning, chance discovery and language sense processing. He worked in NTT Communication Science Laboratories from 1991 to 2000, NTT MSC (Malaysia) from 2000 to 2002, and ATR from 2002 to 2009. During the ATR time, he also was an Associate Professor of IREIIMS, Tokyo Women's Medical University and a Visiting Associate Professor of Kobe University Graduate School (Cooperation Course). Since 2009 he has returned to NTT Communication Science Laboratories.

The papers included in this issue are selected and extended from those submitted to the KES 2007 and KES 2008 invited session on Chance Discovery. In addition, I selected a paper by Vorobieva and Schmidt from the general track sessions in KES 2008 which I considered equally as relevant to chance discovery and an excellent research contribution.

In KES conferences, we have continuously been organising invited sessions on Chance Discovery since 2001 (There was no sessions in 2003). To those sessions researchers from several countries such as Japan, Italy, England, Russia, and Taiwan contributed their papers. Thus we were able to have discussions from the various viewpoints or cultures. The results from those discussions reflect recent novel research and are also represented in this volume.

For the new readers of chance discovery, let me briefly introduce the field. Though in various articles, I have described the definition of a 'chance', which was introduced by Ohsawa (2002), I wish to introduce it here again. In fact, it rather differs from the original definition in Ohsawa (2002) to reflect the recent research interests.

> "A chance is rare, hidden or novel event(s)/situation(s) that can be conceived either as a future opportunity or risk."

Then 'chance discovery' research is a type of research to establish methods, strategies, theories, and even activities to discover a chance. In addition, it aims at discovering human factors for chance discoveries. Therefore not only researchers in computer science and engineering but also researchers with different expertise such as psychologists,

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philosophers, economists and sociologists take part in chance discovery research. Thus chance discovery can also be viewed as an interdisciplinary research. Moreover, a chance is generally used for positive situations, but in chance discovery it is defined for both positive and negative situations. For instance, the possibility of earthquakes, bankruptcies, medical incidents or accident occurrences and users' preferences in shopping or selection are such positive and negative situations that have been investigate. Reasons for these events might typically be analysed by the means of statistics, but it is rather difficult to analyse hidden or potential factors for such events. For instance, a chance can be considered as an alarm, such as an inflation of money supply that will change the middle or long term economic 'bubble' situation (Japan, in 1990). We can also find a similar symptom before the event, such as the rise in subprime loans that incited market panic in August 2007.

For such (computational) discovery research, data mining is the most common approach. However the most significant difference between chance discovery and data mining is that data mining mainly deals with frequently occurring situations but chance discovery especially focuses on rather rare or novel situations. In fact, recently data mining research has shifted their interests to such issues that are dealt with in chance discovery. Thus the importance of the concept of chance discovery has been recognised in recent years in several fields.

In this volume, 11 excellent papers are involved as listed below. Actually research from various fields has been collected in this volume. For instance, Amitani and Edmonds's paper shows the possibility to encourage the user to discover hidden and important information by interactive visualisation. Maeno and Ohsawa also proposed a visualisation system for making users aware of unconscious preferences. Both proposals, though their strategies are different, presented excellent schema to interactively expose hidden or potential possibilities for creative activities. They developed visualisation systems with which we can effectively pick up and create hidden and potential thoughts and reactions. In fact, both systems were demonstrated in KES2007 and participants were impressed by their effectiveness.

Choi, Oehlmann, and Cottington analysed cultural difference and the possibility and effectiveness of using the result for instance in the design of computer interfaces. They showed hidden factors between cultural differences as chances. Nara also analysed the different types of information acceptance according to cultural or national differences. Nara focused on risky cases such as earthquakes. From her analysis, we can understand emotional differences caused by nationality or social situations. For instance, the information acceptance of Chinese people about the situation after the Sichuan earthquake is rather different from that before the earthquake. Such analyses can be applied or considered when we design systems for cross-cultural or mixed-cultural situations. Whereas Choi et al. dealt with a chance for positive situations, Nara addressed chances in negative situations.

Abe, Tsumoto, Ohsaki, and Yamaguchi proposed an effective rule evaluation support system. After data mining, the cost of rule evaluation is high. This situation is the same as or even more difficult in chance discovery. The user should evaluate and discover necessary chances in a way as diamonds are discovered among stones. Their proposal will lessen the cost of the chance discovery process.

Rybakov proposed an extended temporal logical formalisation that can be used in uncertain situations. As can be expected, a chance involves a sense of possibility and uncertainty. Accordingly, his theory can be applied to a chance discovery process to achieve better results. This type of fundamental paper might be more difficult to understand than more application oriented papers, but it supports the concept of chance discovery and is necessary to extend the chance discovery concept in the future.

Nakamura, Ohsawa, and Nishio proposed an interactive tool for the construction of concepts that vary according to the perceptions, categorisations, and areas of focus derived from the expertise of the observer. During playing an analogy game that they proposed, they observed that users' success in processing concepts improved the ability to form internal representations of the external world. This interaction procedure shows a chance discovery process where the users are aware of or discover their potential imagination or creativity.

Magnani and Bardone pointed out that a cognitive niche emerges from a network of continuous interplays between individuals and the environment. People alter and modify the environment by mimetically externalising fleeting thoughts, private ideas, etc., into external supports. Then he introduced the notion of *affordance* to retrieve chances (cognitive niches) embedded in the environment. The notion of *affordance* was originally introduced by Gibson for an explanation of human visual phenomena and the notion is extended to, for instance, the universal design guidance etc. by Norman. The introduction of *affordance* is very novel and will lead the cognitive type of chance discovery research to new directions. Though approaches by Nakamura et al. and Magnani seem quite different, they aim at the same direction in the sense of, for instance, a support system for concept construction.

Yada, Washio, and Ukai modelled peoples' behaviour after financial crises. As pointed out above, recently, we have experienced very big financial crises such as the market panic incited by an increase in subprime loans in August 2007. As a consequence Lehman Brothers filed chapter 11 in September 2008. In addition, GM also filed chapter 11 in June 2009. We have experienced a series of financial and economic crises, and this type of financial or economic crisis still continues today.

Actually for the case of GM, since many experts expected GM's bankruptcy, the effect of the bankruptcy had already been included in the stock market. However, if they could not predict GM's bankruptcy, it would have incited a market panic. It is important to predict peoples' behaviour in such rare situations. Thus an analysis by Yada et al. within the context of chance discovery will be very important for the future financial situation as well as the current financial crises.

Vorobieva and Schmidt proposed a combination of case-based reasoning and statistical modelling which can deal with exceptions. They used case-based reasoning for explaining exceptional models. They proposed it in medical decision situations. In fact, in medical situations, many exceptions can be observed. Accordingly, it is necessary to deal with such exceptions. Their application involves medical problems but this type of system can be applied to general chance discovery procedures. In addition, in the area of medical diagnosis, Abe, Hagita, Furutani, Furutani, and Matsuoka proposed a web-based interactive interface which can check hidden or rare but very important relationships in diagnostic data sets. Indeed, it can be used in applications where data mining cannot return sufficient results, because the data size is insufficient or the data are heterogeneous. In such situations, it is necessary to discover hidden or potential factors

which are sometimes important factors in various applications as well as in medical diagnosis.

I gave an overview over the selected papers in the order shown below;

- Shigeki Amitani and Ernest Edmonds: A method for visualising possible contexts.
- Yoshiharu Maeno and Yukio Ohsawa: Reflective visualisation and verbalisation of unconscious preference.
- Gyoung Soon Choi, Ruediger Oehlmann, and David Cottington: Discovering chances for cross-cultural colour design.
- Yumiko Nara: Risk experience, information, and chance discovery: focusing on earthquakes in China.
- Hidenao Abe, Miho Ohsaki, Shusaku Tsumoto, and Takahira Yamaguchi: Improving a rule evaluation support method based on objective indices.
- Vladimir Rybakov: Modelling of Chance Discovery in variations of Linear Temporal Logic implementing agents' interaction.
- Jun Nakamura, Yukio Ohsawa and Hiroyuki Nishio: An analogy game: toward cognitive upheaval through reflection-in-action.
- Lorenzo Magnani and Emanuele Bardone: Chances, affordances, and cognitive niche construction: the plasticity of environmental situatedness.
- Katsutoshi Yada, Takashi Washio, and Yasuharu Ukai: Modelling deposit outflow in financial crises: application to branch management and customer relationship management.
- Olga Vorobieva and Rainer Schmidt: Case-Based Reasoning to explain medical model exceptions.
- Akinori Abe, Norihiro Hagita, Michiko Furutani, Yoshiyuki Furutani, and Rumiko Matsuoka: An interface for medical diagnosis support: from the viewpoint of chance discovery.

The tendency of chance discovery research has gradually changed since Ohsawa addressed the importance of dealing with rare and novel events as chance discovery. Many application (oriented) researches are currently conducted. This becomes possible because certain theories and methodologies have been established for chance discovery. Of course, neither theories nor methodologies are final. Since the world and human minds are changing, it becomes more and more necessary to investigate logical foundations, theories and methodologies for chance discovery. However, for the actual lives, especially, in recent years, many crises such as financial crises and medical crises are frequently observed and reported. In such uneasy and unstable situations, application oriented chance discovery research should be necessary. Thus as shown above, current target fields of chance discovery are financial issues, accidents or disasters, medical issues, thought and creativity support etc. where not-frequently occurring events occasionally have great effects on future situations.

Therefore, we should continue and progress chance discovery research according to the change of the situation and the environment. In KES2009, we will also have an invited session on Innovations in Chance Discovery. Again excellent research results will be presented in that session. We will continue invited sessions in KES conferences and also in other sessions and workshops. For information on further and past sessions in KES conferences, please visit one of the home pages of the invited sessions in KES conferences, for instance, http://ultimaVI.arc.net.my/ave/KES2009/.

Reference

Ohsawa, Y. (2002) 'Chance discovery for making decision in complex real world', *New Generation Computing*, Vol. 20, No. 2, pp.143–163.