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Natural Computing and Beyond

Winter School Hakodate 2011, Hakodate, Japan, March 2011 and 6th International Workshop on Natural Computing, Tokyo, Japan, March 2012, Proceedings

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Preface

This book is a joint publication of the Winter School of Hakodate (WSH) 2011 conference at the Future University of Hakodate and the 6th International Workshop on Natural Computing (6th IWNC) at the University of Tokyo. WSH 2011 had been scheduled for March 15–16, 2011, but on March 11, just four days before the event was due to begin, the catastrophic Tohoku earthquake and tsunami struck, causing massive damage to the northeastern coast of Japan.

At the time of the earthquake, one of the co-chairs of WSH 2011, Suzuki Yasuhiro, had been attending a conference in the Tokyo Bay area (at the Nihon Kagaku Miraikan, or National Museum of Emerging Science and Innovation) and was promptly evacuated to a nearby emergency shelter. From the shelter, Prof. Suzuki sent the following email to Prof. T. Nakagaki, the principal organizer of WSH 2011.

From: Suzuki
To: Nakagaki
21:10, March 11, 2011
—
Dear Dr. Nakagaki,
I was in the Tokyo area when the earthquake hit and am now in a nearby shelter.
How is the current situation in Hakodate?
I do not suppose we will have to change the schedule for the winter school.
What do you think?
All the best,
Yasuhiro SUZUKI

As time went by, it became clear that the damage from the tsunami was very serious indeed and that a further disaster, involving the No. 1 power plant at Fukushima, was developing. Almost all airline flights to Japan were cancelled and public transportation in the northeastern and Kanto (Tokyo) regions of Japan were in disarray, making attendance at the WSH impossible for foreign participants. Suzuki and Nakagaki discussed the situation and concluded that it was best to cancel the winter school as it had been planned, but hold a small workshop for whatever participants were able to come to Hakodate:

From: Nakagaki, Suzuki
To: All participants in the Winter School of Hakodate
10:31, March 13, 2011
—
Dear participants in the Winter School of Hakodate,
As all of you know, we have experienced a major catastrophe in Japan and continue to face unknown circumstances. Here in Hakodate, we have sustained damage near the centre of town, resulting in a suspension of service for most incoming railways. Fortunately, airways departing and arriving at the Hakodate airport are nearly on time (with some delays) and municipal transportation is running as usual.
In light of the larger regional emergency we did discuss outright cancellation of the Winter School conference, but since the event was scheduled for the last month of the financial year, full cancellation would likely cause problems for the management of grants and expenditures. Therefore, we have decided that it is best to cancel the planned conference but to hold a small workshop for any participants capable of making the journey to Hakodate as planned.
To participants from abroad we have already announced that the workshop has been cancelled, as most flights into Japan are suspended and advisories against travelling to Japan are in effect until the situation stabilizes. If you cannot attend the smaller workshop due to transportation issues or other difficulties, please feel free to cancel.
As mentioned, the workshop will be small and will probably take the form of a casual seminar with a more flexible schedule. We kindly ask that any participants who have reserved a hotel room near the JR Hakodate station please confirm their reservations.
We extend our deepest sympathies to those suffering in any way due to the recent catastrophe and hope that family and friends are safe.
With kindest regards,
Nakagaki and Suzuki

Under these unforeseen circumstances, the workshop proceeded and was attended by a total of seven participants from various parts of Japan. Over the next few days, we became aware of the massive loss of life due related to the tsunami, and of the worsening situation at Fukushima. Nevertheless, while in attendance at the workshop, we tried to focus on the topics at hand: physics, chemistry, computer science, biology, and aesthetics. We were pleased to find the discussions intense and energetic, with particular interest focused on Prof. Akiba's talk on modern arts from the point of view of natural computing. This talk was based on his book *A New Type of Aesthetics,* which proposed an understanding of aesthetics based on the mechanics of natural algorithms. So well received was this talk that it inspired the launch of a new research group in computational aesthetics in the Special Interest Group of Natural Computing (SIG-NAC), a part of the Japanese Society for Artificial Intelligence (JSAI).

SIG-NAC has been organized by the International Workshop on Natural Computing since 2006.

In the days following the workshop, Tokyo had become something of a "ghost town" due to the lack of electric power. Lighting for commercial uses in train stations and shopping areas was limited, many shops were closed altogether, and a significant number of people were stranded in the city centre.

Almost 12 months passed before we gathered again in Tokyo for the 6th International Workshop on Natural Computing (6th IWNC) at the University of Tokyo, from March 28 to 30, 2012. At this workshop, we were reacquainted with the participants at the WSH in Hakodate, and the computational aesthetics research group convened at a special lunch and symposium.

Because WSH 2011 and 6th IWNC are so closely related, we have decided to edit this special publication, merging papers presented at both the Winter School of Hakodate 2011 and the 6th International Workshop on Natural Computing. The publication includes a wide range of interesting new work.

On the topic of computing with natural media, I. Kunita, S. Sato, T. Saigusa, and T. Nakagaki present "Ethological Response to Periodic Stimulation in *Chara* and *Blepharisma*"; I. Kunita, K. Yoshihara, A. Tero, K. Ito, C. F. Lee, M. D. Fricker, and T. Nakagaki present "Adaptive Path-Finding and Transport Network Formation by the Amoeba-like Organism *Physarum*"; and Y. Fujiwara presents "Aggregate 'Calculation' in Economic Phenomena," illustrating a number of interesting distributions and fluctuations.

In the area of natural computing, M. Hagiya and I. Kawamata present a position paper titled "Towards Co-evolution of Information, Life and Artificial Life"; and Y. Suzuki presents "Harnessing Nature for Computation."

On the topic of computational aesthetics in natural computing, F. Akiba proposes "A Theory of Art Learned from Natural Computing" in which he points out the special significance of natural computing when considering computational aesthetics; M. Goan, K. Tsujita, T. Ishikawa, S. Takashima, S. Kihara, and K. Okazaki present the "Asynchronous Coordination of Plural Algorithms and Disconnected Logical Types in Ambient Space"; and J. Watanabe offers "Aesthetic Aspects of Technology-Mediated Self-Awareness Experience" along with several pieces of related artwork.

On the topic of synthetic biology in natural computing, N. Noman, L. Palafox, and Hitoshi Iba propose a "Method for the Reconstruction of Gene Regulatory Networks from Gene Expression Data Using a Decoupled Recurrent Neural Network Model"; L. Palafox, N. Noman, and H. Iba investigate the use of "Evolutionary Techniques for Inference in Gene Regulatory Networks"; and R. Sekine and M. Yamamura review the "Design and Control of Synthetic Biological Systems."

We sincerely thank all contributors for their interesting work and their prompt support in editing this joint volume. We express special thanks to Prof. Masami Hagiya from the University of Tokyo on organizing 6th IWNC and A. Hofmann from Springer, Heidelberg, and to the staff at Springer Japan for this special publication. WSH 2011, 6th IWNC, and this publication were supported by

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December 2012

Yasuhiro Suzuki
Toshiyuki Nakagaki
Co-Chairs WSH2011 and 6th IWNC

Organization

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