Form 7／様式7

(Report 1)

FY 2009

JAPAN SOCIETY FOR THE PROMOTION OF SCIENCE (JSPS)

Report on JSPS BRIDGE Fellowship Activities

by individual BRIDGE Fellows

1. Fellow's BRIDGE Fellowship ID

BR090203/M

1. Affiliated JSPS Alumni Association

JSPS France

3. Name in Full

TOUATI	Corinne	Eva
FAMILY	First	Middle

4. Host Researcher

Name in Full	Affiliation
Prof. Li Jie	University of Tsukuba

5. Period of BRIDGE Fellowship tenure

From			To		
01	02	2010	31	03	2010
Day	Month	Year	Day	Month	Year

7. Please write on the attached form.
8. Please write on the attached form.
9. Please write on the attached form.

Date: April 19, 2010

NAME (Print) : Corinne Touati

Signature:

(Notes)

1. Please send this completed form to both JSPS's Tokyo headquarter and your affiliated alumni association within one month after finishing your tenure under the BRIDGE Fellowship.

7. Research network created, sustained and/or strengthened with Japanese researchers through your visit. (Please add lines if needed)

7-1) Research network created:

During my stay in the University of Tsukuba, I had the opportunity to meet Prof. DongSheng Cai and Prof. James Cole, both from the CAVE laboratory of the University of Tsukuba. Their work focuses on numerical analysis and visualization of physical phenomena, mostly around light propagation. During my visit, I had the opportunity of having several constructive meetings with them about how to use population models from game theory to model the behavior of photons in light propagation.

During my one week trip to Kyoto University, I met Prof. Susumu Yoshida and Prof. Koji Yamamoto, both from the department of communications and computer engineering. They organized a small one day event where: 1. They presented their laboratory's main activities, 2 Prof. Yamamoto presented one of his recent work, very related to my field of expertise: optimization using game tools from game theory. He is using minority games, a special kind of games that are dynamic in nature. This is a promising and unconventional field. His application was the performance evaluation of self-organized wireless systems. 3. I presented a recent work of mine with a distributed algorithm for learning non-cooperative equilibria.

Is there a possibility of the above network yielding an application for a JSPS program?

Yes.

If yes, please state the name of the program and researchers who may participate on both sides.

We would like to apply for a JSPS bilateral agreement program with the INRIA in France, called Ayame program.
In the French side, the participants would be Derrick Kondo, Bruno Gaujal and Corinne Touati, from the MESCAL INRIA Project team in INRIA Rhone Alpes, Grenoble.
In the Japanese side, the main participants would be Prof. Cai and Prof. Cole (University of Tsukuba). Prof Li and Prof. Kameda (University of Tsukuba) and Prof. Fukushima (Kyoto University) could also participate to the project.

7-2) Research network sustained:

I sustained my network, both in the University of Tsukuba and in Kyoto University.
In the University of Tsukuba, I continued my work with Prof. Kameda on both Nash Equilibrium based Fairness and on the definition of fairness in non-convex systems. The papers are now ready and are performing the final proof-checking for submission to peer-reviewed international journals.

In the University of Kyoto, I visited Prof. Fusao Oka and Prof. Fukushima, both I knew from previous visit. One of my master student, presently performing his studies at the ENSIMAG (Grenoble) is visiting Prof. Fukushima and works on algorithmic solutions to the maximum of entropy problem. We discussed the progress made by the student.

Is there a possibility of the above network yielding an application for a JSPS program?

No.

If yes, please state the name of the program and researchers who may participate on both sides.

7-3) Research network strengthened:

I strengthened my collaborations with Prof. Li and his students. I gave two one-hour seminars in his laboratory about game theory and potential applications to wireless systems. I also had fruitful discussions with him and one of his doctorate students about routing protocols in wireless systems.

Is there a possibility of the above network yielding an application for a JSPS program?

Not in the near future.

If yes, please state the name of the program and researchers who may participate on both sides.

8. Results of your research and networking activities in Japan

During my trip to Japan, together with Prof. Kameda, we could write two papers to be submitted to international journals.

First, we made advances on our work about application of non-cooperative games to define fairness. We found a nice application result based on potential games, where the fairness criterion exists and can be computed via a totally distributed algorithm. The algorithm contains two steps. During the first one, the classical Nash equilibrium is computed. During the second, the algorithm evolves towards a Nash based point. The algorithm is stable in the sense that each user has incentive to follow it. Moreover it is proven optimal. We further wrote down an article with these latest developments that is now ready for submission to an international journal.
Also, we finalized the paper "**Fairness in Non-convex systems**", Corinne Touati, Hisao Kameda, Atsushi Inoie, to be submitted to the European Journal of Operation Research.

Aside from these two papers, I could develop two lines of research.

Thanks to discussion with Prof. Li Jie and his doctorate student, Khoriba Ghada, we could develop an extension of the AODV routing protocol that takes into account online measurements of the delay to find an optimal route. The convergence and optimality properties are proven using tools from game theory. This is in line with previous works of Prof. Li and Mrs. Ghada where the route is chosen so as to save energy on the nodes that already have low remaining batteries. The paper, entitled "**Self Optimizing Routing in MANETs with multiclass flows**", with Pierre Coucheney and Bruno Gaujal, is to be presented at the next PIMRC 2010 conference. Our goal is now to jointly develop realistic simulations to numerically assess the performance of the algorithm.

Following my two seminars in the university of Tsukuba, Prof. James Cole, whose research includes simulation of physical phenomena, and more specifically, light propagation, contacted me. OCT (Optical Coherence Tomography) is now a common clinical procedure to make detailed images of living tissues. It uses a light beam sent to the structure. Then, photons reflected from the same optical depth can be gathered to form a layer-by-layer image. Unfortunately, speckle degrades the image quality. His goal is to understand the basic processes that govern propagation in biological tissues. Game theory, and more specifically population games can turn to be a useful tool to model the behavior of photons and how microscopic scales photons and tissue interactions impact the macroscopic scale perceived speckle and resulting image. Thanks to numerous discussions we were able to derive a first simplified model that can serve as a starting point for preliminary results. As this kind of application is different from the ones I am used to (mostly computer distributed systems and wireless networks), understanding the physical model took me time and effort, and I am glad my visit was long enough to allow that. Yet, I believe that the theoretical tools that I am specialized in can help studying such problems.

From the networking point of view, I visited Prof. Yoshida and Prof. Yamamoto (Kyoto University), who are currently hosting one of my master student (she is spending one year in Kyoto university, as an exchange student, under their supervision). They are performing research on a very related topic to mine. Prof. Yoshida gave me a presentation of his laboratory while Prof. Yamamoto presented one of his recent works and showed me the equipment in their laboratory. While my own laboratory focuses on the modeling side and numerical simulations, their laboratory is equipped with state-of-the-art equipment (signal generator, attenuator and oscilloscopes) that help them doing realistic signal measurements. From this point of view our teams are very complementary. Their work on minority games is very interested, but also new to me and I now need to read more about that kind of games. Then, I am optimistic that we can develop some future collaboration.

9. Contributions to networking between researchers in your alumni association's country and colleagues in Japan

During my visit in Japan, I could participate to two scientific events. The first one was the ICT France – Asia conference in Keyo University. There, I could meet people from the AIST-CNRS French-Japanese joint laboratory in Tsukuba. Also, I met Prof. Denis Perret Gallix, a french physicist from the CNRS, now at the head of the France-Japan Particule Physics (FJPP) – Toshiko Yuasa laboratory. He is a physicist who uses grid computing to handle the extremely large amount of data used in their experiments. In my laboratory in France, we have computer scientists expert in the Grid computing and scalable solutions. Although I am not myself involved in that kind of research, I contacted the people in my laboratory to see how potential collaborations between the computer scientist grid experts could help the physicist community in need for the tools they are developping. They were very enthousiastic about the prospect of collaborating with the physicists.

I also participated to the "Erasmus Mundus & EU – Japan bilateral academic cooperation" event, organised by the Delegation of the European Union to Japan, Tokyo. There, the aim was to meet people from europe interested in developping collaborations with Japanese universities and research laboratories and thinking about how to advertise Europe as a research partner.
To this regard, my university (Grenoble INP) is now preparing a proposal under the "erasmus mundus action 2" that group a consortium of five european universities and six asian universities (four Japanese universities and two South Korean universities). I am participating to the writing of the proposal, thanks to information I received during the Erasmus Mundus event. If successful, this program would help strenghen the collaborations between my university and the partner universities in asia, through mobility programs.

While visiting the universities of Tsukuba and Kyoto, I met people involved in the Project for Establishing Core Universities for Internationalisation (Global 30), launched by the MEXT to promote international cooperation. Thanks to this program, in particular, foreign scholars can apply for (no-tenure) assistant or associate professor positions in participating japanese universities. I am, in particular, advertising a position open in the graduate schol of engineering of Kyoto university in the area of mathematics that might interest some of my collegues in Grenoble.

Finally, I met with Prof. Oka to discuss th final elements of our double degree agreement program between Grenoble INP and Koto University. The program is now finalized and has been sent for signature to the department head.