

京都大学若手人材海外派遣事業 スーパージョン万プログラム
研究者派遣プログラム

英文報告書

提出日：平成 28 年 1 月 6 日

1. 渡航者（日本語）			
氏 名	玉置 卓	採択年度	平成 27 年度
部 局	情報学研究科	電 話	
職 名	助教	メー ル	
研究課題名	アルゴリズム設計と計算複雑性理論の関係		
海外渡航期間	平成 27 年 5 月 24 日～平成 27 年 11 月 18 日		
渡航先 (英語表記)	国名：アメリカ合衆国 (The United States of America) 大学等研究機関名：カリフォルニア大学サンディエゴ校/バークレー校 (The University of California, San Diego/Berkeley) 研究室名等：アルゴリズム・計算複雑性・暗号センター/サイモンズ計算理論研究所 (The Center for Algorithms, Complexity and Cryptography/The Simons Institute for the Theory of Computing) 受入研究者名：Ramamohan Paturi 教授 (Professor Ramamohan Paturi)		
2. 渡航の報告（英文）			
渡航先の研究環境、研究者との交流、研究発表の状況等、渡航中の滞在経験について英語 (500～1000 語) で記述して下さい。受入研究者と撮影した写真や研究発表で用いた図等について、可能な範囲で別添として提出して下さい。ページ数については増加してもかまいません。			
Research environments: Simons Institute is founded for theoretical computer science. It hosts one or two programs per semester. Each program invites more than 50 long-term participants, research fellows, postdocs and graduate students, and organizes two or three workshops and a boot-camp. Past programs have produced successful collaboration and given excellent education that resulted in a number of research achievements. I participated in the “Fine-Grained Complexity and Algorithm Design” program that invites lots of top researchers and strong students in the areas of computation theory and algorithm design. The environment is really nice for getting familiar with other researchers in the sense that the university, institute and participants planned various social events. I had opportunities to talk about my research, twice at workshops and once in a seminar. After each presentation, I was talked to by participants and it turned out that I started joint work with some of them. I am very sure that Simons Institute provides the best environment for collaboration in theoretical computer science; it is very effective to invite many researchers who strongly share research interests and keep them in the same place for a sufficiently long term. On the other hand, while staying at UC San Diego, I had enough time to think about my research			

plan alone because it was summer holidays at that time and I saw researchers only occasionally on campus. I would like to say this is also an ideal research environment. I came up with several ideas that turned out to be the seeds of joint papers written at Simons.

Research interactions:

I wrote two joint papers during my stay at Simons: one with Daniel Lokshtanov, Ramamohan Paturi and Ryan Williams (Item 1 below), and the other with Alexander Golovnev, Alexander S. Kulikov and Alexander V. Smal (Item 2 below). We are still working together on new topics.

In addition, I wrote a paper based in part on the discussion with Rahul Santhanam, Stefan Schneider and Srikanth Srinivasan (Item 3 below). They are not on the list of the authors this time, but we will continue our collaboration.

Furthermore, I had a lot of chances to deepen friendship with or get acquainted with researchers during my stay and through attending international conferences and visiting universities. I was fortunate to discuss or exchange information with the following people: Wolfgang Bein, Arkadev Chattopadhyay, Ruiwen Chen, Ariel Gabizon, Nicola Galesi, Valentine Kabanets, Petteri Kaski, Antonina Kolokolova, Lawrence Larmore, Emanuele Viola, to name a few.

Research achievements:

The following papers are based on the research conducted during my visit:

1. Daniel Lokshtanov, Ramamohan Paturi, Suguru Tamaki, Ryan Williams. Beating brute force for systems of polynomial equations over finite fields. Submitted to STOC 2016.
2. Alexander Golovnev, Alexander S. Kulikov, Alexander V. Smal, Suguru Tamaki. Circuit size lower bounds and #SAT upper bounds through a general framework: new bounds and limitations. Submitted to CCC 2016.
3. Suguru Tamaki. A satisfiability algorithm for depth 2 threshold circuits with a sub-quadratic number of gates. To be submitted to FOCS 2016.

Item 1 resolves a fundamental open problem in algorithm design, computer algebra and cryptography. Items 2 and 3 push the frontiers in the study of the circuit satisfiability problem, which is one of the hottest topics in computation theory and main focus of the program.