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香港中文大學
The Chinese University of Hong Kong

Institute of Theoretical Computer Science and Communications

CSE-ITCSC Joint Seminar

Space-Bounded Communication Complexity

By
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January 6, 2014, Monday

2:30pm –3:30pm

Room 121, 1/F., Ho Sin Hang Engineering Building, CUHK

Abstract:
Since its introduction in 1979 by Prof. Andrew Yao, communication complexity has emerged as a foundational tool to proving lower bounds in many areas of computer science. In this model, two (or more) parties try to cooperatively compute a function while each only has part of the input, and goal is to minimize the amount of information exchange.

In classical communication complexity, the participating parties are all-powerful, in particular, they can always remember the whole communication history and every bit that's been communicated. This generality gives the model power. But this power also comes with a price: no super-linear communication lower bound is possible.

We introduce memory model for the 2-party communication complexity. We restrict the amount of memory space each party can use to compress their communication history into. In other words, although the local computation each party can carry out in a single communication step remains unlimited, the amount of information each party can carry through different communication steps is limited.

In this talk, I'll introduce the space-bounded communication complexity model and its variants. We are particularly interested in a restricted model called the one-way limited-memory model, in which the communication is one-way, and the receiving party can only using its memory space in a restricted way. I'll talk about the connections between this model and the communication complexity analogue of the polynomial hierarchy. These connections provides nice combinatorial characterizations for old complexity classes, more elegant proofs for known results, and new tools to the study of well-known complexity problems. I'll also discuss the connection and separation between this model and the bounded-depth NC circuit classes and bounded-width branching programs.

This talk is based on joint work with Joshua Brody, Shiteng Cheng, Periklis A. Papakonstantinou, Dominik Scheder and Xiaoming Sun.

Biography:
Hao Song is a Ph.D. candidate at the Institute for Interdisciplinary Information Sciences, Tsinghua University. He got his bachelor's degree from the department of computer science and technology of Tsinghua University in July of 2008, and joint the IIIS in the same year. His research interest lies in computational complexity, and in particular communication complexity.

******* ALL ARE WELCOME *******