# 7.　Discrete Event Simulation Research Team

## 7.1. Team members

　　　Nobuyasu Ito (Team Leader)

　　　Hajime Inaoka (Research Scientist)

　　　Tetsuo Imai(Postdoctoral Researcher)

## 7.2. Research Activities

This team started on October 1st in 2012, and preparation to start up the team were conducted in this year. Four team members were designated: two joined the team in the end of fiscal year of 2012(Dr. Inaoka from February 2013, and Dr. Imai from March 2013). Two more will join in April 2013. Cluster server and workstations for the team were procured are started operation.

## 7.3. Research Results and Achievements

Research results and achievements will come in the following years.

## 7.4. Schedule and Future Plan

During the following years, this team will develop software for discrete-event simulation for K computer and study their application for social phenomena. Two kinds of applications will be studied and developed: one is simulation software for graph simulations, and the other is management software for various application software with various parameters.

The first one for graph software is to simulate graph dynamics and dynamics on graph. Graphs are discrete objects characterize heterogeneous structures which are ubiquitously observed in discrete-event phenomena, for example, traffic networks, human relations and economic activity. Simulations of those discrete-event phenomena need to treat evolutions on given graphs, for example, how cars flow on roads, and also to treat development of graph structures, for example, how new roads and highways are constructed and destroyed.

However, high-performance computers nowadays are desined for homogeneous simulations, for example, number crunching ones on regular lattices or with regular structures. Graph treatment is still underdeveloped stage. This team has started to develop such graph treatment on K computer, and simulation software for various discrete-event phenomena will be studied and developed.

In general, discrete-event simulations are accompanied with combinatorial variety of input and output. For example, a small change in control of traffic signal may cause disastrous jam. Smooth output cannot be expected from a small change in input. Combinatorial effort for parameter search and output fitting for various simulation models will be necessary. The other kind of applications, management software, is to enable to attack this challenge beyond human brains and hand works.

Preliminary version of graph treatment software and management software will be developed and tested in 2013. Application software for some basic social simulations, for example, traffic flow, human crowd, economic trade and human relations will be developed in 2014 and 2015. Those will work with the management software. In 2016 and 2017, those software will be released for K computer users.

## 7.5. Publication, Presentation and Deliverables

(1)  Journal Papers

Koji Oishi, Takashi Shimada and Nobuyasu Ito, " Group Formation through Indirect Reciprocity," Physical Review E vol.87 (2013) p.030801(R)(4 pages).

(2)  Conference Papers
-None

(3)  Invited Talks
-None

(4)  Posters and presentations
   1.  26th Workshop "Recent Developments in Computer Simulation Studies in Condensed Matter Physics"  (The University of Georgia, Athens, U.~S.~A., February 25-29, 2013)
   2.  Nobuyasu Ito, "Human behavior in video sharing sites".
   3.  Koji Oishi and Nobuyasu Ito, "Group Formation through Indirect Reciprocity".

(5)  Patents and Deliverables
-None