The role of strongly-connected components in the network of Japanese companies

S.Sameshima[a], T.Ohnishi[b], H.Takayasu[c] and M.Takayasu[a]

[a]Department of Computational Intelligence and Systems Science, Interdisciplinary graduate School of Science and Engineering, Tokyo Institute of Technology
4259-G3-52 Nagatsuta-cho, Midori-ku, Yokohama 226-8502, Japan
samesame@smp.dis.titech.ac.jp

[b]Graduate School of Law and Politics, The University of Tokyo

[c]SONY Computer Science Laboratories

We analyze a large data set of Japanese companies which consists of financial data for about 1 million companies including the information of business partner relationships. The reconstructed network of such information of business transactions has been shown to follow a directed scale-free network. In order to analyze the structure and basic statistical properties of this gigantic network, we use supercomputers; the Earth-Simulator and TSUBAME.

We calculate the distance distribution, and the size distribution of the strongly-connected components. A strongly-connected component (in short SCC) is defined by a sub-graph in which there is at least one path from an arbitrary chosen node to the other arbitrary chosen node in the sub-graph. We compare the difference of the largest SCC to the other SCCs of this business transactions' network. We find that the largest SCC is generally consisted of much larger number of elements than that of the rest of SCCs. This dominance of the largest SCC holds in the sub-network for each job category and for each district of area. Also we confirm that the distribution of growth rate of companies belonging to the largest SCC is significantly different from the growth rate distribution for non-SCC companies.

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