

Game Theory Seminar Panel

Reaching Equilibria: game play, informational assumptions and applicability

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Discussed papers

- On a Network Creation Game and Characterizing Selfishly Constructed Overlay Routing Networks.
- A mathematical model for the TCP Tragedy of the Commons.

Game Dynamics

- Classical approach, the authors have not considered the dynamical behavior. The authors don't show how the equilibria are reached, they find the N.E. solutions analytically and show its characteristics.
- One extension could be if we consider a population of k connected graphs representing the possible topologies. Over these k connected graphs, we have a global expected payoff. Then a mutation will provide a new population of k' connected graphs. This mutation will last for next generations if the new expected payoff is greater than the previous one (necessary condition).

Available Information

- The nodes just have to know the cost of each link and the distance to all other nodes.
- These informations don't change in time in the first paper.
- The second one considers the link cost depending of the node degree.
- Both papers don't consider the congestion in the link weights.
- The game has perfect and complete information.

Applicability

- The model seems to be so simplistic given the complexity of the Internet Topology. An extension could be:
 - The model could consider the traffic matrix because the congestion is relevant in the traffic cost.
 - The link cost to be fractional.
 - A scenario with nodes entering and leaving the network.
- The main difficulty of these extensions is to keep the model tractable.

Game Dynamics

- The paper does not address dynamic behaviors. The authors examine the system state for each possible configuration. The equilibrium is reached when all users cheat.
- A natural extension would be to allow each user to choose its strategy. Analogously to the model proposed in [Dan05], a user would assume an evil behavior with a rate proportional to its gain. On the other hand, a user would become fair only due to a mistake.

Available Information

- Users must know their own slot. This information does not change, since the number of players is fixed.

Applicability

- Fixed number of players seems to be a too restrictive assumption.
- Slotted time division force all players to be synchronized, with is a very unlike situation
- A central entity is needed to distribute slot ownership
- Lack of an acknowledgment mechanism

References



Daniel Sadoc Menasché and Daniel Ratton Figueiredo and Edmundo de Souza e Silva.

An Evolutionary Game Theoretic Approach to Congestion Control.

Performance Evaluation, 2005.