CS-698w: Game Theory and Collective Choice **Jul-Nov 2017**

Lecture 11: A Real Life Example

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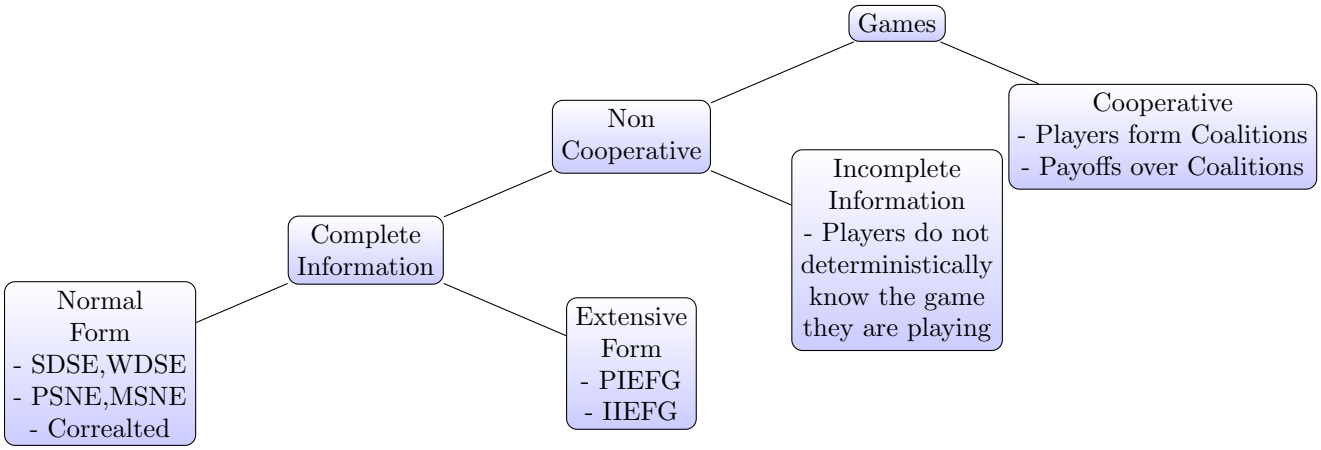
11.1 Recap



11.2 Peer to Peer

Peer to Peer denotes a completely decentralized network in which each client is capable of acting as a server for another.

11.2.1 Basic Terminology

1. **Protocol**: Messages that can be sent, actions that can be taken over the network
2. **Client**: A particular process for sending messages, taking actions
3. **Reference Client**: A particular implementation of P2P

11.2.2 Early Implementations

11.2.2.1 Napster

1. Centralized database
2. Users download music from each other

11.2.2.2 Gnutella

1. Get list of IP addresses of peers from set of known peers (no server)
2. To get a file: Query message broadcast by peer A to known peers
3. Query response: sent by B if B has the desired file (routed back to requestor)
4. A can then download directly from B

11.2.3 The File Sharing Game

		Person 2	
		Share	Free Ride
Person 1	Share	$2, 2$	$-1, 3$
	Free Ride	$3, -1$	$0, 0$

11.2.4 BitTorrent Protocol

1. Break file into pieces: A repeated game!
2. If you let me download, Ill reciprocate.

11.2.5 BitTorrent Optimistic Unchoking Algorithm

Tracker is a centralized entity that controls the traffic, tracks the connection between peers and their speed of upload, download etc.

11.2.5.1 Reference Client Protocol

1. Set a threshold r of uploading speed (typically the third maximum speed in the recent past)
2. If a peer j uploaded to i at a rate r, unchoke j in the next period
3. If a peer j uploaded to i at a rate $< r$, choke j in the next period
4. Every three time periods, optimistically unchoke a random peer from the neighborhood who is currently choked, and leave that peer unchoked for three time periods.

11.2.6 BitThief

BitThief does not perform any chokes or unchokes of remote peers, and it never announces any pieces. In other words, a remote peer always assumes that it interacts with a newly arrived peer that has just started downloading. Thus, we are able to download without ever uploading any time.

11.2.7 Strategic Piece Revealer

1. Reference client: tell neighbors about new pieces, use rarest-first to request
2. Manipulator strategy: reveal most common piece that reciprocating peer does not have!
3. Try to protect a monopoly, keep others interested