Reputation Mechanism: From Resolution for Truthful Online Auctions to the Model of Optimal One-Gambler Problem

Milan Bradonjic
Mathematical Modeling and Analysis Group, and Center for Nonlinear Studies
Los Alamos National Laboratory, Los Alamos, NM 87545, USA
email: milan@lanl.gov

November 29, 2009

Game theory has been present in both theory and applications in settings of games over (large) number of agents, providing the explanation on the (rational) agents’ behavior. A very well studied, and today, proficient and very exploited, part of game theory is the theory of auctions (see a monograph by Milgrom 2004). The auctions have been a natural way for auctioneers to assign resources to selfish agents who compete for resources, e.g., wireless spectrum, or for e.g., electronic equipment, songs, or other digital goods. Online auctions on the Internet are substantially different than traditional offline auctions (Cassady 1967, Stark and Rothkopf 1979, Milgrom 1982, McAfee and McMillan 1987), and apropos that fact their bidders behave differently (Beam and Sergev 1998). The presence of feedback forums, such as Amazon, eBay, Yahoo!, at online auction sites, provide us with the possibility to rank other agents, get informed, and be ranked. This effect, in any case, affects the market outcome – given that we already have some information about the agents with whom we deal. For an overview of eBay, and the aspects of reputation on eBay, we refer the reader to (Bajari and Hortacsu 2003, Resnick et all 2006, Resnick and Zeckhauser 2002). Also regarding work on reputation we refer the reader to (Houser and Wooders 2006, Dellarocas 2005). For the question on optimal bidding strategy in sequential auctions see (Arora et all. 2004).

In this work, we solve the problems in the setting of the online auctions with the presence of reputation management. Reputation, should simply mean, the higher the reputation of an agent is, the more confident that agent is. Further, the notion of reputation helps the agents, or the system designer to optimally make their decisions, or to optimally design the mechanism, respectively. This optimality is enabled and conducted by the fact that any agent has signals, that is, knows reputations, of other agents in the game. We naturally rise and solve the following two specific problems. What would be an optimal strategy, for an agent, where an optimal strategy is defined in terms of maximizing the revenue. Consequently, we move forward to the optimal gambler seller problem, and explain how that problem is refinement of the currently discussed online auction problem, plus we emphasize which class of games (problems) we want to solve.

The partial motivation for our work comes from the following problem. In (Guo 2002), Guo has analyzed an online auction system, in which it is not humanly possible to evaluate all agents’ bids. More specifically, the motivation in (Guo 2002) is that an agent has to make an instant decision, under conditions that the number of bids is large or unknown ahead of time and the bidders are unwilling to wait. Similarly, in the second part of our work, we want to model and optimize a real situation, where an agent has to make his decision quickly, precisely and instantaneously; e.g., imagine a poker player, dealer, or seller of real estate properties, where he has to think instantaneously, that is, neither he has possibility to use some computational power, nor does he have time to do it.

We show how the notion of reputation can help us in building truthful online auction mechanisms. From the mechanism design prospective, we design and derive the conditions on a truthful online auction mechanism. In the case when some agents can lay or do not have the real knowledge about the other agents’ reputations, we derive the resolution of the auction, such that the mechanism is truthful. Furthermore, considering the game from the prospective of one player, the question that arises is: What is an agent’s optimal strategy, in order to maximize his revenue? We also define the problem of optimal one-gambler/one-seller and analyze the problem, deriving some of the optimal player’s strategies.

We would like to stress that our analysis goes beyond the scope, which game theory usually discusses under notion of reputation. We model one-player games, by introducing a new parameter (reputation), which helps us in predicting the agent’s behavior, in real-world situations, such as, behavior of a gambler, real-estate dealer, etc.