**Multiagent Systems Assignment 6**

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**Question**

Read the following paper and summarize it in one or more A4 paper(s).

Gagan Aggarwal, Ashish Goel, and Rajeev Motwani. 2006. Truthful auctions for pricing search keywords. In Proceedings of the 7th ACM conference on Electronic commerce (EC '06). Association for Computing Machinery, New York, NY, USA, 1–7. https://doi.org/10.1145/1134707.1134708

**Explanation**

The research paper focuses on the role of keyword auctions in web search engine business models, specifically examining mechanisms used by platforms like Google and Overture to display and rank advertisements based on keyword bids. It addresses challenges arising from conflicting merchant objectives, varying click-through rates, and the selfish nature of merchants in these auctions. The paper introduces the "laddered auction" as a truthful and revenue-maximizing alternative to existing next-price auctions.

In the model and notation section, they establish the auction framework, including merchant bids, click-through rates, and ranking functions. The researchers assume a separability assumption for click-through rates, contributing to results on revenue equivalence. The need for a new auction mechanism is discussed, highlighting the limitations of current auctions and the unsuitability of the VCG mechanism in non-separable scenarios. The author also discussed about the laddered auction. The laddered auction is presented as a truthful pricing mechanism where merchants pay based on their ranks. The section on the truthfulness of the laddered auction proves its honesty and uniqueness under fixed bids, emphasizing its effectiveness and profitability.

Then the paper compares revenue between the laddered auction and next-price auctions, demonstrating that truth-telling is not a dominant strategy in existing auctions. Under separable click-through rates, the paper establishes the existence of a Nash equilibrium in the next-price auction with revenue equivalence to the laddered auction. The section provides a formula for defining bids in this equilibrium and proves that no merchant can gain by unilaterally changing their bid.

In summary, this research explores the challenges and limitations of existing keyword auctions, introduces the laddered auction as a better revenue-maximizing alternative method. It demonstrates revenue equivalence between the laddered auction and next-price auctions under specific conditions. The findings contribute to understanding and improving auction efficiency and revenue generation of search engines.