Market User Interface Design

[Extended Abstract]*

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1 Introduction: Market Design & UI Design

Electronic markets are becoming more and more pervasive but a remaining challenge is to develop user interfaces (UIs) to promote efficient market outcomes. This can be a challenge in markets with a large number of choices, yet traditional economic models do not consider that humans have cognitive costs, bounded time for decision making, and bounded computational resources.

Behavioral economists have begun to explore the cognitive costs associated with decision making in complex environments [1], but until now, the market design community has largely ignored the intersection of market design and UI design. Gajos et al. [2] have designed a system that can *automatically* generate UIs that are adapted to a person's devices, tasks, and abilities, but not for market domains. In our own previous work [3], we have introduced the goal of designing *simple* and *easy-to-use* interfaces for electronic markets, in particular for domains where users repeatedly make decisions of small individual value.

In this work, we propose a new research agenda on "market user interfaces" and present an experimental study of the market UI design space. A market UI can best be defined via two questions: first, what information is displayed to the user? Second, what choices/how many choices are offered to the user? Our goal is to design market UIs that make the decision-making task easier for the users and lead to more efficient market outcomes. Thus, the research question we want to answer is: *what is the optimal market UI given that users have cognitive costs?*

2 Experiment Design

To answer this question, we conducted a lab experiment with 53 users. We situate this experiment in the domain of 3G bandwidth allocation, assuming a fictitious market game with inter-temporal budget constraints. Figure 1 presents four screenshots of the game with 3, 4, 5, and 6 choices. Each game has 6 rounds and a user starts with 30 tokens which he can use to select different connection speeds. Each available speed has a *price*, in terms of tokens, and a *value*, in terms of dollars. Upon selecting a particular speed, the corresponding amount of tokens is deducted from the user's budget, and the corresponding value is added to the user's score. Determining the optimal choice is difficult, because of the budget constraint and because the values and prices change stochastically

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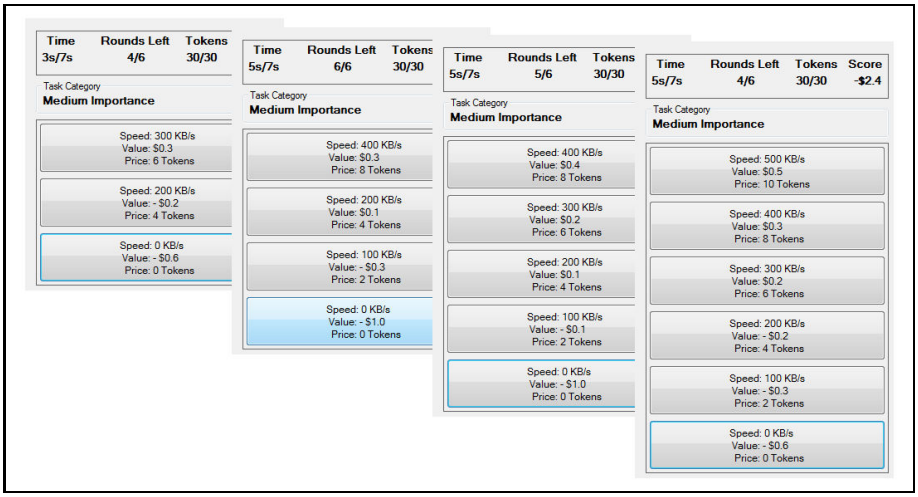

Fig. 1. Screenshots for the game used in the experiments with 3, 4, 5, and 6 choices.

in each round. Furthermore, the user has to make a decision within a time limit (7 or 12 seconds) before the lowest speed is automatically selected. Each user played 32 games and was paid his total score in the form of an Amazon gift card.

3 Overview of Results

Our experimental results illustrate the importance of taking behavioral factors into account for the design of market UIs. Our findings show that users make more mistakes with a larger number of choices, users select the optimal choice more often when its position is high, and users exhibit strong loss aversion.

When varying the "number of choices," we find that *overall efficiency* significantly increases as we go from 3 to 4 to 5 choices, and then slightly decreases as we go from 5 to 6 choices. When changing whether the composition of the choice sets stays fixed or adaptively changes according to the game situation, we find that adaptive choice sets lead to higher efficiency, with high statistical significance. Finally, we fit a quantal-response model to users' behavior and evaluate an *optimized market UI*. Here, we find the surprising result that the optimization actually *decreases* overall efficiency. Most interestingly, in particular the *more rational users* suffer from the optimization procedure, while no statistically significant effect can be observed for the *less rational users*. This finding naturally suggests our future research direction on "personalized market UIs."

References

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