Customer Coalitions in the Electronic Marketplace

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Abstract

In the last few years, the electronic marketplace has witnessed an exponential growth in worth and size, and projections are for this trend to intensify in coming years While the Internet offers great possiblities for creation of spontaneous communities, this potential has not been explored as a means for creating economies of scale among similar-minded customers

This demonstration (TSCY00) [1] will illustrate the economic incentives behind formation of buying clubs and achivement of effect of economies of scale within temporary agent coalitions The demonstration will also focus on coalition formation mechanisms for creation of such buying clubs

Introduction

A coalition is a set of self-interested agents that agree to cooperate to execute a task or achieve a goal. Such coalitios were thoroughly investigated within game theory (Pel84; RZ94; SS97; SLA$^+$99) There, issues of solution stability, fairness and payoff disbursements were discussed and analyzed. The formal analysis provided there can be used to compute multi-agent coalitions, however only in a centralized manner and with exponential complexity DAI researchers (SLA$^+$99; SS97) have adopted some of the game-theoretical concepts and upon them developed coalition formation algorithms, to be used by agents within a multi-agent system These algorithms concentrate on distribution of computations, complexity reduction, efficient task allocation and communication issues Nevertheless, some of the underlying assumptions of the coalition formation algorithms, which are essential for their implementation, do not hold in real-world multi-agent systems.

This demonstration will illustrate the economic incentives behind formation of buying clubs and achivement of effect of economies of scale within temporary agent coalitions. The demonstration will also focus

on coalition formation mechanisms for creation of such buying clubs

The demonstration will start by illustrating the protocol and scenarios in coalition formation, and presenting the economic models that show how both suppliers and customers can benefit from advent of such buying clubs (i.e *incentives* to create buying clubs), which are critical in any real-world system We will proceed by demonstrating a multi-agent system that implements formation of buying clubs based on abovementioned mechanisms Coference attendees would be able to interact with the system using a web-based interface, and form buying clubs for procurement of technical books. This system would be used to collect empirical data on user's reactions to different coalition formation scenarios in a real-world setting, as well as data on economic incentives in a situation that maximally approaches real world deployment of such a system.

Issues in Design of Coalition Systems

It is possible to construct a number of coalition models and protocols, all of which would have different properties and requirements. In general, all coalition models include several stages:

- **Negotiation:** The coalition leader or representative negotiates with one or more suppliers to provide the good or service, addressing the choice of suppliers, and evaluation of competetive bids.

- **Coalition Formation:** The coalition leader solicits new members to join his coalition, based on a set of admission constraints

- **Leader Election/Voting:** The members elect a coalition leader or cast direct votes for or against certain bids

- **Payment Collection:** The coalition leader or third party collects the payments from coalition members and is responsible for conveying the full amount to the supplier

- **Execution/Distribution stage:** As a transaction is executed and the purchased goods arrive, they must be distributed to the members of the coalition

As one designs a coalition protocol, he must take into account issues such as coalition stability, distribution of costs and risks among coalition memebers, allocation of utility after the transaction is completed, and need for trust in members of coalition, suppliers or third parties.

Most coalition protocols can be divided into two classes (*pre-negotiation and post-negotiation*), based on the order in which negotiation and coalition formation happen In pre-negotiated coalitions, the coalition leader negotiates a deal with one or more suppliers using an estimated coalition size or order volume, and then advertises the creation of the coalition and waits for other members to join. In pre-negotiation protocols, the coalition leader must estimate the group size and thus carries the risk of not being able to form a suitable coalition Other pre-negotiation protocols may shift some of the risk onto coalition members (by introducing a small price uncertainty) or onto the supplier.

In post-negotiation scenario, the group is formed first, based on some admission criteria. Then, a group leader negotiates with suppliers, and offers the resulting deal to the group. Here, the group must be able to trust its leader to negotiate on its behalf. Unless the group is formed by a number of people who know each other through other channels (i.e. a group of students in a class), there would have to be an explicit leader selection/verification mechanism, or a mechanism for collective negotiation.

Demonstration System

In order to verify the abovementioned hypotheses, we have designed a flexible test-bed that can be used to evaluate different coalition creation protocols, as well as determine the real-world feasibility of automated agent-based coalition formation and negotiation protocols.

As an initial problem domain, we chose collective book purchasing Often, in the university setting, one sees large number of students that are enrolled in the same class purchasing the same books reqiored for a class Such groups are natural coalitions, given the ease of collection of payments and distribution of goods, and a large number of potential users of the system

The testbed system (see figure 1) consists of a coalition server, an auctioneer agent, set of supplier agents, and a web-based interface for end users. The system is based on a simple pre-negotiation protocol

Users use the WWW interface to conduct reverse auctions with supplier agents. The supplier agents, in turn, are given a step function volume discount schedule and make their bids accordingly to projected sizes of coalitions After the reverse auction is complete, the coalition server opens the coalition to new members, which can join the group if they meet the entrance requirements After the group is formed, the coalition server proceeds to execute the transaction.
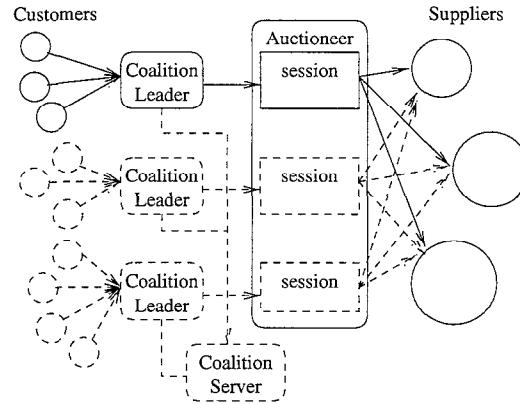

Figure 1: System Architecture

Conclusion

The demonstration system will illustrate issues in formation of spontaneous buying clubs and offer conference attendees a chance to have a hands-on expcrience with coalition formation in a virtual market environment.

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