Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 07, July-2016

Evaluating Negotiation Protocols and Negotiation Strategies for Automated E-Commerce

Aakanksha Gupta
BRCM College of Engineering and Technology,
Bahal

Durgesh Kumar Srivastava
Assistant Professor,
BRCM College of Engineering and Technology,
Bahal

Saket Jain
Senior Engineer,
Business Support System Ericsson Global Pvt. Ltd,
Gurgaon

***Abstract*--Online or E-Shopping requires a great effort of investigation to find the best deal. Although immense information is available on World Wide Web to make smart decision in shopping, however for analyzing, comparing, and making purchase decision in e-business transaction, humans are required. Most of the developed E-Commerce businesses are still based on human intelligence. To save this investigation cum effort time, we can automate this task using some software agents which will automate this e-commerce shopping. Not just automation, we can also put the negotiation capabilities into the software agent which can help us to get the best available deal. Software agents help to automate the process of buying and selling goods and services in E-Market. To enhance the shopping process agents are the useful tools and acts as a channel between traditional market and automated E-market. This paper presents usage of negotiation protocols and intelligent agent negotiation strategies which have been mentioned in literature, responsible for price negotiation. The conclusion here is to work in automating e-commerce transaction(s) using improved negotiation strategies to enhance the experience of e-business by reducing the human effort.**

Keywords*-- *E-Commerce, Software Agent, Multi-Agent System, Negotiation

I. INTRODUCTION

Electronic transactions (e-business) and human computer interaction have grown to a larger extent over the last few decenniums. Internet is becoming highly eminent for providing people with almost all services related to their business, which is now becoming unmanageable without E-commerce. With online shopping, day to day life has become more convenient. E-shopping is growing in an exponential manner however it is not automated and at almost all stages of e-shopping, the buyer and seller processing, humans are involved. A human buyer is responsible for collecting all information about the products from different available sellers and websites, comparing and analyzing them, searching the best product among all, sending the purchase order and finally performing E-payment, all these stages need human intervention, today the business websites are heavily loaded with information, so a customer has to go from that flood of information and choose the product which waste a lot of time. This drawback opens up totally new direction of research and development which basically deals with automating the whole E-commerce. The best way of doing so is to employ a "Software Agent" who can do the whole task which reduces the buyer's and seller's time which they spend in negotiating with each other, so focus of this paper is on negotiation phase. It explores agent based automated price negotiation protocols and agent strategies of negotiating price over time that have reported in literature and gives an idea of combining these two in a system which helps to automate e-commerce transactions.

II. SOFTWARE AGENT AND MULTI-AGENT SYSTEM

Agent is a piece of software which is implemented to achieve a goal. A software agent is a computer program that acts for a user, however this is not just a program, an agent is a system in an environment which sense that environment and react accordingly. Software agents are different from traditional software programs as these are personalized, continuously running and designed to be autonomous in the quest of their goal. These qualities make the agent a powerful tool for designing the complex and distributed business applications in E-commerce. [1] Use of software agents for/in e-commerce was identified long back but not much of work has been done in this area. Some experiments were conducted in MIT Media Labs [4] [6] [7] and more by Chmiel, Czech, Paprzycki, Ghanza [8]. Software agents are capable in interacting with other software agents and working together to carry out task for which they are designed. In this way many software agents together form a multi-agent system. In a multi-agent system, the agents can be compared similar to humans, robots and human teams. Multi-agent system can contain a combination of both human and automated agent teams. [2] An agent can be defined as a software entity comprising of some goals, actions, and domain knowledge, situated in an environment. The way it responds is called its "behavior". The agent validates the information it receives and creates the most effective plan to meet its goals and perform its function within a business process. [3]
Researches have already proved and often claimed that software agents are most promising as well as efficient technology.

III. CONSUMER BUYING BEHAVIOR MODEL

The commerce moved to internet and became e-commerce but still based on a common model which focuses on the decisions and actions involved in purchasing and using goods and services. However, the model is Consumer

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 07, July-2016

Buying Behavior model. Consumer Buying Behavior refers to buying behavior of a consumer. To make any business successful we need to understand consumer buying behavior and act accordingly. The six main stages of consumer buying behavior model have been conceptualized [4].

- Need Identification: In this stage the consumer identifies the need of a product or service in their real life; we need to identify the requirements and demands of consumers and need to update ourselves and our goods catalog accordingly so that the consumer will get whatever he need and in the way he need.
- Product brokering: In this stage information of the product is retrieved which helps the customer in determining what to buy. So, product needs proper advertisement with full details so that customer can find whatever he is seeking for. This is "what to purchase" stage.
- Merchant brokering: This stage tells "from where to buy the product". The customer decides from which merchant or seller he has to buy the product on various considerations like price, warranty, quality, availability, delivery time etc. So, a merchant has to convince the customer for the available product by telling its qualities and plus points. He can also give some offer to customer to attract him.
- Negotiation: This is the main part of any commerce/business which helps in making a deal finalize such that buyer as well as seller both is satisfied and happy. It is the most important part in buying and selling. There are various methods available for negotiation such as English and Dutch auction methods, Linear, Quadratic, Cubic methods etc.
- Payment and Delivery: After the deal is done, buyer need to pay the purchasing amount of product to seller and seller is required to deliver product on time and should keep all the promises done while finalizing the deal.
- Service and Evaluation: This is the last stage in which a trust factor develops on seller depending on his previous products, their qualities, and their services.

IV. NEGOTIATION

Negotiation is a talk between persons or parties intended to reach a fruitful outcome.

A few or all parties involved in negotiation can use this outcome. [5] To negotiate with each other agents follow a negotiation process where they communicate and agree on a mutually acceptable point. For automated negotiation we have to distinguish two terms, *negotiation strategies* and *negotiation protocol*.

A. Negotiation Strategy

Negotiation strategy defines the behavior of the participants which they demonstrate while achieving the desired outcome during the negotiation process.

- *Kasbah*

The very first system developed at MIT labs is a web-based multi-agent classified ad system [4] which helped human user in selecting the desired product from the set of products already available in its database and then allows them to create the agents on giving the asked parameters viz. price range, time within which user need to buy/sell product, and some more. After the creation of these agents, human intervention is not required. Agent thus created, will go to Kasbah server, and negotiate the price of desired product and get back the best deal for the user. Kasbah offers buyers to opt one of three negotiation strategies: Anxious, frugal and cool-headed and that three to seller namely Anxious, cool-headed and Greedy.

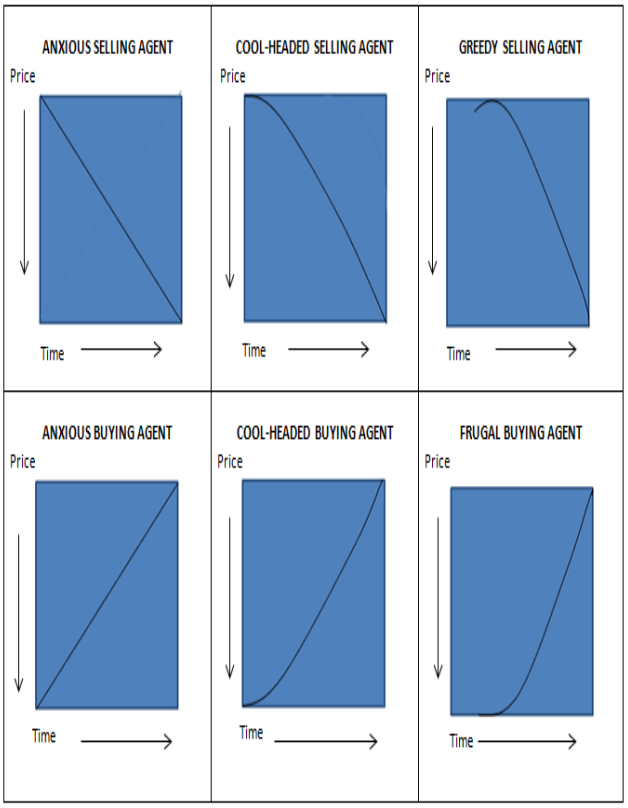

Fig. 1 Strategies of Agents to negotiate price over time. [7]

B. Negotiation Protocol

Negotiation Protocol defines the rules which formalize the interaction between the agents. Ongoing conversation between agents often falls into typical patterns, certain message sequences are expected to appear during the conversation. These typical patterns of message exchange are referred as interaction protocols.

Agent Communication Language(ACL) proposed by FIPA is language for agents to communicate uses protocols for message exchanging, the Interaction Protocols(IPs) offered by Foundation for Intelligent Physical Agents(FIPA) are Request IP, Contract Net IP, Query IP, English Auction IP, Subscribe IP, Propose IP, Dutch Auction IP etc. [9]

- *English Auction FIPA Interaction Protocol*

In English auction, a monetary value is proposed by an auctioneer lesser than that of the said market value/price, raises the product price so as to come up to the product's market price. Every time the price is declared, the auctioneer waits to check if any buyer will indicate their

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 07, July-2016

willingness to bear the proposed price. As soon as a buyer signals that it will accept this price, the auctioneer comes out with a new call for bids declaring an incremented price. The auction tends to continue until no buyers are available to pay the defined price, at this point the auction reaches to its end point. If the last known price which was accepted by a buyer is more than the auctioneer's reservation price (original cost), the product is sold to that buyer in the agreed price. If the accepted price is less than the reservation or cost price, the product is not sold to the buyer. [9]

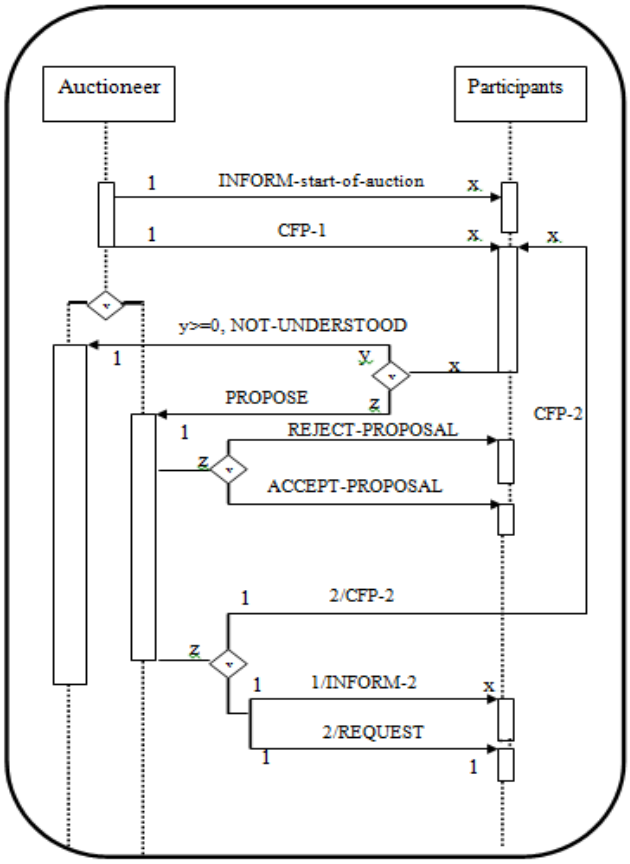

Fig. 2 English Auction Interaction Protocol, FIPA

C. An Abstract Negotiation Process

An abstract negotiation process comprises: negotiation infrastructure, generic negotiation protocol and taxonomy of declarative rules. [10][11][12]

1) *Negotiation Infrastructure*: It defines the roles involved in negotiation process, the negotiation host and the negotiation participants. For example, the negotiation participants in auctions publish their proposals within a shared multicast space in the negotiation locale which is managed by the negotiation host.

2) *Generic Negotiation Protocol:* A Generic negotiation protocol defines the constraints on message sequences interchanged between the host and the participants. Process of negotiation has three main phases: admission of proposal, proposal submission, and agreement formation. *"Admission"* phase is the conversation phase between the participants and the negotiation host, here negotiation participants submit their credentials to the host and request for the admission in the negotiation process and then host decides whether or not participant is admitted in the process and informs the participant. If a participant is admitted for negotiation process, host shares a negotiation template having parameters like price of the product, type of the product, brand, date of supply etc. with the participant. As soon as it was accepted to the negotiation, a participant enters in the "*proposal submission"* step. Proposal contain some constraints over the parameters specified in the template, here according to the strategy participant starts bidding for the product and submits the proposal within the locale and here the negotiation process starts and at last the "*agreement formation*" takes place , where a mutual agreement is made as per the rules defined in the negotiation locale. Agreement forms when the proposal satisfies the rules and conditions of the locale. For example, FIPA English auction the agreement formation phase states that an agreement is formed between a bidder and seller on the highest bided price. [9] Finally negotiation process ends if it matches the termination rules, in FIPA English auction, termination rule quotes that the auction finishes when no participant participated actively, that is has bided for a certain period of time [9]

3) *Taxonomy of Declarative Rules:* It contains the negotiation rules organized into a taxonomy contain categories like rules for admission of participant in negotiation, rules for checking validity of proposals, rules for updating negotiation status and for informing participants, rules for agreement formulation rules for terminating negotiation etc. [12]

V. CONCLUSION

Agent technology is quite feasible and flexible for automating e-commerce. Consumer buying behavior model shows the negotiation phase where buys and sellers spend their time in negotiating with each other can be reduced by automated negotiations. In this paper we studied agent based automated price negotiation protocols and agent negotiation strategies and an abstract negotiation process showing automated negotiations using rule based approaches.

VI. FUTURE WORK

As future work my plan is to automate negotiation by developing a system where FIPA protocols and Kasbah strategies would be used as negotiation mechanism/protocols and agent negotiation strategies respectively. In my consequent papers I will report my progress and conceptualize the ways to implement the above mentioned system efficiently.

VII. REFERENCES

[1] P. Maes. "Agents that Reduce Work and Information Overload." Communications of the ACM, vol. 37, no.7, pp. 31-40, 146, ACM Press, July 1994.
[2] K. P. Sycara Multiagent Systems. *AI Magazine* 2, (2002), p. 79-92.
[3] T.V. Solodukha, O.A. Sosnovskiy, B. A. Zhelezko "Multi-Agent Systems for E-Commerce"
[4] Robert H. Guttman, Alexandros G. Moukas and Pattie Maes "Agent-mediated Electronic Commerce: A Survey", Software Agents Group, MIT Media Labs.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 07, July-2016

[5] https://en.wikipedia.org/wiki/Negotiation
[6] Anthony Chavez and Pattie Maes , "Kasbah: An Agent Marketplace for Buying and Selling Goods", Proceedings of the First International Conference on the Practical Applications of the Intelligent Agents and MultiAgent Technology(PAAM'96). London, UK, April 1996.
[7] Robert H. Guttman, Pattie Maes, Anthony Chavez, Daniel Dreilinger, "Results from a Multi-Agent Electronic Marketplace Experiment", MIT Media Labs
[8] Maria Ghanza, Marcin Paprzycki, Amalia Pirvanescu, Costin Badica, and Ajith Abraham"Jade based Multi agent E-Commerce Environment: Initial Implementation", Presented at 6th Int. Symposium SYNASC04, Timisoara, Romania
[9] www.fipa.org/repository/ips.php3
[10] Claudio Bartolini, Chris Preist, Nicholas R. Jennings "A Software Framework for Automated Negotiation♦ (Revised and Updated)" HP Laboratories Palo Alto HPL-2006-33 February 17, 2006*
[11] Costin Badica, Maria Ganzha, Marcin Paprzycki "Rule based automated price negotiation: Overview and Experiment"
[12] Costin Badica, Adriana Badita, Maria Ganzha "Implementing rule-based mechanisms for agent-based price negotiations" SAC'06 Aril 23-27, 2006, Dijon, France.

Aakanksha Gupta received B. Tech in IT from B. K. Birla Institute of Engineering and Technology, RTU and pursuing M.Tech from BRCM Bahal, MDU. She is having 3 years of working experience as Assistant Professor. Her research interest includes Artificial Intelligence and Multi-Agents.

Durgesh Kumar Srivastava received B. Tech in IT from MIET Meerut, M. Tech in SE from BIT Mesra and pursuing PHD from Punjab Technical University Jalandhar. He is having around 8 years of work experience. Presently he is working as an Assistant Professor in BRCM College of Engineering and Technology, Bahal. His research interest includes Soft Computing. He has published 9 papers in journals and 3 papers in conference.

Saket Jain received B. Tech in CS from JNIT Jaipur, RTU. PGDM in Systems from IMT Gaziabad. He is having around 6 years of work experience. He is presently working as Senior Engineer in Ericsson Global Pvt. Ltd, Gurgaon. His research area includes Unix/Linux, and Artificial Intelligence. He has written a book named "Unix Administration Quick Guide".