行政院國家科學委員會專題研究計畫成果報告
智慧型協商程式在電子商務上之應用暨行動式虛擬大學軟體系統架構之研究
Intelligent Negotiation strategy based on Agent technology

計畫編號：NSC 90-2218-E-032-017
執行期限：90 年 8 月 1 日至 91 年 7 月 31 日
主持人：施國琛　淡江大學資訊工程所

一、中文摘要

隨著電子商務在網路環境中的成長，消費者可輕易地獲得商品的相關資訊。例如：商品的價格及特點。通常消費者花費了大半的時間在完成商品的交易。基於這個理由，提出了一個協商策略來使得消費者在在最有效期間內完成交易。而透過智慧型代理程式的協商過程後，消費者可以在短時間內花費最少的錢來購買最符合其需求的商品。今日，許多研究員採用一些協商的策略，其中包含遊戲理論(Game Theory)、決策論(Decision Making)等。這些決策會幫助消費者者在網路上購買商品。計劃中的協商機制不僅是被使用於一網站，亦可在拍賣網站中執行。在未來，這協商策略會更符合消費者的需求。

關鍵詞：協商策略、協商代理程式、喜好程度值

Abstract

With the growth of the electronic commerce on the Internet, people can easily get product information, such as features, evaluation, and price. The useful information can help consumers to find the suitable merchandises. However, people often waste a lot of time to complete the transaction. Due to this reason, the proposal is to bring up a negotiation strategy to complete the trade in an effective time. The purchasers require to offer the degree of favorite and the range of the price. Using these parameters, the benefits of users are to save their money and gain their best choices in a short time. This process is called intelligent agent's negotiation. Today, researchers use many negotiation strategies, including Game Theory and Decision Making. This strategy can help consumers to purchase goods on the Internet conveniently. The project is not only to be used on general site but also to be applied in a group auction. In the future, the negotiation strategy could be more full-fledged suitable for the user's demand.

Keywords: Negotiation Strategy, Negotiation Agent, degree of favorite

二、緣由與目的

With the enormous users on the Internet, there are many real-world activities applied on the different website. For example: Electronic commerce. We proposed a negotiation strategy to help consumers buying more convenient on the Internet. In our negotiation strategy algorithm, we introduce the viewpoint of negotiation tree how to negotiate prices phase step by step. This strategy can provide auction participators with the solutions of many conditions. And our negotiation simulation system includes two parts: system administrator and user interface.

- **System Administrator:** to manage the negotiation simulation system, maintain all database and set the length of negotiation time.
- **User Interface System:** to check users'

status and let users set all related conditions of the product.

We will apply the flow of real-world auction. Associated with the feature of Internet, we established the flow of negotiation. That is the process of auction. There are many phases to negotiate price until that buyers and sellers reach an agreement. We must take all situations in our assumptions.

三、結果與討論

■ The Negotiation Algorithm

In this section, we proposed a negotiation strategy to help consumers to offer next price in the auction. The main point of negotiated price is that every participator showed insisting their positions on the auction. Besides, consumers' satisfaction, demand and expect are the other key factors to decide the negotiated price when the auction is in process. Therefore, we must understand consumers' expect to suggest them offering the suitable price. According to this reason, we bring up a negotiation strategy to solve this problem. We divide the strategy into several algorithms.

First, when the auction will start, every participator who wants to join the auction. They must fill out some forms to let their agents know what they want and need. So they set their initial price (IP), top price (TP), rise rate (RR) and the exponent to interested product (IE).

Algorithm a: *Inputs Conditions*

1. *Participators set up product conditions： IP、TP 、IE and RR*
2. *Participators set up the exponent of interested product*
3. *Assume α、β、γ are the three different fixed adjustments of the rising price (α < β < γ)*

Second, our strategy will build a negotiation tree based on consumers' conditions. And our strategy will be counted different weight in terms of distinct conditions. Figure 1 is the negotiation tree architecture the tree will display in a polyhedron. Figure 2 is the negotiation tree in the inner architecture.

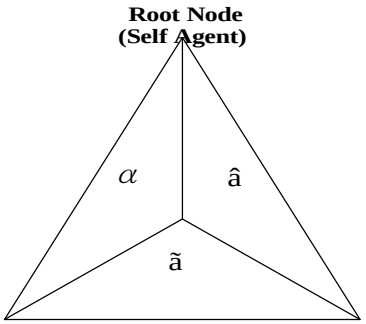

Figure 1. Negotiation Tree Architecture

Algorithm b: *Establish the negotiation tree algorithm*

Function TREE
set Root all values (including Name,IP,TP, Rise, IE)
While build with different Rise（α、β、γ）
First build one level nodes
Set other agents' value (including name, previous price)
Then count next Price using other conditions
Until all Rise are computed
End Function

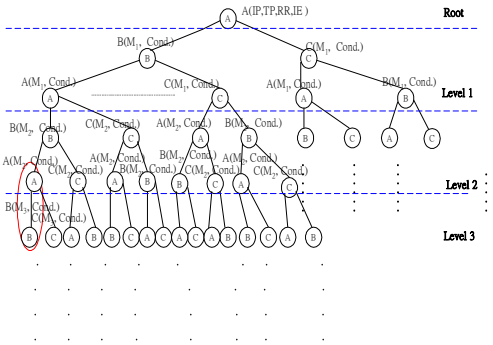

Figure 2. Negotiation Tree inner Architecture

Third, after building the tree, the strategy will delete impossible node which the price is more than customers could pay the highest price. Then we will find the next range of the offering price range.

Algorithm c: *Calculate the range of the next price offer algorithm*

Function Price（other agent name, different Rise）
Find Max_price from Previous Price
*Self_next_Rise = Rise * IE * Service * Percent * Time*
Self_Price=Max_Price+(Max_Price self_Next_Rise)*
While different Rise (α、β、γ or more)

While different IE
*Guess_next_Rise=Rise*IE* Service * Percent * Time*
Guess_Price=Max_Price+ (Max_Price Next_Rise)*
set different Node with different Rise and IE
Until IE up to 10
Until compute all Rise
Delete Node where Guess_Price > TP or Guess_Price < Self_next_Price
Find Next_price Range
End Function

Then the strategy choices one price for the consumer in the next phase. After accounting the price rise and compare the other one the strategy will select the closer rise to be the rise in the next phase.

Algorithm d: *Find the proper price for the Price negotiation algorithm*

Function Find_Next_Price(agent name, Rise Rate)
$R_A = A_N - A_{N-1}$
Compare α, β, γ and R_A relationship
If R_A closed to α then
Next_Price Used Rise α Node
If R_A closed to β then
Next_Price Used Rise β Node
If R_A closed to γ then
Next_Price Used Rise γ Node
End Function

At last, the below conditions are our algorithm terminated conditions.

Algorithm e: *The conditions of the terminated the Agent program*

1. Negotiated time up
2. No competitor wants to bring up the price
3. Customers could not pay more than the highest price

■ The Architecture of Negotiation Simulation System

About the negotiation simulation system, we implement the last section of negotiation strategy. Now we are related to the system architecture. When the consumers want to use this system, they must register to the system. Because this action is the basic security of the system and let the system administrator to know whom has been in the system. After consumers login into the system, they have been requested to fill out a form. The form contains many conditions of consumers demand. And then our strategy will include these conditions to be the factors of the offering price. When consumer submits the form, the negotiation will begin at the same time. Every agent goes to the same platform to negotiate their price with other agents. At any moment, they also could know the highest price offers of the other agent. When agents know the highest price, it could adjust the next price offer until the end of the negotiation time. The negotiation system architecture is shown in Figure 3.

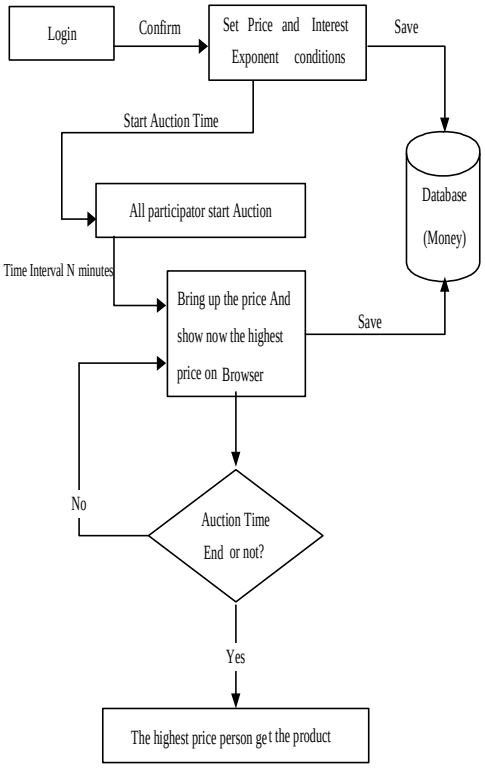

Figure 3. Negotiation system Architecture

The administrator system is very important, because this system is used to control all negotiation processes. Users must be confirmed the administrator's status to avoid hackers destroying the system rule. And this system main function is the administrator permits users to set the auction start, ending time and the price offers every agent at the interval time. And users also could change administrator information including their passwords. The administrator system architecture is shown in Figure 4.

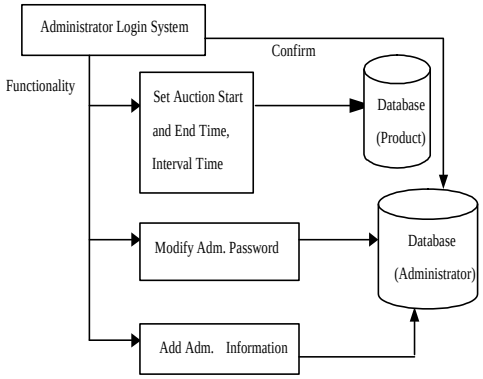

Figure 4. Administrator System Architecture

四、計畫成果自評

In this paper, we provide a negotiation strategy for the auction. This negotiation strategy can save more consumers where they buy merchandises time buying on the Internet. But our strategy doesn't include the vicious bid in our research. The contributions of this paper are summarized as the following:

- Reducing the overloading (time and money).
- A negotiation simulation system was executed according to the consumer holding constrains.
- The user interfaces are friendly for the setting conditions of each user in the negotiation time.

The Negotiation Simulation System has already been implemented for our negotiation strategy. But our strategy maybe only supports negotiation among few people now. In the future, we hope it can be more popular for on-line users. For example, participators can be divided into different groups, and then different groups do the negotiation first. Hence, agents do not need to negotiate with all agents. Only one agent with groups represents his group to negotiate with other. To do this, consumers can save much time to negotiate with the similar buyers. To combine the Recommend system in electronic commerce, it can help purchasers understanding how much the rising price can get the product. In addition, agents can also collect the similar consumer experience to enhance the negotiation efficiency. We hope the negotiation strategy will be a useful prototype for electronic commerce environment.

五、參考文獻

[1]. Iizuka, H. Suzuki, K. Yamamoto, M. Ohuchi. "Learning of words in negotiation between autonomous agents" A. Systems, Man, and Cybernetics, 1999. IEEE SMC '99 Conference Proceedings. 1999 IEEE International Conference on Volume: 2, 1999, Page(s): 598 -603 vol.2

[2]. Charles J. Petrie, "Agent-Based Engineering the Web and Intelligence." IEEE Expert, Vol. 11, No. 6, 1996, p24-29.

[3]. Chanda Dharap and Martin Freeman, "Information agents for Automated Browsing.", In Proceedings of the 1996 ACM CIKM conference, Rockville, MD, U.S.A., 1996, p296-305.

[4]. Weatherall, A. "Structured negotiation using GroupSystems electronic meetings" Systems Sciences, 1999. HICSS-32. Proceedings of the 32nd Annual Hawaii International Conference on , 1999.

[5]. Winsborough, W.H., Seamons, K.E., Jones, V.E. "Automated trust negotiation" DARPA Information Survivability Conference and Exposition, 2000. DISCEX '00. Proceedings Volume: 1 , 1999 , Page(s): 88 -102 vol.1.

[6]. Lee Fu-Ming, Chen Juei-Pin "Researches on Intelligent Auction and Bargaining Mechanisms on the Internet " 2000

[7]. Limthanmaphon, B., Yanchun Zhang, Zhongwei Zhang. "An agent-based negotiation model supporting transactions in electronic commerce" Database and Expert Systems Applications, 2000. Proceedings. 11th International Workshop, Page(s): 440 – 444.

[8]. Frontiers of Electronic Commerce, Kalakota & Whinston, 1997

[9]. P. Faratin, C. Sierra, N. R. Jennings and P. Buckle (1999) "Designing Responsive and Deliberative Automated Negotiators" Proc. AAAI Workshop on Negotiation: Settling Conflicts and Identifying Opportunities, Orlando, FL, 12-18.

[10].A. Lomuscio, M. Wooldridge and N. R. Jennings (2000) "A Classification Scheme for Negotiation in Electronic Commerce" in A European Perspective on Agent-Mediated Electronic Commerce (eds. C. Sierra and F. Dignum), Springer Verlag.

[11].N. R. Jennings, S. Parsons, P. Noriega and C. Sierra (1998) "On Argumentation-Based Negotiation" Proc. Int. Workshop on Multi-Agent Systems, Boston, USA.

行政院國家科學委員會補助專題研究計畫成果報告

※※※※※※※※※※※※※※※※※※※※※※※※※※
※　　　　　　　　　　　　　　　　　　　　　　　　※
※ 智慧型協商程式在電子商務上之應用暨行動式虛擬 ※
※ 大學軟體系統架構之研究 ※
※※※※※※※※※※※※※※※※※※※※※※※※※※

計畫類別： 個別型計畫 □整合型計畫

計畫編號：NSC 90-2218-E-032-017

執行期間： 90 年 8 月 1 日 至 91 年 7 月 31 日

計畫主持人：施國琛

本成果報告包括以下應繳交之附件：

□赴國外出差或研習心得報告一份

□赴大陸地區出差或研習心得報告一份

□出席國際學術會議心得報告及發表之論文各一份

國際合作研究計畫國外研究報告書一份

執行單位：淡江大學資訊工程所

中 華 民 國 91 年 8 月 14 日