

A Virtual Property Agency: Electronic Market with Support of Negotiation

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Abstract

To have an efficient and reliable infrastructure is crucial to any electronic market. Most existing electronic markets only provide limited services, such as, communication supports between buyers and sellers, databases to increase the selections, and market information to help estimation of reasonable transaction prices. In this paper, we propose a new electronic market, an Internet-based clearinghouse with a set of agents to support coordination, negotiation, and settlement with both numerical data and textual information. We have developed a Virtual Property Agent for highly uncertain and dynamic markets. Such approach is extremely helpful to markets that have complicated negotiation process or require more expertise, such as, real estate or used car.

Keywords: Electronic brokerage, negotiation support system, market signaling, agent technology, real estate market.

1. Introduction

Residents of Hong Kong used to invest heavily on real estate. Three of the top five firms in Hong Kong belong to this category and almost all the top ten billionaires have major investment on real estate. However, since the financial market turmoil in 1997, real estate investment has become relatively high-risky, which reflects the uncertainties in such industry. Before 1997, government could manipulate the supply side (auctioned lands for construction) to control the price. However, this was no longer the case due to the outflow of cash.

With the advances in information technology, real estate seemed ready to move on-line. In 1996, RealSelect Inc. opened Realtor.com [16], which is managed by National Association of Realtors. It lists 1.3 million homes, or about 95% of the existing for-sale inventory in the U.S. market. Microsoft also opened an on-line realty service [7]. In Hong Kong, TeleProperty Limited publishes

useful information about property transactions and key events of the real estate market on the Internet [10].

Like other industries that need middlemen to serve both producers and consumers, the role of the middleman in real estate industry is even greater. In this paper, we propose to create an electronic market to support the process of real estate transactions. Which is more than just listing and searching, it also includes searching, coordination, negotiation, and settlement.

In section 2, we will discuss the role of the middleman in various markets. The process of negotiation and negotiation support systems (NSS) will be discussed in Section 3. Section 4 will be used to introduce the Software Agent. Design of the Intelligent Electronic Market will be provided in Section 5. Section 6 will discuss the Virtual Property Agent. This paper is concluded with discussion about future research.

2. Role of Middleman in Markets

Every market transaction consists of searching, coordination, negotiation, and settlement. Search reflects efforts of a buyer or seller to search for candidates to have transaction. Once candidates identified, the process moves to the next step – coordination. Normally it involves exchange of information about the terms and conditions to see if any transaction can be made. If there is no such possibility, then negotiation starts, which is the most difficult step. Through negotiation, different parties aim to reach an agreement by making compromise or concession. However the difficult is that all the parties have their own objective functions. Negotiations may have to be repeated many times before terms can be finalized. Finally, settlement clears the transactions.

In a direct search market, buyers and sellers must search for counterparts to bargain directly. Therefore, the size of candidates is normally small. With a middleman, such situation can be improved. Because middleman holds

information about both sellers and buyers. However, this may also create asymmetric information among the three parties and middleman could earn unreasonably high profits by manipulating the information he has. If they charge less than that in a direct search market, they provide a strong incentive to their clients. When the candidate pool becomes significant, middleman may have to offer searching services to their clients [13].

3. Negotiation Process

Negotiation is a process by which a joint decision can be made by two or more parties. These parties express demands and move toward agreement by a process of concession or compromise making or search for new alternatives to move forward. Demand level, bottom line, concession rate, losses due to negotiation break-up, completeness of information about the counterparts, limit and level of aspiration, and time pressure all affect the outcome of negotiation. Basic negotiation strategy has been proposed [9]:

- Concede unilaterally in order to reduce the distance between the parties.
- Stand firm and employ pressure tactics (e.g. persuasive arguments, threats, positional commitments) to persuade the other party to concede, which is called competitive behavior.
- Collaborate to search for mutually acceptable solution, which is called coordination behavior.

Some negotiations accompany with deep distrust or dislike, such can be called a “win/lose” negotiation or a typical “zero-sum” game. “Business is a form of human competition greatly resembling war,” summarizes the non-cooperative nature of human in competing for resources. Porter also studied non-cooperative strategies in analyzing the bargaining powers between buyers and suppliers [15]. Similarly he treated market signals, intelligent collection, and strategy formulation as tools or weapons in negotiation games.

Some negotiations are more cooperative and constructive. Normally they are called “win-win” negotiation because they seek congruent goals for creating win-win solutions.

Since the 1960s the concept of computerized negotiation support has evolved from moving computers from “backroom processors” to support negotiators. One approach was to combine Group Decision Support System (GDSS) and Decision Support Systems (DSS). Researchers have studied how Negotiation Support System (NSS) alleviated major cognitive and social-emotional stumbling blocks. Perkins et. al. used practicing purchasing managers as subjects to investigate the effects of computerized negotiation on the outcomes of buyer and seller negotiation [14]. The results showed

that, by using NSS, managers achieved better outcomes (payoffs) and more quickly reached satisfying solutions. NSS also help users handling the social aspects of negotiation, which allowed them to focus on content and analysis of negotiation.

4. Intelligent Agent

Zeng and Sycara outlined a meta-framework for coordination and structure of a collection of intelligent software agents [20]. They classified agents into three categories: 1) interface agents, which interact with the user; 2) task agents, which actually carry out the user’s tasks and 3) information agents, which provide access to diverse, possibly heterogeneous information sources.

Since each real estate transaction is a major decision and the process is very complicated, it is difficult to automate such process. Therefore, we developed an agent-based system to support the negotiation process, instead of automate the process. We support the negotiation with two types of information: texts and numerical data.

The major reason is that existing automated negotiation agents, such as, Kasbah [2], are not flexible and sophisticated enough. Which rely only rules, for example, game theory, which assumes perfect and symmetric information that identically perceived by all negotiation participants. However, most negotiations have to deal with conditions with imperfect, incomplete, or asymmetric information.

5. Model for Intelligent Electronic Market

Normally transactions in real estate are not rely only on one single attribute. They involve multiple attributes. Such as price range, space, location, car park, interior structure, etc. Some attributes people do care, some attributes are not. Also, some attributes are negotiable, such as, price, car park, etc., and some are not, such as, space and location.

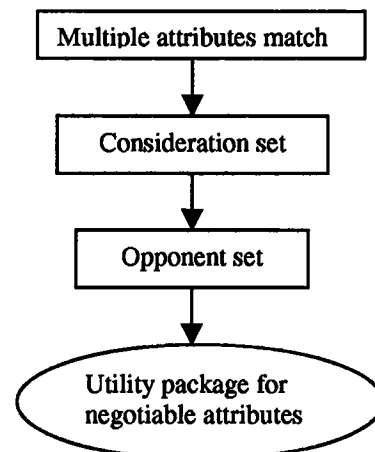


Figure 1. Analysis of preferences and alternatives

When a buying search with selection criteria arrives, searching agent retrieves all the qualified candidates to form a candidate set as shown in Figure 1. Buyer can choose the candidates to form negotiation. Simultaneous negotiations were encouraged to create higher competition among candidates. Then negotiator chooses the negotiable attributes to develop the utility function. Negotiator's preferences over negotiable issues as well as acceptance level of each criterion need to be determined.

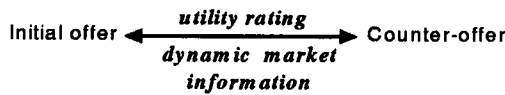


Figure 2. Offer evaluation

For the following each round of negotiation, task agent helps the user rate his offers based on his utility package and dynamic market information, see Figure 2.

We adopted the market signaling as an incentive structure for negotiation process [1]. In the relatively high-risk, and somewhat unpredictable real estate market, information is crucial to the performance of the market. We use market signaling to make negotiation process more efficient and prevent from deadlock as shown in Figure 3.

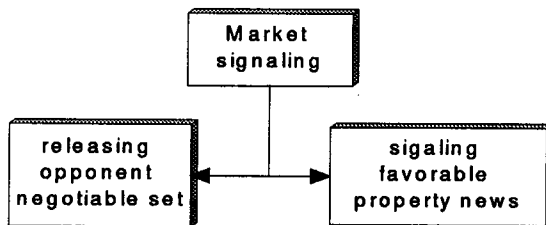


Figure 3. Market signaling

Intelligent market allows negotiators send signals to opponents to create favorable impressions, or more

precisely, to affect the opponents' subjective probabilistic beliefs about their positions and market condition. For example, recent transactions of similar apartments should have impacts on the negotiation.

Also results of simultaneous negotiation with the candidates will create pressure to the opponents. News agent receives up-to-date news from Internet. Such intelligent market should validate and guarantee the credibility of information.

6. System Architecture of Virtual Property Agent

Virtual Property Agent is an Internet-based middlemen for real estate market. Home sellers post their own listings into the database and the potential buyers visit the web site to search for candidates. Once potential candidates been identified, buyers can choose candidates to visit. After that, the negotiation can be started through the Internet. Sellers can also have such candidate sets. The web site supports 24-hour message transmission for negotiators. For each round of negotiation, electronic market provides the rating based on user's own utility function, and news agent collects on-line information. Negotiators can either choose his favorable news to signal his opponents or release his alternatives and negotiation results to his opponents. E-mail will be generated automatically to notify the negotiator the result. Negotiators can accept or reject, and start another round if necessary.

Support for pre-negotiation

- Home Listing

Home listing is the interface for home sellers to post listings. System provides form for sellers to describe their homes, such as, locations, building names, sizes, number of bedrooms, ask prices, reserve prices, and the dates to make deal. Multimedia supports, such as, pictures and short video clips, will be available in the future.

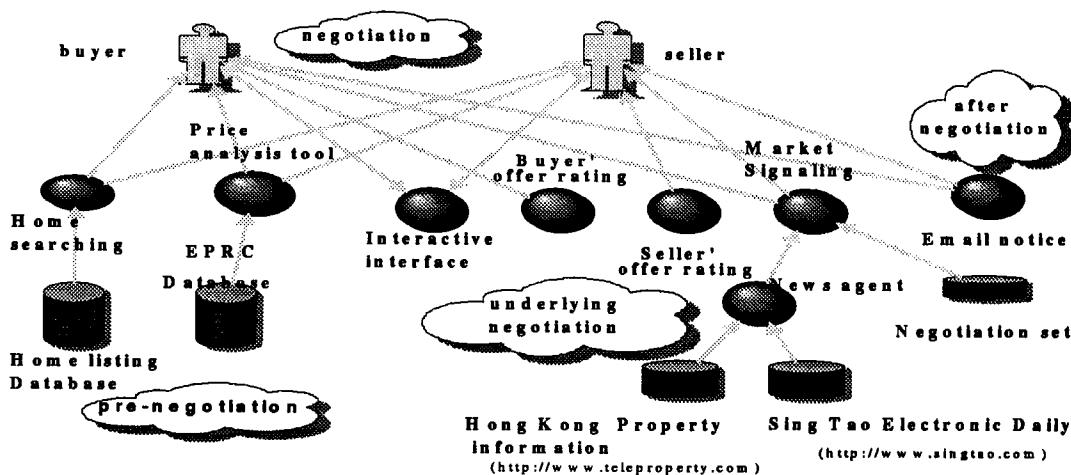


Figure 4: Architecture of Virtual Property Agency

- **Home Searching**

Home searching allows potential buyers to set the criteria to screen and generate candidates. Similar to home listing, home searching provides interface for buyers to input the similar information to support searching the database. If candidates been found, more complete description of house or apartment will be provided by the system and visit can be arranged through the system. Buyers can start the negotiation process with the seller if the only discrepancies are negotiable attributes. If none been identified, buyers will be notified to soften their requirements.

- **Market Price Analysis Tool**

Real estate market is dynamic, sometimes it is a buyer's market and sometimes it is not. Price analysis agent extracts prices from the historical transaction records in the same building or in the same neighborhood to draw the curve, which vividly indicates the trend of price, see Figure 5. Price analysis tools helps the participants to estimate reasonable transaction prices before the negotiation.

Support and facilitate the negotiation

- **Interactive messaging**

Negotiation process involves many rounds exchanging information between the parties. Offers and counter offers will be automatically sent to buyer or seller by the interactive messaging system until two parties.

- **Buyer/Seller offer rating**

Once a user enters the system, form will be presented for the user to choose the negotiable attributes. When multiple attributes are entered, importance of each attribute and acceptable range need to be entered. If only price is under negotiation, aspiration level and reserve level are required.

Message about the rating of buyer or seller offers appear together with these offers to remind the negotiators their original objective.

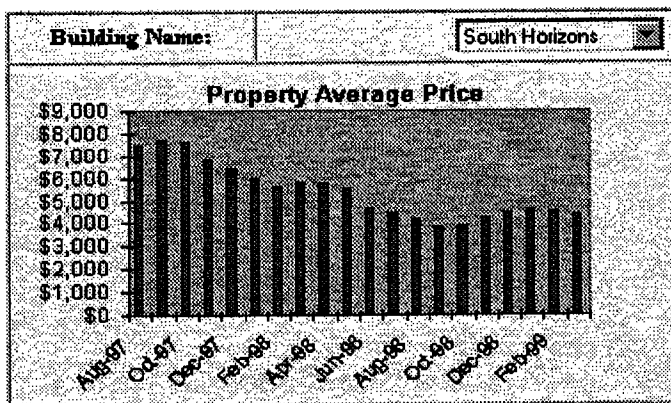


Figure 5. Price curve

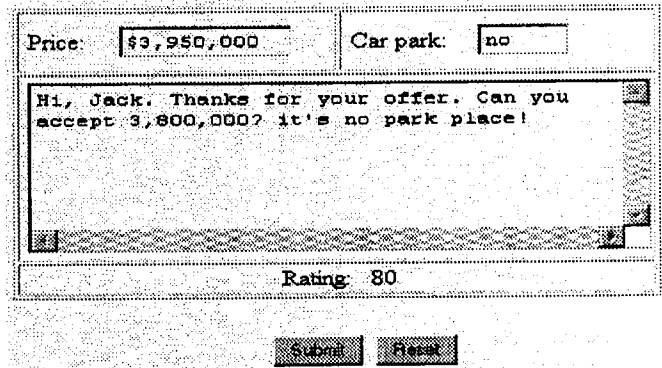


Figure 6. Interactive message and rating

- **Market Signaling**

Real estate market is influenced by the supply and demand force, financial environment such as mortgage rate, income, interest rate, equity, and also government's new property policy. We create one search agent get up-to-date online information from Hong Kong Property Information(<http://www.teleproperty.com/>) and local newspaper Sing Tao Electronic Daily (<http://www.singtao.com/>), put it into system's database and provide news bulletin for market participants browsing. Negotiator can choose effective message from the bulletin to signal his opponents. Another kind of signal comes from negotiator's opponent negotiable set, user can choose to roughly release the negotiation result, system will automatically send each around of negotiation results with all the candidates to his ongoing opponent.

Notification

- **Email notice**

Email notice system strongly supports off-line message transmitting. E-mail Inform Agent will support the participants to fully aware of the progress of negotiation.

7. Conclusion

In this paper, we propose an electronic brokerage infrastructure to support the coordination, negotiation, and settlement of transactions that have complicated negotiation process. Intelligent software agents have been developed to support the operation of this electronic market. The Virtual Property Agency is able to help users quickly search for information to better understand the condition of the market to design the negotiation strategy, which include both the textual information from the selected web sites and transaction data that stored on Government's database.

Date: 13-Apr-99		Class: transaction news	
		HK property information 13-Apr-99	
		靚濶居蝕本價開售48個單位·呎價3265元	
Num:	Title	會德豐發展的荃灣靚濶居，首批48個單位以蝕本價發售，平均呎價3,265元。比同區二手價低10%，下周一至四(4月19日至22日)接受認購登記，4月25日揀樓。靚濶居共有792個單位，面積由589至978平方呎。首批單位分布A、B、C座的6至13，售價由150萬至350萬元，據悉現已獲約400個內購登記。	
1	靚濶居蝕本價開售48個單位·呎價3265元		
2	濠日居擬月底進行內部認購·料呎價六千		
3	帝峰豪苑提價加推30個單位·呎價4038元		
4	金蘭豪園38貨尾單位封盤·擬加價5至10%		
5	好姨斥620萬購入心頭好		
6	策~首季一手樓價企穩		
7	舖位交投趨活躍		
		Send Reset	

Figure 7. Interface for news and market signaling

Instead of automating the process, we focus on supporting the users with information collection and providing channel to communicate with their counterparts. Compare with the existing web sites, our system provide greater flexibility to the users. A user evaluation will be conducted to compare the performance or user satisfaction with that of the other on-line property agents.

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