Automated Negotiation System in E-Commerce Using Economic Psycho Knowledge

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Abstract:
We now present our approach to automating one-to-many negotiations. The scenario we are tackling is one in which one agent (buyer or seller) wants to negotiate a deal with a number of opponents, in order to find the best possible deal in the market e-commerce applications as well as supporting automating e-commerce business processes. Despite this fact, up to now, the most successful e-commerce systems are still based on human input to make the most important decisions in various activities along the lifecycle of an e-business transaction. Our work aims at bridging the gap between these two scenarios (the possible and the real), by proposing a conceptual architecture of a multi-agent e-commerce system

Keywords: Electronic Data Interchange, Multi-agent systems, E-commerce, Socio Psycho Knowledge

1. Introduction

Electronic marketplaces are becoming necessary for a successful business and more and more companies have an alternative e-commerce way of selling. The final scope of e-commerce is to imitate, and of course improve, the process of negotiation that takes place between human beings. The plethora of fine aspects and subtleties involved in human negotiations are difficult even to be identified. This is one of the reasons why current e-commerce websites are in fact catalogs of products and services along with their descriptions and prices. The most popular form of negotiation is represented by auction-like websites.

The model of auction is old and is used for decades in all sorts of markets. There are many models for auction, but the bottom line is that we have a cycle that ends when some conditions are met. Auction websites are largely adopted by both customers and sellers because the model is understandable and easy to be implemented in computer programs. The real challenge raised by such websites is the real time aspect of model. Bilateral negotiations are part of every dialog we may have and is so natural that we do not even become aware of it. We negotiate when we need to buy or sell a product with some gain, we negotiate when we expose or contest some ideas and we negotiate when we need some sort of satisfaction or emotion. Negotiation is a central part of human being and this is the reason way it is so difficult to be formalized in some theoretical model. In order to build a realistic model we need knowledge from multiple domains like psychology, neuroscience, economics or artificial intelligence. A model of bilateral negotiation for retail markets should formalize some of the following aspects (Xudong, *et al.*, 2003):- in retail markets, the seller and the buyer should implement a win-win strategy. There is no need for hostility between them. The final agreement should be fair for both sides. It is more important to make the customer as satisfied as possible so that long-term relationships can be established. Relationship is the base for profitability. The main business negotiation theory suitable for this kind of environment is the *principled negotiation approach* (Cohen, 2002). According with this theory, agents should reach a fair and reasonable agreement for both parties that maximize their own payoff. Thus, the principled negotiation has elements of competition, where agents maximize their individual payoff and cooperation where Agents want to maximize the outcome for both participants - if the current proposal is not acceptable by the opponent the proponent should find an alternative with equal payoff for it, but better for the opponent. Therefore, each agent must do trade-offs between multiple issues in order to reach an equilibrium state between own needs and the opponent needs.

- the quantity of information revealed during negotiation process must be kept minimal. There is a real threat if opponent knows more than necessary information. Any leaked information could help opponent to infer strategies in order to gain more. This is dangerous for both participants and the model must be concerned about offering equal chances. A participant could deduce some internals of the opponent, and a good negotiator should be able to do such things, only from the feedback received or from the formulated requests. In real world, a good negotiator is a fine observer of attitudes and feelings of the opponent and such skills should be implemented by model: - a common practice in retail markets is to offer some bonuses, gifts, discounts, facilities in order to raise a product's acceptability for the customers. The customer agent should be instructed how to modify the acceptability level when unexpected and potentially interesting offers are made. A reward could affect the acceptability in such a way that a previously unacceptable offer becomes acceptable; - when you

search something with a search engine, is easy to formulate the need by entering some words. If the words are inappropriate, the results will not be as good as one expects but you can try other combinations until the result becomes satisfactory. When you are new to domain or you simply do not know the real value of a service, in real world you try to find information from different sources. The customer agent should be able to find such resources and in extreme situations when you do not know anything about a service, it must find ways to auto configure negotiation parameters. This is not a hypothetical situation; just imagine that you wish to choose an excursion in some exotic places but you know nothing about, like common prices or entertainment possibilities, you cannot formulate exactly what you want. You are able to formulate only some general constraints such as the distance from the beach to be short, the quality of services to be excellent, the price to be reasonable, but the fact that the a location is very noisy in that period because the wind is powerful at nights it's a hard to get knowledge without prior experience. The agent should be capable to find deals, to suggest and to negotiate with minimum intervention from human counterpart; - it is rarely the case when an offer is completely acceptable or completely inconsistent with agent's requests. The agent should be able to analyze the offer, and to accept it even if the offer is not the best imaginable. For example, even if the quality of services is not so good, the fact that the panorama is astonishing should make the offer acceptable. For no matter what offer, the agent will have to trade-off between the rational and emotional aspects; Multi-issue negotiation is necessary for every agent. It is rarely the case when a single issue characterizes a product or service. Even if you try to by a new TV set, apart form technical characteristics that are quantitative by their nature, there are many qualitative aspects like the beauty of design, the visual experience, the profoundness of sound, the manufacturing quality. When you buy something, you place that product in a future environment and build different scenarios of interactions. As in life, every negotiation is a compromise between issues.

2. The Advent of Social Shopping
Shopping has gained mainstream as an electronic commerce application in the early 1990s. Some forecasts predict that worldwide spending on electronic goods and services will reach more than $7,000 billion by the end of year 2007 (IDC, 2004). E-commerce websites offers a plethora of choices for content, products and services, affecting the perceptions and attitudes of traditional market (Rosen, 2000). The multitude of choices has altered the way in which customers choose and buy commodities. Buyers benefit from convenient access to information and commerce while sellers benefit from selling to consumers anytime and anywhere with low costs. The advent of e-commerce urges the creation of new tools to support customer-supplier interactions in order to facilitate the act of commerce. It is not sufficient to create websites to sell products or services. It's important to offer instruments to support real life commerce acts, word-of-mouth advertising, bargaining, emotional implication, social shopping etc. In real world the act of commerce is a social one and so must be on the net. People choose and buy following their emotions. The role of customers is central to this new environment because they convey ideas, impressions or feelings (Militaru,2007) on goods or services, concentrated in so called "customers' opinions". Through this "opinions", the buyer becomes the interface between retailers and consumers and their presence in ecosystem is highly influential. Consumer satisfaction is a central issue in marketing thought and practice (Oliver, 1997), (Yi,1990) and serves to link processes of decision making and consumption with post purchase phenomena, such as attitude change, repeat purchase and brand loyalty (Fornell, 1992).The e-commerce act should be treated as a whole, merging into the same infrastructure the consumer, the buyer and the retailer along with special tools for social shopping.A social network is a representation of the relationships existing within a community. Within the same community, several types of network relations can be built, depending on the social aspects taken into account: affinity, friendship, mutual support, cooperation, and similarity are typical criteria used in establishing the social relationship components of a community.

A social networking service – SNS - provides an on-line private space for individuals to interact with other individuals. SNSs help people to find each other based on a common interest, to establish a forum for discussions, to exchange photos and personal news and many more. MySpace, Orkut or Hi5, are similar social networking services, having more than 50 million users each. Recently, the number of MySpace users exceeded 100 million with a growing rate of over two hundred thousand people per day. These SNSs attract nearly half of all web users. The goal of these services is to help people establish an online presence and build social networks. The dynamics of these online social networks are of tremendous importance to social networking service providers and those interested in online commerce.

Even for the short history of the Internet, SNSs are a new phenomenon and their network structures are not yet studied carefully. The social networks of SNSs are believed to reflect the real-life social relationships of people more accurately than any other online networks. Moreover, because of their size, they offer an unprecedented opportunity to study human social networks. The basis for their sustainability and persistence over time is the interchange of services between community members. Members of electronic communities can be people or agents acting on behalf of the former ones. Typical interchanges include commercial transactions, documentary information and knowledge

exchanges, responses to answers, advice, suggestions, help, reference to further information, etc.

The next step in the evolution of commerce is social shopping, a combination between social networking and e-commerce. Blogs, podcasts, video casts, tagging, recommender systems will drivee- commerce. Social Shopping is based on the principles outlined in the book 'The wisdom of crowds' by James Surowiecki, where a large group of users can recommend products to each other. Social shopping is just the latest solution to a chronic problem for online retailers and shoppers: many shoppers are not sure what to buy, where to buy from, but they know they will not find it on the sites of mainstream retailers. Sites like ThisNext.com or services like Kaboodle.com, Wists.com and StyleHive.com are leading the new way of doing shopping. These sites try to combine two favorite online activities: shopping and social networking. These sites are the next MySpace wave by gathering people in one place to exchange shopping ideas. Like MySpace, these sites are designed for both browsing and blogging, with some shopping-related technology included. Users who register with social shopping services typically create their own pages to collect information on items they find. Instead of simply describing what they have found on other sites and posting a Web address, they can download a piece of software that allows them to grab images of those products to post on their own shopping lists. The social shopping services can then post pictures of items that have been viewed or circulated widely among visitors who have searched the site for, say, home furnishing ideas or ideal vacation destinations. ThisNext.com also gives users the ability to transfer pictures or videos of their favorite products from the site to their personal blog pages.

ThisNext.com has a tool allowing users to populate their sites with lists of products, called "shopcasts." Shopping search site like ShopWiki.com let users to submit video and text reviews, and add to or edit product category guides. Yahoo aims to socialize online shopping through its "Shopo sphere" communities. The increasing popularity of customer reviews on retailer sites and elsewhere, will help get customers a little more engaged, and thinking about recommendations from other people, which is what ThisNext.com and these other sites are based on. Another site, MyPickList.com, has gathered about 1,000 registrants in the few weeks it has been publicly accessible. The site allows users to highlight and link to preferred products using a customizable widget that can be added to their personal blogs or profile p a g e s . If items sold by MyPickList.com affiliate merchants are purchased through one of those widget links, the company shares half its commission with the customer. Sites like Stylehive.com, Kaboodle.com and Wists.com have similar offerings, enabling people to grab product images and links, add them to their sites, write reviews, and share information about chosen items with others. Retailers love this new type of e- commerce concept because there is nothing better than word-of-mouth marketing, which is intrinsic to the whole concept.

3. Emotions and Customer Satisfaction

Evaluation of service quality can be described as a cognitive process where customers consider the goodness or badness of the commodities, by evaluating the perceived service performance only, or by comparing the service performance with some predetermined standard. On the other hand, satisfaction contains an affective dimension, without which customers responses cannot be full accounted for. Cognitive and affective responses can be seen as distinct, and having a separate influence on satisfaction formation (Oliver, 1989), (Oliver, 1993), (Karat, 2002), (Thomas and Macredie, 2002).

Oliver and Westbrook (1993) defined affect as a mediator between cognitive evaluations, such as perceived product performance, and satisfaction. In his theory, Oliver argues that it is possible, regarding to a commodity, to experience both negative and positive affects at the same time. When we speak about life quality, we consider both types of affect. Oliver (1989) finds these ideas adaptable to the field of consumer goods and service consumption. When a service is seen as consisting of several different attributes which can be evaluated by the consumer before, during and after consumption, each of these evaluations of service attributes, may also be seen as a potential source of negative or positive affect. If a product fails to accomplish the customer's needs or expectations, the response will include negative emotions. If the commodity is perceived to be desired or better, the customer will respond with positive emotions. The satisfaction comes from the combination of positive and negative emotions of all service attributes.

Customers may have a large palette of different opinions, not simply all positive or all negative emotions. Stauss (1996) has suggested that different satisfaction types may exist according to the pattern of emotions, cognitions and intentions that the customer expresses. This may explain observed weak links between satisfaction and customer loyalty. An empirical study in the financial service industry indicates support for the hypothesis that a particular overall satisfaction score may be connected with different levels of an emotion (Morrin and Chebat, 2005), (Mattila and Enz, 2002). In the process of acquiring a commodity, the customer interacts with the supplier by separate service episodes, the sum of these episodes forming a so-called relationship. A relationship consists of several episodes in which the post-purchase reactions serve as input into the next pre-purchase phase. In the same time, there is an evaluation mechanism, some kind of introspection, in which the customer makes an overall appraisal of the relationship in terms of both its cognitive and emotional components. In fact, some levels of emotion are present during all interactions between the customer and the service provider. Emotions can be experienced from the start of consuming a service to the termination of the service

experience, and even a long time after the actual consumption has ended. They may also change for the worse or for the better during the service encounter, depending on the actions taken by the service employees (Muller and Venkatasubramaniam, 1991), (Desmet, *et al.*, 2000, 2002, 2003). There are many aspects and facets of emotion in customer-supplier interactions, but as a conclusion for this paragraph, ignoring the customer's emotions in the process of acquiring products or services it's a huge mistake for a supplier. If there is a computerized model, it should be able to take into account the emotions elicited during interactions between parties (Pullman and Gross, 2004), (Yeung and Wyer, 2004).

4. Circumplex Model of Emotions

Emotional judgments and affective self-ratings often are found to array in circular arrangement, referred to as a "circumplex" structure arrangement (Russell, 1980, 2003). A circumplex is a two-dimensional, circular structure in which single attributes correlate highly withthose attributes nearby on the circumference of the circle, correlate near zero with those attributes one-quarter way around the circle, and corre
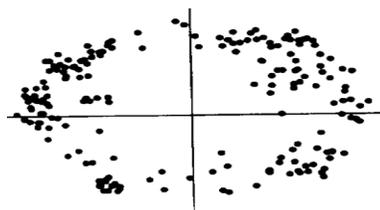

Fig.1. Principal Components of 191 affect terms

With those attributes directly opposite on the circle. Using   a   circumplex   structure   for   representing emotion is equivalent to making several assertions about the nature of the emotion domain. At the most fundamental level, a circumplex model means that some emotions are similar to each other yet measurably different from other emotions. Structural theories of emotion presume that emotions are not all unrelated and discrete but have certain underlying similarities and differences. Second, by using the circumplex model, a claim is made that two affect dimensions can capture the majority of emotional experience. Third, a circumplex suggests that emotions can be described in a circular fashion in two-dimensional space and that emotions do not simply aggregate together in several groupings or fall in order along two axes. The circumplex model holds that some affects will always fall between any two axes that are drawn through the two-dimension circumplex space. In addition, a circumplex implies that a very high or very low value on one dimension is accompanied by a moderate value on the other dimension. A circumplex model of emotion suggests a clear structure for the effects emotion will have on behavior and thus has large heuristic value. Similarly, a circumplex model of emotion, by accounting for a majority of the variance in affect measures, suggests a simple yet powerful way to organize facts about emotion. The circumplex provides a measurement model that can be useful for understanding and organizing the many emotion measures used in research today.

Fig.2. Self-report emotion circumplex

As a specific structural model of emotion, the circumplex also suggests a collateral structure of emotion that may exist at the cognitive and/or physiological level and therefore points toward a search for structures in those domains. Although a structural model such as the circumplex may be thought of as only descriptive, it can organize a large body of known facts in a simple way and make testable predictions about the effects of emotion on behavior, cognition, and physiology.

The circumplex points to the features of emotion that are most salient in experience and therefore allows a simple subjective mapping of affective life.

The circumplex model of affect is a powerful theoretical tool that describes the relations between emotions as well as suggests the dimensions that characterize, to some degree, all emotions. As a basic structural model of affect, it specifies which emotions are similar and different or which emotions are likely or unlikely to be experienced together. Emotion circumplex models are very specific in indicating mathematically testable relationships between various affects. Thus, the emotion circumplex provides a theoretical structure that can potentially advance our understanding of emotional life.

5. A New Approach
Emotional aspects are involved in the act of commerce in many different ways: the product or service designer needs to understand why a product is preferred over other; the marketing department needs to understand the customer in order to make better commercial decisions; the social shopping community is a recommender system that performs better if the customer's opinion contains some emotional value; the real world B2C bilateral negotiation have an emotional dimension which
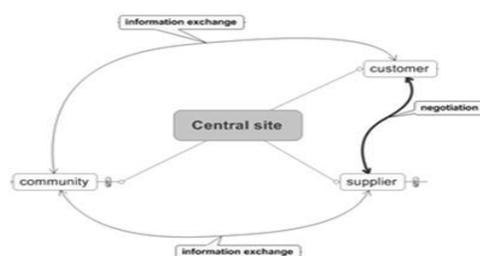

Fig.3. E-commerce ecosystem: Customer, Supplier

The essential aspect of the proposed e-commerce ecosystem is the bilateral, one-to-one, multi-issuenegotiation. The approach is novel because it includes emotion as a central concept and it relies on the community opinions about commodities issues. The model relies on the circumplex theory, for emotional knowledge acquisition and representation. When someone explains why he or she decided to buy or wish to buy that product or service, the explanation includes both the rational and emotional components of the reasoning process. For example, when you try to rent a house in a Caribbean resort, the final decision is a pleasing one even if the price is a little too high. The pleasure comes from the fact that the location is near the beach and the renting period is the desired one. For example, when you try to rent a house in a Caribbean resort, the final decision is a pleasing one even if the price is a little too high. The pleasure comes from the fact that the location is near the beach and the renting period is the desired one. Therefore, it is natural to make a compromise and accept the offer and feel good about it imaging how good it will be on the next summer of coursethere is a limit on price,and if. the price is too high, the offer is denied, no matter how good are the other issues. It is relatively easy to build a model for the rational part of decision, but it is very hard for a person to think in a pure quantitative way for every issue. On the other side, it's very hard to formalize a qualitative model, especially one which includes emotions. When you buy something, you aim for several issues so that the final decision is a trade-off between those issues. The model assumes that each of those issues have multiple possible values, each value representing an important mark for customer. For example, the value of 10 minutes on distance issue is such a mark and it means an excellent distance from beach. So, it's naturally to collect from customer only such representative marks. The tool which collects issues and issue-marks is the circumplex model. It is used for decades in psychology as a dimensional model and proved to be understandable by humans. The scenario for collecting knowledge from customer is very simple: the customer supposes that the commodity is accepted and the mark on that particular issue have a specific value. For example, we accepted that excursion and the time to get on beach is 20 minutes. For sure, it doesn't feel so good and the only reason for accepting something that is not so good for us, is because the other issues are in a range from good to excellent. It is hard to explain, even for the customer, the reasoning process, what are the motivations, why he or she feels in that way about that issue-mark. But, it is relatively easy to set a point into the circumplex model that approximates what he or she feels, without explaining everything. Because the community opinions are also captured into the circumplex, the negotiation has direct support from the community. Relying on community adds qualitative value to the negotiation process and the customer could include issues like comfort, soundness, general impression, cleanness etc.

The current approaches for social shopping do not have a quantifiable emotional model. Emotions are embedded

inside recommendations without any ability of being used. When a customer recommends something, it shows the picture or movie of that product or service along with some personal comments. There is eventually a ranking mechanism over customer opinions so you could easily search the most recommended products. The lack of an explicit emotional model raises some fundamental problems impossible to address some oth
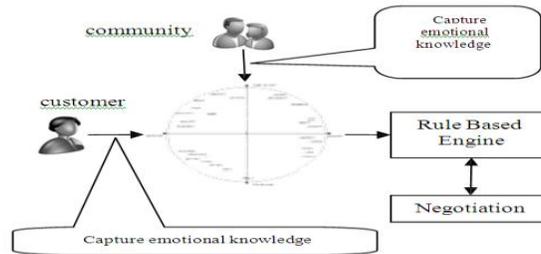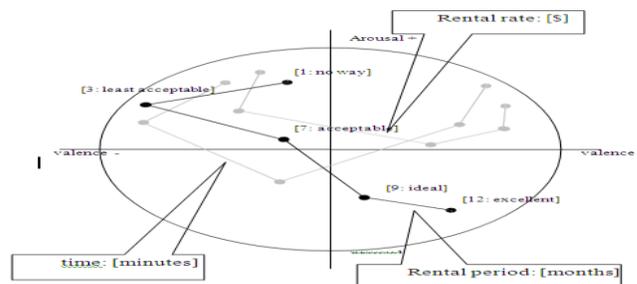

Fig.4. Knowledge acquisition and transformation

- Social shopping is a way of conducting the customer through an ocean of commodities. By watching at what is most recommended by others, it will be able to know better what it wants. But, this is a recursive phenomenon because from an ocean of possibilities you get an ocean of recommendations becoming hard to choose something.

- When you recommend something to someone else there is an emotional dimension embedded in that recommendation. You probably liked or did not liked the respective commodity and you want to share this with others. The question here is what aspects exactly you liked or not. Because, even if a lot of people do not like that exotic place – youngest around 20-23 years old - you will like it because of its quietness and calmness. Actual social shopping site are not able to capture such details in their recommender engines.

- the search inside a social shopping site is a traditional one without any semantic way of finding what it is interesting from our point of view. Regarding a commodity, we should be able to configure an emotional profile that tries to match our feelings. Using this profile, the system will understand what we like or not and will return a more accurate listing of choices.

The proposed ecosystem tries to offer to social shopping a new dimension: the emotional one. By now, the only way of capturing qualitative opinions is through writing some comments about those commodities. There is no automated way of processing those comments. Only humans could understand and extract valuable knowledge from those comments and this is a daunting task when you have to read hundreds of comments.
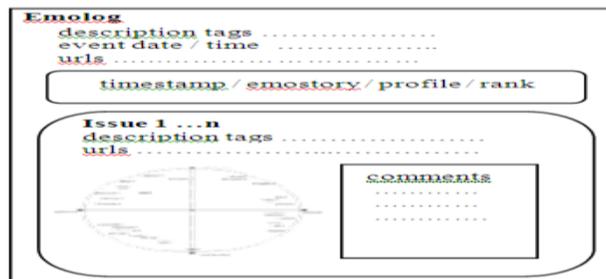

Fig.6. Emolog graphical form

The paper proposes a tool to capture emotional aspects, the so-called emolog. An emolog is a way of describing the emotions felt on some circumstances regarding a commodity. When you make a comment on something or

you share your opinions, the emotions felt are embedded inside your comments, pictures, or movies. The emolog offers a way for humans to express those emotions explicitly, without sacrificing the current offerings of recommender systems. The emolog is part of a triumvirate: the emolog, the user profile and the rating system. The figure 7 shows this triumvirate. The rating engine allows for other people to vote on someone else emolog. In time, the rating engine will be able to select the most voted emologs as references. The description of the voting mechanism is not part of this paper. The user profile is an essential tool that allows market segmentation. When you search a good resort for your vacation, you will search through recommendations of mid-age people with a high educational level.

Each emolog could be part, but it is not obligatory, of a bigger construct called emostory. Let's imagine that we are in a vacation for a week. During that period we encounter a great number of situations that affect us positively or negatively: the flight, the road to the hotel, the room-service, the night atmosphere, the quality of water, the entertainment possibilities etc. For each of these situations, we could write an emolog. The totality of emologs forms an emostory of our vacation. The emostory is an important construct because it naturally connects emologs between them, creating a huge graph. Using this graph, the recommender engine is able to analyze what else is interesting when you intend to go in that special vacation. More than that, the service suppliers are able to better understand what's going well or wrong in their offerings.

The third actor of the proposed ecosystem is the supplier. It is not realistic to think that someone could impose a new system to a customer. Each customer has its unique commerce system and no one will change the existing infrastructure. So, for supplier it is reasonable to offer only an interface, able to communicate with customer's agents and community. The interface is a rule based reasoning engine, each rule representing a selling situation. For example, different combinations of services for an exotic destination could be implemented as rules. Because the engine is able to extract valuable marketing information from community and negotiation processes, it is possible to add or retract some services in order to maximize the benefits.

6. Conclusions

In this paper, we introduced a B2C e-commerce multi-agent platform with three major actors: the customer, the supplier and the community. The novelty of the model is represented by the way in which emotions are integrated in every aspect, from the customer knowledge acquisition, negotiation to consumer feedback and supplier marketing research tools. By incorporating emotions, the model is able to capture almost naturally the rational and the emotional aspects, to learn about personal preferences, to gather and use in negotiation process the community opinions, which are essentially emotional, to offer snapshots of emotional state to negotiation partners without exposing internals, and finally to offer a more human-like experience over negotiation.