Role of Software Agents in E-Commerce

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Abstract

This paper states how software agents will influence the present marketing prototype in interactive media. It focuses on the importance of these in E-Commerce. E-Commerce is a platform for the online activities of commerce, increase in the activities of trade in cyberspace increases the business opportunities over internet. Software agents are the useful tools to help individuals to undertake their activities on E-Commerce surroundings. Software agents create different paths for communication. Software agents increase the effectiveness and efficiency in several levels of market processes. The agent technology builds the bridge between the previously existing physical market and consequences of virtual markets. Software agents will have dramatic competition effects by quick transfer of information through new technology. As the name indicates software agents acts as mediators for the processes of choosing products and merchants. Overall software agents act as a vehicle between E-Commerce and business.

Keywords: agent, Agent-Based technology, collaborative agent, e-business, E-Commerce, ecommerce analysis, Mobile agent, reactive agent, Software Agents, technology

1. Introduction

Greater portion of daily activities such as shopping, socializing, and working are being transferred to the internet environment. Over the past few decades, human computer interaction, and electronic transactions are being used. Individual's online activities are getting more and more complex with growing opportunities of internet environment. The internet that has grown dramatically in the past few years would by now becomes unmanageable without E-Commerce for business [2]. It is claimed that within the next decade the internet could be populated with billions of agents exchanging information, goods and services with one another and with the people [3].

1.1 What is E-Commerce:

Modern methodology of news selling and merchandising tools that refers to the need of market by cost reduction in turns giving quality goods and services. E-commerce means doing business over interconnected networks. The term commerce is treated as transactions between business clients. So the meaning Electronic Commerce is narrow to some people thus there is a usage of term E-Business. But E-Commerce is not just buying and selling but also providing services to the clients and providing both inter and intra transactions of information in the organization irrespective of the type of company. This extended use of internet for trade and business led to the use of software agents in E-Commerce.

1.2 What are Software Agents:

Although the theory of agents stated that agent is given a very famous with the growth of internet. Software agents are a piece of software which works for the user. However software agent is not just a program. An agent is a system situated within and a part of an environment that senses that environment and acts on it. Over time in pursuit of its own agenda and so as to effect what it senses in the future [4]? Important use of agent concept is, as the tool for analysis not as dosage. As the system changes on can understand it.

1.3 Characteristics of Software agents:

Software agents are like guards and locomotives of most E-Commerce. The following are very few characteristics:

- Software agents can do their task without any outsource intervention.
- Social interaction with other software agents and human.
- Software agents are specific in their goals.
- Good software agent is the one which has the attitude to receive and adopt changes [9]. The agent must be programmed in a powerful language so as to express the rules.
- Safety of the information must be promised by the agent.
- Effective usage of the existing resources.
- Agent must be a good sailor
- Agents must be very careful in handling unauthorized users. The same information must be accessed by the user to which they have right.

1.4 Type of Software agents:
Agents are classified into different types based on the characteristics they posses. In order to possess the above properties agents must have distinct features such as locomotion, integration, co-operation, information, stimulation, etc. For the same sake software agents are classified into 8 agents.

1.5 Collaborative agents: A collaborative agent is a software program that helps users solve problem, especially in complex or unfamiliar domains by correcting errors, suggesting what to do next, and taking care of low level details. Collaborative agents are also refereed as collagen. In spite of their behavior of autonomy, co-operation, and learning, collagen punctuate the first two behaviors. In order to perform these they have to agree on acceptable protocols.

1.6 Interface agents: Interface agents are computer programs that employ machine learning techniques in order to provide assistance to a user dealing with a particular application (Maes, 1994b). These agents take sufficient amount of time to understand and learn human behavior before they are onto work. In spite of their artificial learning thoughts they are limited co-operative with other agents [10].

1.7 Mobile agents: A mobile agent is an executing program that can migrate during execution from one machine to another in a heterogeneous network [11]. Mobile agents are used to solve many problem of network computing with minimum bandwidth and connectivity [12]. The theme behind these agents is, 'give program the ability to move'. The main advantage of mobile agent over stationery agent are:
(a)This is not bound to the system where it begins execution. (b) Can move from one system to another within the network. (c) Both the state and code is transported.

1.8 Information/Internet agents: The intelligent part of software which can automatically search for information on the website is termed as information agents. Information system can be considered as knowledge base system. These agents are defined by what they do unlike collaborative agents or interface agents which are defined by what they are. [10].

1.9 Reactive agents: These agents are responsible for stimulating the response to the present state of the environment in which they are embedded. These agents interact with other agents in a very simple and basic way. The important things which support reactive agents.(maes 1991 a ; p.1)

There is no prior specification of the behavior of these agents set since the dynamic interaction leads to the emergent complexity. (b) Reactive agents are responsible for collection of modules which operate autonomously. (c) Reactive agents tend to operate on representations which are close to raw sensor data [10]. (d) Intelligent behavior is the interaction of these agents with their environment.

(a) **Hybrid agents:** Combining two or more of the previous mentioned agent philosophies will yield a better functioning agent. E.g.: Synergy of reactive and collaborative model. The expectation is that this hypothesis will come true.

(b) **Heterogeneous agents:** These agent systems unlike hybrid, refers to an integrated set up of at least two or more agents which belong to two or more different agent classes. These may also contain two or more hybrid agents [10].

(c) **Smarts agents:** The smart agents are the new form of software agents that interface with other agents forming an artificial intelligence. SMART stands for System for Managing Agents for Real Time. The key concept lies here is not the entire individual agent need be intelligent. But by working together in a smart way the agents form a type of emergent intelligence that may appears to exhibit intelligence.

2. Literature Survey
There are several experimental agent projects at HP Labs in Palo Alto and Bristol, focusing on E-commerce and application management. Agents include standard libraries of measurement objects and methods to initiate, change, and dynamically update measurement. (See http://beast.cs.utah.edu). They have implemented a light-weight, dynamic agent infrastructure in Java (Chen, 1998, 1999), used for data mining and dynamic workflow integration and provisioning. Dynamic agents support "on demand".Several projects have focused on the agent mediated E-commerce, looking at negotiation in task allocation (Preist 1999), implementing a new facilitator architecture (Pearson, 1997), and playing a key role in the FIPA97 ACL specification. They are developing an experimental web-based economic simulation environment for a shopping mall, and integrating

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that with personal agents and mobile appliances based on HP CoolTown (http://www.cooltown.com) (Griss, 2000), using Zeus (Nwana, 1999) as base.

3. Motivation:

It is a strong motivation for the use of software agents: agents with great powers should be carefully designed and analyzed. The role of software agents is very important in E-Commerce since it performs many functions like economic benefits, collaboration, integration, etc.. A full proof design is necessary to test the importance.Software agents mimic the way human individuals, organizations & societies succeed in very large complex tasks with the combination of E-Commerce. The fact is that a single human or any organization of humans is usually good in doing something, called Creating Value [1]. The fact that one earns money is because he/she creates value for their employer; the fact that some company makes money is because it creates value for its customers. So the general motivation for an architecture that tries to mimic human or human organization is to enable software to create value. It isn't that existing software today doesn't create value, the only reason software agents exists is because it creates value. But, unlike software agents, humans aren't (explicitly) programmed – they are given some initial knowledge (education/training), they are assigned some jobs, & they create value while collecting the knowledge & expertise in doing it. Something innovative is required to basically be able to claim that we can build such applications that create value without being programmed again and again, except for some basic business: when assigned with a job, performing it, improving in it & creating value without being specifically programmed as to how to solve each case. It can

- Solve unexpected situations,
- Create value in unexpected ways, employ both common sense & the ability to learn from situations,

improve its performance, i.e. by collaboration and by merely performing the job for sufficient amount of time. The basic attribute of Intelligence can be assigned to three dimensions [5].i.e. Knowledge, Thinking, Learning.
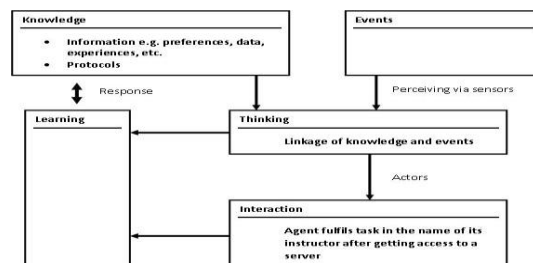

Figure 1. Mode of operation of software agents modified [main source [6]]

The knowledge of an agent consists of information and protocols. Information is to be understood data such as user preferences, or data. A protocol consists of simple if then relationships or represents also complex neural networks. For the use of knowledge the agent needs the ability to think, which is called agent machinery. The agent machinery requires two things. The agent must assume events in its environment over sensors and it must combine the assumed events with its knowledge in a thought process (6). From this linkage the agent can draw conclusions. And the agent can initiate autonomously, without intervention of the instructor, and act through the actors. The extension of the knowledge base results from learning processes. Learning is a behavior modification, which is the result of an experience. A software agent learns using its learning machinery [7]. The agents execute their task by replicating themselves within a network from one computer to another computer.Agent-based e-business in E-Commerce can be defined as a business enabled and operated by software agent technology. The primary roles in the agent-involved E-Commerce environment are played by users, agent-based e-business, existing e-business and other agents. The framework for agent-based E-Commerce analysis in
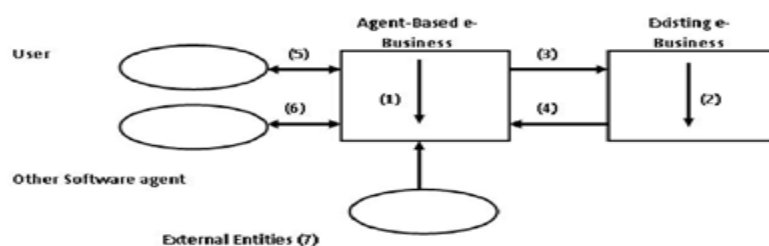

displayed in Figure 3 from the paper [13] .
Figure 2. Framework for Agent-Based E-Commerce Analysis

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The classifications of researches by the framework for agent-based E-Commerce analysis are shown in the table.

Arrow 1-> Evolution of agent-based e-business [13].
Arrow 2-> Change of existing e-business [14]
Arrow 3-> Impact of agent-based e-business on existing e-business [15].
Arrow 4-> Effect of existing e-business sites on agent-based e-business [14]
Arrow 5-> Interaction with agent-based e-business and user [16]
Arrow 6-> Interaction between agents [17]
Arrow 7-> Influence of external entity (institutional, legal etc environments)[14],[5],[16].
The above discussed concepts, the Knowledge, Thinking, learning, and eventual change in e-business provokes to note the important role of software agents in the market.

4.   Role of Software Agents In E-Commerce:

This part focus on the basic fundamentals including, the terms used in E-Commerce with respect to software agents and different examples which explains the role.

4.1. Software Agents enabling the formation of virtual organization:

Virtual systems are the decentralized business networks which work in flexible. To have efficient operation and productivity virtual organizations must be able to communicate, Co-operate and Co-ordinate (the 3Cs of business) with each other. Software agents are effective tool to virtual organizations since they provide mechanisms to automate several activities like, gathering data, refining information, negotiate business deals and also intelligent agents work like human beings in supplying and buying goods having the artificial machine knowledge. Software have variety of applications which includes, B2B E-Commerce, Internet based info systems, robotics, smart systems, DSS, data mining and Knowledge discovery. Agent technology helps in finding intranet or internet, Customer relation management, supply chain management and market pricing.

4.2. The reason behind the use of Software Agents:

The software agents are used due to the effect of following reasons:

[1]   Software Agents and Mobility: Mobile agents are a kind of software agent that represent a revolution in how programs are distributed, run and server resources shared and how computer users interact with online services.. They can act on behalf of their principals autonomously while performing their actions in some level of pro-activity and reactivity.

[2]   A software agent is a software entity that acts with autonomy to accomplish tasks on behalf of its users. They function continuously and autonomously in a particular environment, often inhabited by other agents of processes [20]. The idea here is the use of software agents for collaboration.

[3]   Coping with Emergencies: There are situations where people, organizations or computer systems will undergo stress. During this stage they fail to take quick actions which are common or daily tasks. For an individual, if there are some natural problems like death in the family, illness, or job problem etc. they fail to take care of simple thing like paying phone bill or electricity bill etc. For these kinds of problems it is not the solution to have a automated systems. Dynamic Distributed systems: Software agents provide a better figure for utilizing parallelism and dynamics of Computer networks which increases the usage of the available networks. Software agents give an ideal figure out for distributed computing.

[4]   Life agents: Life agents are software agents that are initiated and run in the background and act directly or indirectly on the client's side automatically, monitoring the progress over the period of time.

4.3. Technology behind Software Agents:

The idea here is enabling the intelligent agent as an instantly connected computing service on the network [18]. The use of WWW provides robustness and scalability of web servers; access of firewalls will also become easier. Since Intelligent Software Agents (ISAs) include problem domains that require *human-like intelligence* processing automated they need to have artificial human like intelligence. In order to process this they need the knowledge of the techniques like Artificial Intelligence, Pattern recognition, neural networks, embedded systems, and similarly such high end knowledge. Software agents offer great promise to build loosely-coupled, dynamically adaptive systems on increasingly pervasive message-based middleware, P2P and component technology, Java, XML, SOAP, HTML, HTTP and CGI etc. It can be seen that the knowledge of software engineering and enterprise modeling is also required for software agents.

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4.4. Examples of Software Agents:

- Buying agents: Also know as shopping bots. These bots helps the users to surf while finding the products and services they are searching for. For example, when a person surfs for an item on eBay, at the bottom of the page there is a list of similar products that other customers who did the same search looked at. This is because it is assumed the user tastes are relatively similar and they will be interested in the same products.

- User agents: Also known as personal agents. These agents carry out user tasks automatically. For example, some bots sort emails according to the user's order of preference, assemble customized news reports, or fill out webpage forms with the user's stored information.

- Monitoring and Surveillance agents: Also known as predictive agents. For example, the agents keep track of company inventory levels, observe competitor's prices and report them back to the company, watch stock manipulation by insider trading and rumors, etc.

- Data-mining agents: This agent uses information technology to find out the modern fashion in information from many different sources. For example, the agent that detects market conditions and changes and relays them back to a user/company so that the user/company can make decisions accordingly. The others examples are User agent, Mail Transfer agent, SNMP agent, DAML (Defense Agent Markup Language), 3APL (Artificial Autonomous Agent Programming Language), OWL (Web Ontology Language), Management agents, etc.

5. Applications And Benefits Of Software Agents:

[1] Agents make less work for the end user and application developer.
[2] The agent can adapt to its user preferences and habit over a course of time.
[3] It will intelligently get shared among the community.
[4] Mobile agents manage the user's E-mail, fax, phone and pager as well as linking the user to Telescript-enabled messaging and communication services such as America Online and AT&T PersonaLink Services [10].
[5] The most favorite area with respect to reactive agents is games and entertainment industry [10].
[6] Shopping agents are ideal applications of AgentBuilder agents. These agents can be used to locate
[7] merchandise, compare prices, place orders, etc.

Intelligent Software agents will have numerous applications in the field of human like intelligence capabilities which is a area of research being done in Artificial Intelligence. Some of the applications are:

[1] Logical Inference and Deduction
[2] Contextual Domain Knowledge
[3] Pattern Recognition
[4] Learning and Adaptively.

Once the human-like intelligence capabilities are automated, autonomous operation permits software agents to process vast volumes of data which would be unmanageable by human agents.

6. Conclusion:

After studying the characteristics of software agents different conclusions were drawn that software agents are flexible enough to adopt and adjust themselves into changes. Software agents provide security to the information. Since E-commerce deal with business online, security plays the heart of business. Business needs lots of communication skills which is provided by software agents. Software agents are responsible for customer satisfaction in terms of B2B E-commerce. Software agents can be thus proved as an important entity with respect to E-Commerce. Without Software agents E-Commerce is like "a man having his leg cut".

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