Intelligent Agent Facilitated e-Commerce

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Abstract
The depiction and execution of a multidisciplinary fact-finding design including a smart agent-based architecture for collective e-commerce operations are presented in this article. A Multi-Agent System (MAS) structure is designed and developed for multidiscipline e-commerce settings including a variety of globally distributed consumers and merchants. This framework is distinct from other current e-Commerce systems in that it not merely uses agent technologies in new ways in e-commerce systems, but it also integrates the law on privacy and regulation into its technological framework.

Introduction

Many current e-commerce [1] apps simply offer customers with a very basic, browser-dependent layout to obtain available consumptions that frequently lack social status replication. The clients are mostly separated, and everybody is purchasing as if they were in a void store. As a result, consumers do not get the same purchasing experience as they would at a physical shopping outlet or mall. Purchasing is a public event that many individuals love doing with their friends and family. Shopping is a socially facilitated activity, meaning that individuals shop more often and appreciate it more when they do it with others. Researchers claim that "people don't really like to purchase in an empty store". Studies indicate that 90% of consumers like to converse with each other during purchasing. Researchers state that purchasing groups enhance customer commitment and viral purchase, lower the customer acquisition costing, and enhance higher transaction levels. Given the present outburst of electronic commerce over the World Wide Web [2] and making purchasing as painless, simple, and pleasant as practicable, it is fascinating in improving the means by which individuals purchase. As a result, offering an e-community web buying experience brings online purchasing closer to the genuine shopping experience consumers enjoy in real-world stores. Basically, the word "community" specifies to a gathering of individuals who have similar interests, such as asking questions, collaborating, or sharing cultural standards and experiences. Members may connect frequently to master from one another by exchanging their explicit expertise and disclosing information about their triumphs and mistakes since they are in the same location. Web technologies are used by these groups to disseminate cognizance and information rapidly and cheaply, and for worldwide transmission and cooperation. E-communities, including conventional groups, serve as data warehouses for its clients. However, e-communities have the advantage of being able to keep a greater quantity of essential data. The increased interaction between sellers and buyers, and between clients and visitors, is a benefit of using e-communities in e-commerce systems. It allows online businesses to provide functionalities that are currently unavailable in the majority of e-commerce shops. The online group shopping store, for example, provides a facility for shop owners to offer real-time customer service, sales help, selling activity, advertisement, and personalized fostering, all of which is shown to increase selling in the past[3]. The goal of

this multidisciplinary study is to provide a platform for cooperative e-commerce applications based on intelligent agents. We want to create a Multi-Agent System (MAS) [4] framework considering big cross- discipline e-commerce settings that include many geographically distributed users (customers/merchants). The connections amongst agents in the e-commerce environment enable collaborative trade. Due to the significance of cooperation and society, the framework that we create will be based not only on solid technology but also that took on a well-thought-out legalized framework. The aim is to combine technology and regulations, fusing software and legal codes. We want to build an ecommerce culture that enhances ethical and legal concepts like

explicit consent and the preservation of personal privacy [5], apart from providing an agent system which convincingly represents the reality of business. In addition, the agents observe fundamental client safely along with data principles, as well as current ethical [6] and legal standards, with great care.

Collaborative Commerce Multi-Agent System

This article offers a framework for building e-communities related to a group of linked agents, every agent accountable to a job, for optimizing adaptation and adaptability in an electronic commerce context. The collection of agents can answer increasingly complicated system needs by working together. The whole system becomes more contained and flexible when a big e-commerce system is broken down into sub-tasks. The interoperability of various agents and possibly the interoperability of various agent groups results in the capacity to solve complicated needs.

A. General Framework for Collaborative Agent-Based e-Commerce

The AGILE architecture [7], that is a framework for agent-dependent collective and communicative environments, was suggested in earlier works. This study builds on prior studies. Figure 1 depicts the suggested system design.

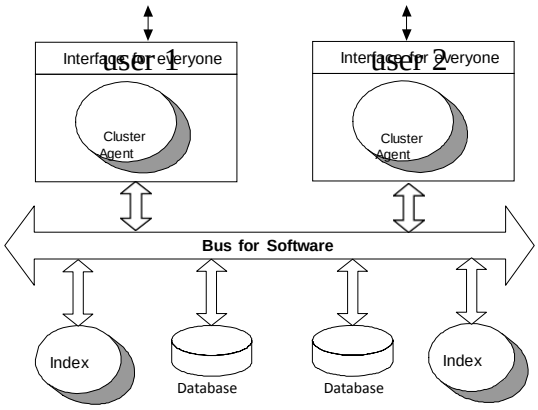

Figure 1 Generic Framework for Agent-Dependent e- Commerce

It is split into two conceptual modules that are inextricably linked: information sharing and collaboration among the various system constituents including agents, in addition to agent layout and collaboration. The agents are used in communicating with users, provide a consistent interfacing, and facilitate cooperative job among many buyers. The Agent Cluster is a distributed system's substitute for a buyer, is made up of various agents (buyer agent, purchasing agent, selling agent, and so on) that facilitates the consumer with a consistent interfacing for different tasks. They too track buyer activity in order to understand about the buyer's inclinations, interact with various other buyers, and execute activities for the client even though the user has signed out. The directory/index offers distributed solutions in

providing necessary details related to the whereabouts and locations of agents and distributed information repositories. The inter-agent communication is handled by the software bus that is built in accordance with the Microsoft.NET framework.

B. An individual working as an agent

For our simplicity, an agent defines a software constituent that runs in a scattered environment and can do autonomous actions in response to demands from different agents or exterior approaches. The processing of the demands may sometimes necessitate the creation of additional requests from other agents in the network. A location, a logic element, and a publicized interface are all necessary components of a system agent. Almost every agency will get a name property as well.

Address

In a distributed system, the address attribute is utilized to find the agent. The suggested system is built on the Microsoft.Net framework, while the address in the context was http://demomachine:5050/demoAgent.

Logic Component

The logic part is unrestricted. There must be an application that handles the request behind the agent interface. Behind the interface, whether it's an older inherited platform or completely newer code, there's an entity that processes the request and generates intelligent answers to queries. There are no hard and fast rules on how this should be accomplished; it will be as easy as a repository search or computation, or it could need the deployment of sophisticated machine learning techniques. The philosophy needed for an agent is determined by the agent's requirements including the kinds of queries it anticipates to process.

Interface

Additional agents or exterior frameworks may interface with and approach the agent via the interface property. The strategy is to utilize generic interfaces that are standardized. This usually entails creating an interfacing framework which may be utilized by many kinds of agents. The Knowledge Query Manipulation Language (KQML) [8] is an agent communication language that allows agents to communicate with one another. Performances in KQML describe the types of communications that a KQML talking agent may possess. The content layer, the communication layer, and the message layer are the 3 levels that make up a KQML message. Communication level codes a collection of information characteristics which define the communication's lowest-level attributes, including the transmitter and beneficiary's identities, as well as a unique identification. The message layer is used in encapsulating data in which one application wants to send to another third party. The message layer is at the heart of the KQML language, determining the type of intercommunications possible with a KQML-talking agent. KQML message may be used to demand an agent to do a task, to give different agents with specific message, to monitor different agent for a specific state, including demanding that an agent may undertake a task.

C. Agents Community

In the suggested architecture, a community is a collection of linked agents. Agents in a group are realized utilizing the interfacing that the community requires, and they anticipate related agents in the group to comprehend those interfaces too. Agents in a group may also require circulating Naming Service Agents so that other agents in the community may locate them. Different agents and applications can locate and use the agents in a community since they are grouped together within it. In a normal community, there really are very few other kinds of agents.

Naming Service Agent

Service for Naming is a deliberate agent which tends to keep the framework informed about the presence of agents in a population. The naming assistance is in charge of managing its inherent information of the agents in a group (usually by processing add/remove agent petitions received by different agents whenever those penetrate or depart the application). While an authorized agent wants to locate an agent, it communicates this information with them. The only agent who will always be recognized by address is the Naming Service Agent, which is why it is such an important aspect of any community. Agents are often temporary, with the ability to migrate, enter, or exit a community depending on their specialized tasks. Because Naming Service Agents allow access to several other agents in a society, they are responsible for defining which agents are present in that community as well as the boundaries of that group. In various circumstances, a basic address lookup may not be enough to meet the needs of the group. A ticket creating server may operate as an identification facility when a community requires security or privacy management. Ticket generators and naming services, for example, help agents locate and connect community resources. Depending on the demands of the community, the specific mechanics vary.

Broker: A broker denotes a straightforward name lookup facility in which an agent sends a request for a program and receives accurate connecting details (IP address, HTTP address, port number, etc.) in order to connect to that service. Clean text is frequently used to pass the details.

Kerberos Server is a client/server authentication protocol. Rather than simple data connection, a Kerberos server sends an encrypted [9] ticket including information authenticating [10] the person who will use the ticket as well as a few easy constraints on the agent's usage of the ticket. There are two pieces to a ticket: the client and the server. Each section contains connection limitation information and is encoded with private keys that are known by the server only. Kerberos tickets enable an agent in verifying it with a request and generate a key which every party could utilize in sending secured data.

Pluto Server: Pluto is a new protocol that combines Kerberos and expands the ticket to also incorporate purpose information. It was developed as part of the architecture. A major necessity for establishing privacy management in information flow is the purpose of information. Pluto was created with the goal of allowing private information to be shared in an e-community.

Agent in the Directory

Agents who have registered to do a specific duty are listed in the Directory Agents. Agents [11] who can take orders may index with a unit individual who maintains a listing of such agents. It is comparable to the work of the Naming Service Agent, except that every agent in a society must list with the Naming Service Agent, but only those ones who need special recommendations should enroll with a Directory Agent. For adding and uninstalling agents, most directory agents include interface methods. Finally, the distinction between such directories including a name service would be that it is a full naming system to the whole world, but a directory provides a more limited perspective of connected facilities. A naming facility is a worldwide scheme, whereas an active directory is a better localized collection of associated agents collected for the purpose of a particular objective.

Simple Agent

Simple Agents is an agent who only process requests and doesn’t keep track of every other agent in the network. It is informed for the Naming Service agent since it is required to

register while entering or exiting a framework. For similar reasons, they might be knowledgeable of Directory Agents. A simple agent is one that may handle most of the petitions devoid of the help of various different agents. Simple agents need strategies that are clearly relevant to their goal.

Agent for the Application

Agents who handle queries by organizing sub-requests to go to other agents are known as application agents. Typically, this entails breaking down a lone request (given to an Applications Agent) into numerous sub- requests that are sent to different agents, after which the petition agent performs a few calculations of its own and returns the calculated result to the primary pleader. If the group is password-protected [12], chunk of this computation will include filtering responses based on the Pluto session's goals. For their purposes, application interface methods, as well as connection to a directories service for locating agents to process sub-petitions. These agents may not be necessarily exclusive, and composite agents which combine these kinds of agents are anticipated. A utilization agent, for example, may keep track of its individual collection of simple agents and operate in a combination of Directory/Application agent. These agent aids in the classification of agents as well as the comprehension of an agent's interface requirements.

D. Community-to-Community Cooperation

The fundamental architecture has various advantages of its own, but it is also outlined to consider of the likelihood of agents existing in various organizations simultaneously. To become a member of a community, an agent must first enlist with the group's Naming Service Agent and alter an interface which the group interprets. It's not difficult to sign up for a new naming service. The agent should have a distinctive identity for that group as well as a label in order to register. If these two conditions are satisfied, the Naming Service will include it to the community's agent list. The necessity to swap private keys and authorization will complicate this in secure or privacy-guided groups. It's frequently more difficult to meet the interface requirement. There's no purpose to suppose that certain groups will undergo the same needs, so there could be a few challenging job ahead. In most cases, there are two options: The first method is to make use of generic interfaces. After all, the ability to share interfaces across many communities is why generic interfaces exists. If two communities require their agents to have the same generic interfaces, adding a current agent to a new society is as simple as alerting the new group's Naming Service Agent. Another possibility is to add new interfaces to surviving agents. Because the agent interface and the agent logic are kept distinct, newer interfaces must have little consequence on the real agent logic. Although new reasoning may be required, agents are developed for a certain purpose, and migrating to a newer group should not alter that goal. Most of the rationale should remain intact because the goal is unlikely to change. Incorporating an agent to a newer community should, at the very least, necessitate the creation of a newer interface which is compatible with the newer environment and the reuse of current logic.

Community Secrecy Management

It is assumed that fewer agents may need confidential information regarding the clients in order to accomplish their goals. Because the acquisition, utilization, and dissemination of private data [13] may have valid ramifications, a group of agents will be needed to accurately control private data. Agents are able to take independent action, and if that activity includes exchanging private data, agents will be structured to do so in a manner which follows the statutory privacy standards.

The Private Information Protection and Electronic Documents Act (PIPEDA) [14], Canada's comprehensive private-sector privacy legislation, incorporates the Code. The Code and PIPEDA are utilized to aid in the development of security conscious agents since they establish obligations for companies in Canada to maintain private data. Other countries have enacted or are enacting similar legislation. While the concepts mentioned in the Code and PIPEDA are significant in the e-commerce society, most of them are basically not relevant from the perspective of agent framework. As those postulates have a consequence on the architecture of agent groups, this paper observes at the Accountability, Disclosure, Safeguards, Identifying motive, and Retention principles.

A. Protections

Personal information must be secured by security precautions that are proportionate to the information's sensitivity. To manage private data, a single agent or a group of agents is needed to emphasize that the system's data is protected. The utilization of digital signature along with cryptography can ensure that system agents are who they say they are, and that private data in the system is not intercepted while moving. Although the Kerberos protocol will assure that every message sent across a local group are properly encrypted [15], it is insufficient. Though enough security for sharing private data is accomplished, there are further important problems about regulating what data is shared and with whom it can be shared. Purpose information must be used for filtering in regulating information for confidentiality.

Collaborative e-Commerce

Existing online shopping websites mainly concentrates on the technique of trading products in their design and execution. Mail-order catalogues are produced online, and metaphors such as shopping carts and virtual payment registers are introduced. While these analogies attempt to make buying easier by simulating real-world experiences, existing virtual marketplaces [16] frequently fall short when it comes to simulating social interaction aspects. We think that the virtual economy and the social space should be combined once again. Customers who buy on the virtual market must shift from being consumers to becoming individuals who wish to purchase to meet a broad variety of requirements. One of these is the purchase of products; others include social contact, learning, and thrill, all of which may be fulfilled in a community [17]. The function of markets in bringing strangers together may lead to the formation of new social groups. An e-commerce community engaged in the selling of bedding is intended to verify the suggested architecture. Businesses in this sector may deal with the selling of mattresses, pillows, and sheets, as well as consumers who want to buy them. To organize the buying tasks, special purpose applications and directory agents would be used. Each company would choose its own sales representative to handle the selling of its goods inside the community. Those selling parties may utilize the company's proprietary group or include rationale necessary for conducting sales of that company. Moreover, clients may be assigned to agents who will manage their purchases. It would keep track of a customer’s wants and preferences and be granted the power in acting as that client's proxy within the system.

Interactions between customers and businesses (C-B)

A consumer agent purchasing a product or service from a Business Sales Agent [18] is the most apparent connection between agents in this framework. A directory agent may be used in tracking of all product-selling salespeople. A client interested in purchasing that product may then contact that directory agent for a record of all selling agents for that product and

make a purchase with an applicable sales agent. The negotiating procedure between the client and the sales representative will be detailed in the next section.

Interaction between customers (C-C)

A more intriguing situation is to group consumers together so that they might benefit from group discounts provided by certain companies. A second application agent might maintain records of consumer agents seeking a commodity, and if enough customers are focused, it could make a combined sale.

Conclusion

Electronic commerce is increasingly becoming a significant part of company interactions. Users may encounter mush more features which they would meet in a real-time purchasing environment as a result of the development and usage of a collaborative e-commerce environment. The study described here will have a big effect on how intelligent-agent-based e-groups of sellers and buyers are used in business. Plenty of contemporary e-commerce apps use agent technologies to deceive users about online goods and services, or to collect and mine private details without their knowledge. A value-centered design approach was developed by concentrating on consumer safety and data principles as a major design element, ensuring that essential policy and legal objectives are maintained while also understanding that protecting end-user privacy makes excellent economic sense. Furthermore, ontology-dependent methods for the abstraction of general interfaces, that are popular to facilitate integration across diverse parties, will be explored in the future.

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