Development of Web-Based Air-Line Arrangement System Using Intelligent Agent

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Abstract

In traditional AI technique, systems have not been designed for dynamic environments requiring adaptive response. Agent-oriented approach has the potential enough to improve robustness and flexibility of web services. The primary function of an agent is to help the user better use, manage and interact with the computer applications. Intelligent agents automatically identify web resources, integrate and execute them for achieving the intended goals of the user. Electronic commerce is having a revolutionary effect on business. It changes the way businesses interact with consumers, as well as the way they interact with each other. In fact, we build a Web-Based E-Commerce System using intelligence agent to compose and combine web and services of flight and airways to achieve user goal. It has many advantages like improved efficiency, better process control, improved customer service, flexibility and business process improvement. System relate with web services to provide refined search and composition in order to take care of user needs. But still there is need of more research to explore this area of e-commerce system.

Keywords: Intelligent Agent, Dynamic Composition, AI Planning, e-Commerce.

1. Introduction

Artificial Intelligence (AI) is one of the newest computer science concerned with designing intelligent computer systems that is systems that exhibit the characteristics we associate with intelligence in human behavior understanding language, learning, reasoning, solving problems and so on. The first successful commercial AI system, R1, began operation at the Digital Equipment Corporation that helped configure orders for new computer systems.

AI currently encompasses a huge variety of sub-fields, from general purpose areas such as perception and logical reasoning, to specific tasks such as playing chess, providing mathematical theorems, writing poetry, diagnosing diseases. Often scientists in other fields move gradually into artificial intelligence, where they find the tools and vocabulary to systematize and automate the intellectual tasks on which they have been working all their lives. Similarly, workers in AI can choose to apply their methods to any area of human intellectual endeavor. In this sense, it is truly universal field. [1]

Agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through effectors. The primary purpose of agent is to help the user better use, manage and interact with computer applications. Agent based systems are assumed to involve artificial intelligence and include a degree of autonomous problem-solving ability.

The work of Allen Newell, John Laird, and Paul Rosen Bloom on SOAR is the best-known example of complete agent architecture, one of the most important environments for intelligent agents is the Internet. Intelligent agent system have become so common in web-based applications that the "-bot" suffix has entered everyday language. AI technologies underlie many Internet tools, such as

search engines, recommender systems and Web site construction systems or Contents Management Systems (CMS). [3]

This paper intends to build a web based Intelligent Agent system that helps us in the area of searching quality and optimize Air-line from Internet. This system may serve users with best online searching services and reasonable and optimal flight traffics.

This paper organizes introduction, related work, intelligent agent, system architecture, implementation and conclusion. At intelligent agent section, we introduce agent technology and application area. Then, system architecture is presented. Working flow and agent design algorithm are implementation section. Last, we conclude with effect and result of using agent technology.

2. Related Work

The agents should be able to interpret the services provided over the web. Agents should be able to discover, invoke, compose, interoperate, monitor. The web resources offer particular services and having particular properties. [4]

Semantic web services will publish machine interpretable descriptions of their capabilities and interaction models so other software agents can find and use them without prior 'built-in' knowledge about how to call their APIs. They will soon support the development of personal software agents or 'semantic web clients' for such things as comparative shopping, information discovery and travel planning, and compositions of those services. Less glamorously, but perhaps more importantly, these techniques may soon enable business-to-business interactions that are more dynamic, support semi-automated service composition on the scientific computing Grid and enable mobile, wireless devices to be able to interact seamlessly with the services discovered as they move about.

- "Service" not only the static information but allow one to effect some action
- Semantic web will enable users (agents) to locate, select, employ, compose and monitor web-based services automatically.
- a software agent can interpret the description of services (Web Services), a framework needs to be established within which these descriptions are made and shared

Intelligent Agents [6] and Semantic Web Services are located on two different layers of abstraction. Web Services, in the lower layer, make some parts of the companies' private business processes public. Then agents, in the upper layer, provide higher-level functions by using, combining and choreographing those services. [5]

3. Intelligent Agent

An intelligent agent is a computer system that is situated in some environment, and that is capable of autonomous action and learning in order to meet its design objectives. Agents have the following characteristics: reactivity—they perceive their environment, and respond, pro-active—they exhibit goal-directed behavior, and social—they interact with other agents. [6]

Real-time intelligent agent technology offers a powerful Web tool. Agents are able to act without the intervention of humans or other systems: they have control both over their own internal state and their behavior. In complexity domains, agents must be prepared for the possibility of failure. This situation is called non-deterministic. Normally, an agent will have a repertoire of actions available to it. This set of possible actions represents the agent's capability to modify its environments. Similarly, the action "purchase a house" will fail if insufficient funds area available to do so. Actions therefore have pre-conditions associated with them, which define the possible situations in which they can be applied.

The key problem facing an agent is that of deciding which of its actions it should perform to satisfy its design objectives. Agent architectures are really software architectures for decision-making systems that are embedded in an environment. The most complex general class of environments is those that are inaccessible, non-deterministic, non-episodic, dynamic, and continuous. [7]

The promise of combining two innovations will mean that the semantic web will move information from keywords to concepts and allow information retrieval to answer questions in way that makes sense. Web services will allow business applications to communicate over an existing, low cost infrastructure and if we add intelligent software agents to this mix, we allow task delegation as well as aggregation and coherent presentation of distributed content. The challenge will be in the automation of many of tasks.

4. Overview of System Architecture

System Architecture is described in figure 1. In this system, there are four main components. They are Interfacing, Searching or Discovering, Composition, Temporal Database and intelligent agent role and work flow.

4.1 Interface Components

Interface Component is Graphic User Interface. First user requested data such as travel start location, destination, date and time, money amount to spend are accepted. Then user is showed by displaying travel track or traffic. This component also interact other system components such as Search component, Composition component to get user goal or need.

4.2 Search Components

Search Component is discovering the information of all flight services from Internet. Temporal database is constructed and required data is stored.

4.3 Composition

Composition is arrangement to meet user required air line with lowest cost. If results are insufficient for user, composition component sends message to search components to discover again.

4.4 Temporal Database

In accessing the right and quick web service for the flight information it is necessary that all the requirements and user needs, preferences must be specified in order to get the right web service in no time. But this can not be done in this flow and the current architecture of web service. In order to avoid these things and make composition and users, company's task efficient, the agents can be placed in the current architecture so that it can overcome the problems that have been faced by the most customers. The users can't really express their preferences in searching a particular construction material. There is some lacking in the existing web service architecture as well.

The first thing is that the temporal database should be filled properly having all information of e-commerce web sites without any lost or broken services and should have updated information.

Second issue is as there is no such database which could provide and assist the users preferences, for that purpose an agent can be placed having its own database which keeps the information about the customers with the history and customers files as well as searching, maintaining previous histories and making new files with linking them and having the information about the customers preferences and every time the customer make search for particular construction material. All the summary information is provided in the database with the customer information whenever they search flight or travel. This approach can be provided in agent that as well the agent has the database, an intelligent feature like tree structure.

So, temporal database is created by discovery components according to user requirements. Then Flight and traffic data are stored at temporal database to use composition components. In temporal database, there are user input or requirement data , departure location, arrival location, departure date, departure time, flight class, return date and time, direct flight or not.

4.5 Introducing Agents in the Architecture

Introducing agents in this system can make users easy to find the construction traffic or travel for arrangement fast and in less time. The role and services that agents will play will be like services for web services in the process of searching and finding the traffic or travel fast by keeping all information regarding the user preferences about the traffic or travel and getting back the results in less time for the right traffic or travel which has to be arranged later on. In the web service architecture agents can be introduced as active agents, which interact with each other in order to process the inquiry (search) and process it and then return the results back to the requester who made the request. So agents can be deployed in the web service architecture for searching as well as introducing them in this system, to make it adaptive.

4.6 System Flow and Overview

According to system flow diagram described in figure 2, procedures of the system are described as follows. Users can search for flights information by inserting their traveling data. The system will reply Air-line when the user enters input data completely, and click Search button. Then, user's

input data are transmitted to system web server. So Travel Agent System searches and discovers appropriate web services at World Wide Web.

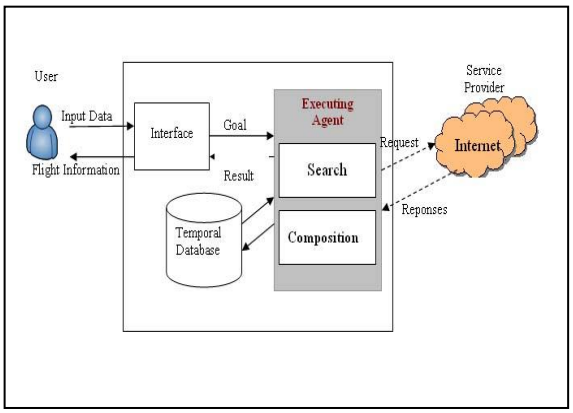

Figure 1. System Architecture

System stores required services and flight information temporally. So, system constructs temporal database. Temporal database will store for flight traffic composition and searching cost effective way or track. Temporal database will include some data fields such as Air Line or Company Name, Flight Name or Number, Departure Date and Time, Arrival Date and Time, Departure Airport and Arrival Airport, Seat Available Amount, Seat Class or Type, Ticket Condition, Price and Cost, Ticket Sales Companies and Agencies.

System composes and arranges airline transits and flight by using goal-based agent approach shown in Table 1. When the agent system meet user's requirement and need, reply and response best and optimize cost airline and flight to user's client computer.

```
Intelligent-Agent (request) return result
/*    seq - travel sequence, initially empty
      state – current state
      goal – user request, initially null
      pro – problem
*/
state = Update_State( state , request );
IF seq is empty THEN DO
      goal = Formulate_Goal( state );
      pro = Composite_Track( state, goal );
      seq = Search( pro );
END DO
RETURN result;
```

Table 1. Agent Algorithm

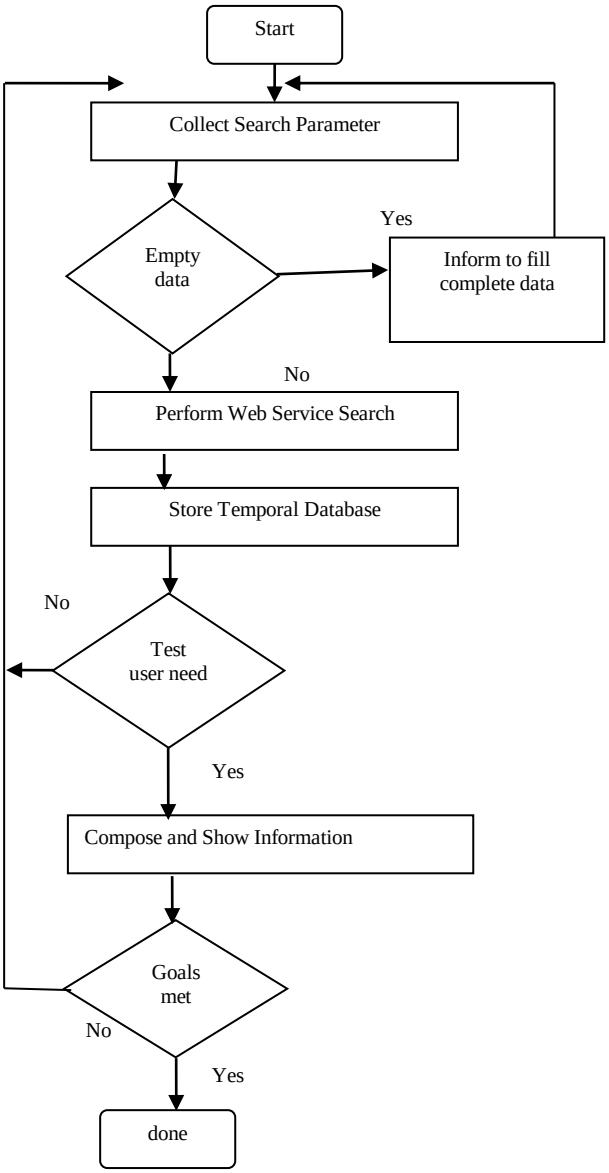

Figure 2. System Flow Diagram

5. Implementation and Use Case Study

There are seven menus of the system: Home, AgentSearch, NormalSearch, Booking, Help, About and Source. Traveller can search flight information by using two ways such as agent searching and normal searching, can book flight, can find airports and cities of each country of each continent. By using 'NormalSearch' entry form page, traveller can compare 'AgentSearch' entry form page and their result.

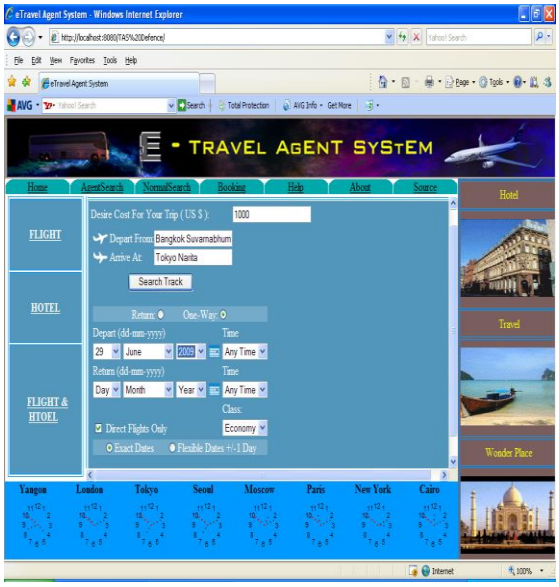

Figure 3. Graphical User Interface to give Input from User for Agent Searching.

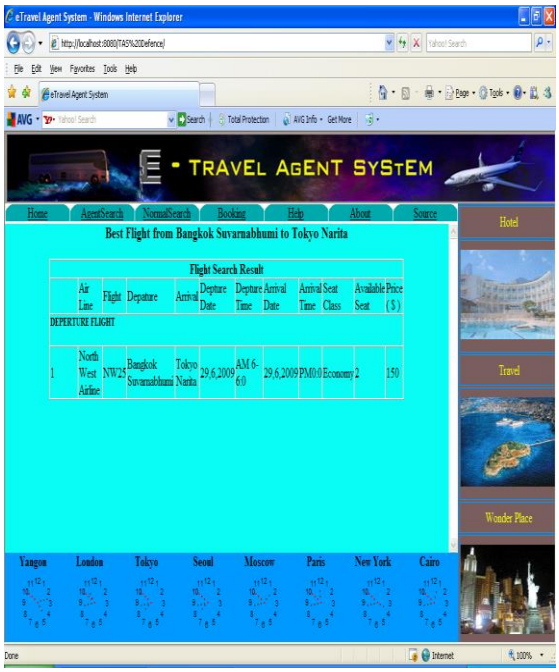

Figure 4. Graphical User Interface to show Output from System

If the traveler chooses to search, click 'AgentSearch' menu button, Figure 3 will appear in sight. Then traveler must input desired departure location, arrival location and departure date essentially.

When the customer clicks 'Search' button, the correspondence flight information screen will appear. The traveler decides to go from 'Bangkok Suvarnabhumi' to 'Tokyo Narita', Figure 4 will show.

6. Conclusion

Agent based approach is more favorable to the e-commerce than expert systems and based on dynamic implementation, since most of projects still dependent on the other available approach. Expert systems are not favorable to use agents because are not designed for reactive, proactive behavior also they are not coupled to their environment

A Web-Based E-Commerce System has been developed using intelligence agent to compose and combine web and services of flight and airways to achieve user goal. The use of Agent-based applications in Internet and Web is increasing rapidly. Thus, Agent system will have effects on application developer and consumer. E-commerce is more engaging and effective because customer, user and provider can process business transaction without the limitation of distance, time and locations. This system overcomes the limitation of current E-Commerce System because Intelligent agent system changes on-line transaction and process from manual discovery and usage of web services and to allow agent interaction, corporation and cordination. By using this system, traveler and tours and travel agencies will be able to get real world information using a click instantly.

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