

Travel Service Advisor System Based On Multi-agent Technology

Ei Ei Thu, Myint Myint Maw

University of Computer Studies (Mandalay), Myanmar
eithu.tweety@gmail.com, myintmyintmaw09@gmail.com

Abstract

Software agents are well-sited to assist users with routine, repetitive, and time-consuming tasks in various tourism domains. The use of agent technology is a very useful tool to find a solution in every day problems. This paper studies the web based agent framework with agent's cooperation capabilities. The cooperation between human and agent would benefit the human in saving time and receiving assistance. This paper discusses the software agent based travel service advisor system (TSA). The travel service advisor system targeted to support travelers by providing up-to-date information about travel companies' performance and help them to advice right decision according to their requirement and preferences. The TSA system can advice which trip package, hotel and travel company are relevant for user. The proposed system is implemented by using Java Server Page (JSP) and MySQL database server.

Keywords: Multi-agent, Information Retrieval, Information Filtering and Online Travel Advisor

1. Introduction

Agent technology is contributing most in the field of intelligent software. Intelligent software programs are being used to help users with personalized information [5]. Multi-agent systems are distributed software entities that cooperate or compete to achieve individual or common goals. The ability of agents are to acquire information and help the user to acquire information and help the user to gain optimal result. World Wide Web (WWW) is the primary source of information for people when searching for suitable travel destinations or planning a trip. In addition, these studies show that also the share of people actually book their arrangements via the online channel is constantly taking up [1]. In parallel, the number and variety of information offerings on the Web is also growing, which increases consumer confusion. Thus, it is becoming increasingly important for platform providers to differentiate among each other and come up with value-adding (electronic) services to turn lookers into bookers. The purpose of this paper is to construct some of the basic characteristics of online travel service advisor system. The proposed approach intended to help

online customers to overcome information overload and to support them in the decision-making process. Thus, travel service advisor systems are supposed to play a vital role in current and future e-tourism. The purposed system help to facilitate the work carried out in travel agencies by providing an interactive way to construct personalized tours, select predefined package tours and handle the underlying touristic information. This system has been designed as a set of high-level interacting agents. An effective advising process for the traveler requires the capture of the integrated information material in every possible form from all the sources and services such as travel companies' web pages. The goal of advisor system is to welcome online visitors and provide them a single-point of contact for preference elicitation. Travel advisor system uses software agent approach and preference-and-filter model.

This paper is organized as follows: Section 2 describes some related work. Section 3 describes the advantages of using agent and agent's cooperation capability. Section 4 introduces the system architecture which includes the functionality of agents, agents' interaction process of the system and data source of the system. Finally, we conclude the paper in section 5.

2. Related Works

Dielmar Jonnach et.al [4] presented an approach to providing an off-the-shelf software framework for the rapid and cost-efficient of an online pre-trip travel advisory service and that support for automatic generation of functional web applications. This system uses the collaborative-filtering and knowledge-based approach.

David Comacho et.al [3] introduced a multi-agent travel planning system to solve the web electronic problems. The main goal of this system is to search for useful solution in the electronic – Tourism domain. This system use different types of intelligent autonomous agents whose main characteristics are cooperation, negotiation, learning, planning and knowledge sharing. In this system, the information used by intelligent agents is heterogeneous and geographically distributed. The process to obtain, filter and store the information is performed automatically by autonomous agents. And then, this information is translated into a homogeneous format for high-

level reasoning in order to obtain different partial solutions.

Constantin Holdsis et.al [2] presented the multi-agent tourist advisor system to facilitate the work carried out in travel agencies by providing an interactive way to construct personalized tours, select predefined package tours and handle the underlying touristic information. This system has been designed using a multi-agent architecture with Distributed Artificial Intelligent (DAI) principles.

3. Advantages of Using Agent

An agent is known as a computer system that is situated in some environment, and that is capable of “autonomous action in this environment in order to meet its design objectives” [6].

The significant contribution of software agents is that an agent can act on the user’s behalf while the user is doing something else, leading to a significant decrease of human effort in routine work.

Another advantage of using agents is that the agent can work on tedious, repetitive tasks without losing attention and they act and react in situations more quickly than the user could.

3.1 Agents’ Cooperation Process

Agents are capable of co-operating with other agents, human or software, to accomplish their tasks. Agents’ cooperation process can be viewed as a three-stage activity as follows [6]:

- **Problem Decomposition:** In this stage, the overall problem to be solved is decomposed into smaller sub-problems. The decomposition will typically be hierarchical and the sub-problems are of an appropriate granularity to be solved by individual agents.
- **Sub-problem Solution:** In this stage, the sub-problem identified during problem decomposition are individually solved. This stage involves sharing of information between agents.
- **Solution Synthesis:** In this stage, solutions to individual sub-problems are integrated into an overall solution.

4. The System Architecture

Our proposed system is online travel service advisor system based on multi-agent technology. Online travel service advisor system also involves access to database using information filtering and link the appropriate travel web page. In multi-agent system which include humans and artificial agents interacting together to achieve the advising task. The architecture of the system is multi-agent system and three agents play a major role in our

system. They are: Interface agent, Facilitator agent and Information agent. Our proposed system includes three travel companies. They are MT&K travel company, AhNyarThar travel company and Green Palace travel company. Our proposed system advises which travel company and trip plans are appropriate for tourists. Figure 1 illustrated the overall architecture of the system.

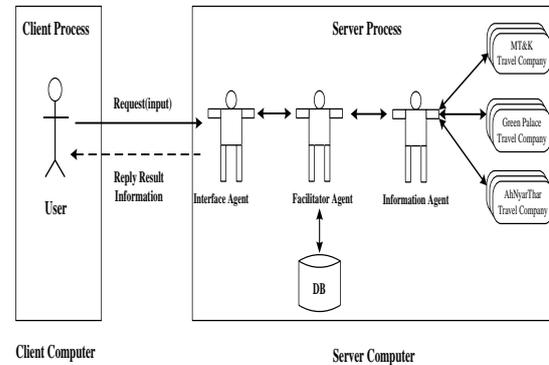


Figure 1. Overall architecture of the system

4.1 Functionality of Agent in the system

The proposed system is based on software agent that acts as user’s personal assistant. A software agent consists of the program execution states (the current input values, next instructions to executed, etc.). Three kinds of agents are used to implement our system. These agents are interact and cooperate to achieve advising tasks. Figure 2 illustrated the sequence diagram for the proposed system.

Interface Agent: Interface Agent has the responsibility to accept user’s input data and to send results information to the user. Interface Agent receives user’s input data and sends this input data to the Facilitator Agent to check the user’s input budget. If user’s input budget enough, Interface Agent accept the user’s travel requirements and preferences to filter and collect the relevant travel information according to this input. Secondly, Interface Agent receives the travel advice from the Facilitator agent and sends back it to the user. In third stage, Interface Agent receive detail travel information web page link from the Information Agent according to the Facilitator Agent’s advice trip package and then returns it to the user.

Facilitator Agent: Facilitator Agent uses database (DB) including the names of trip packages, place types and hotels in Myanmar. Firstly, Facilitator Agent receives the user’s input from the Interface Agent. Then Facilitator Agent check user’s input budget whether it is enough or not according to the total amount range of trip package in database. If, it is enough, then the Facilitator Agent has been

motivated to filter the user's travel requirement and preferences. As a result, the suitable advices are responsible to be sent to the Interface Agent. And then, Facilitator Agent save the resulted travel advices to temporary storage. Secondly, Facilitator Agent sends the resulted trip package ID to Information Agent to link the relevant travel web page according to this package ID.

Information Agent: In the proposed system, Information Agent is embedded within the Web Browser. Information Agent receives the result trip package ID from Facilitator Agent. According to the package ID, Information Agent link the travel information web page by using the Intelligent Page Store Iterator Function. As a result, Information Agent returns the detail trip package link to the Interface Agent.

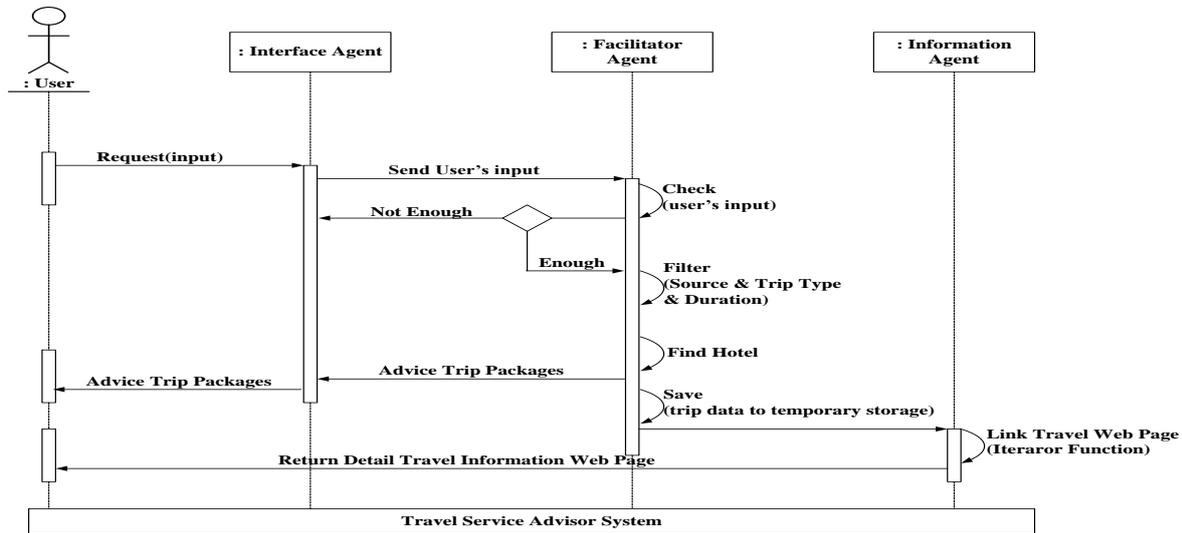


Figure 2. Sequence diagram for proposed system

4.2 Agent Interaction Process of the System

Our proposed system uses agent's cooperation capabilities to achieve the advising tasks. At first stage we decompose the advising tasks into five sub-processes. The sub-processes in our system are (i) Filter Information process, (ii) Find Hotel process, (iii) Information History process, (iv) Intelligent Page process and (v) Get Advice process. To accomplish these five processes, the system use agents' cooperation and interacting ability. In second stage, Interface agent, Facilitator agent and Information agent are individually solved their sub-processes. In third stage, the sub-processes are synthesized into overall solution. Figure 3 demonstrate the agent interaction process with cooperation ability.

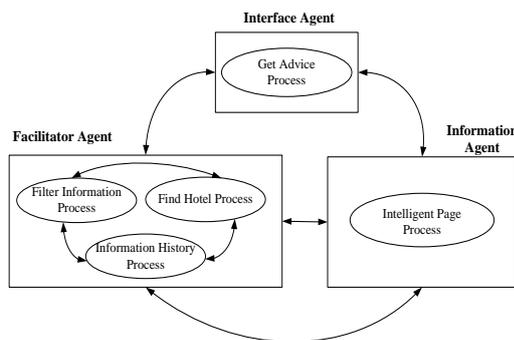


Figure 3 Agent Interaction Process with Cooperation ability

(i) Filter Information Process

In filter information process mode, the Facilitator agent filter trip package according to the user's expected budget, current source, trip type and available duration. Trip type includes the pagoda trip, mountain and adventure trip, beach tour and island and river cruises tour. To implement travel service advisor (TSA) system, we used 30 famous places in Myanmar. Filter information process can advice relevant trip packages for users based on their preferences. One of the examples for pagoda trip package is Mandalay-Monywa-Mandalay.

(ii) Find Hotel Process

Find hotel process mode includes the three hotel class for each trip packages. Three types of hotel class are superior hotel class, standard hotel class and ordinary hotel class. Find hotel process mode can advice which hotel class is relevant with users' expected budget. The result of find hotel process is hotel packages for trip packages. (eg, Sedona Hotel-Win Unity Hotel).

(iii) Information History Process

In this process, Facilitator agent save the travel history record in temporary storage. Travelers can

review the travel companies' performance from temporary storage. Facilitator agent limits the temporary storage capacity. If travel records exceed than limit, Facilitator agent automatically remove the oldest records from temporary storage.

(iv) Intelligent Page Process

Travel service advisor (TSA) system used 100 trip packages records to implement and the system have the detail trip package web page for each trip package. Information agent use Intelligent Page Store Iterator function to link these trip web pages according to the resulted trip package.

Intelligent Page Store Iterator Algorithm is

```

Begin
  Receive (tripPackageID, Facilitator Agent)
  ArrayList L;
  Iterator itr = L.iterator();
  Object oj;
  int i = 0;
  while (itr.hasNext())
  {
    oj = (Object)itr.next();
    i++;
  }
End

```

(v) Get Advice Process

In this stage, Interface agent synthesizes the sub-processes solutions into overall advice. First of all Interface agent organize the filter information. And then, Interface agent advice the suitable trip package, transportation costs, suitable hotel class, hotel price and travel company for travelers.

4.3 Data Source of the System

There are 100 trip packages in our proposed system. Trip package in travel service advisor (TSA) system obtained from MT&K travel company, AhNyarThar travel company and Green Palace travel company web pages. MT&K travel company includes 42 trip packages, AhNyarThar travel company includes 21 trip packages and Green Palace travel company includes 37 trip packages. Predefined trip packages include the transport type and transport charges. Transport charges depend on trip duration. The proposed system includes three hotel classes for each package. eg, Mandalay-Monywa-Mandalay trip package has three hotel classes. They are Sedona Hotel-Win Unity Hotel for superior hotel class, Hotel Mandalay-Monywa Hotel for standard hotel class, Silver Swan Hotel-Shwe Taung Tan Guest House for ordinary hotel class.

5. Conclusion

We present the online travel service advisor (TSA) system based on multi-agent technology. This system intended to understand the role of software agents for effective online tourism and it supports the development of online travel environments. Our goal is to encourage online traveler to get update travel information. And this system provides the effective information filtering and web page linking process. By using this system, online traveler benefits the following advantages.

- i. TSA system provides the user to get the relevant information based user's travel requirements and preferences.
- ii. TSA system can help the users to reduce their workload and save the time for searching information that user requires.
- iii. The proposed system can assist any users who don't know about travel company in Myanmar.
- iv. The TSA system can advice which travel plans and accommodations are suitable for user.
- v. The TSA system intended to help online travelers to overcome information overload and to support them in decision-making process.

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