Design of an Interactive Agent Based User Support Module

Mohd. Hafiz Mohd. Hassin[1] and Azizi Ab. Aziz[2]

[1]Artificial Intelligence Special Interest Group (AISIG)
[2]Postgraduate Research Laboratory
School of Information Technology
Universiti Utara Malaysia, 06010 Sintok, Kedah
Tel: 04-9284005, E-mail: ***alhafiz98@yahoo.com*** *, azizi_ab_aziz@hotmail.com*

Abstract

The focus of this work is the integration of multi-modal interactive agent in AVICENA's user support module. AVICENA (*Adaptive Business Insolvency Classifier System*), is an intelligent business insolvency classifier software that was developed by graduate student at AISIG, School of Information Technology, Universiti Utara Malaysia. The implementation of an interactive agent in this software aims to increase understanding and natural communication scheme between user and system under certain conditions. This paper presents the design and practical framework of user support module with interactive interface agent.

Keywords

Interactive Interface Agent, Multi-Modal Interface, Rule-Based Model, Speech Input, Text-Based Input, User Support Module.

Introduction

In recent years, the area of intelligent agents has been one of the most prevalent fields in the Artificial Intelligence community. There are branches of intelligence agent applications, according to their behaviors and functions. This paper deals with one specific type of agent, the interactive agent, which is a program that acts as a personal assistant to a user dealing with particular computer based application.

Inspired by multi-modal design framework by Fleming and Cohen (2000) , Min Chen and *et al* (2001) and Microsoft Office Personal Assistant®, we put forward this technology in order to assist end user when using our system. Human-computing interaction plays an important role in user interface design. The interactive agent aims at overcoming static and one-way communication in typical user support module, by exploiting the complementary nature of interactive and multi-modal input in human-computer interaction (Lieberman, 1998).

Intelligent Agent

Intelligent agent is new class of software, which exhibits acts on behalf of user by performing special task, such as filtering e-mail, negotiating for services, automating complex task and so forth. According to Janca (1995), this promising technology has been predicted to be most important computer paradigm in next ten years. This technology is expected to eventually have an effect as profound as World Wide Web. Intelligent agents are diverse according to the nature of its usage. It can be classified into following general characteristics (Knapik and Johson, 1998):

- *Autonomy*: the ability to operate without direct human intervention.
- *Social Ability*: the ability to communicate with humans and other agents.
- *Reactive*: the ability to response appropriately to changes within environment or in the needs and preferences of the user.
- *Proactive*: the ability to initiate act in order to achieve the goals determine by the user.
- *Mobility*: the ability to travel through network executing commands and carrying accumulated within.
- *Collaborative Behavior*: the ability to work with other types of agents, which posses various capabilities in order to achieve a common goal.
- *Adaptive*: the ability to learn from experience and use that learning to improve behavior and reasoning process.
- *Inferential*: the ability to use prior knowledge of general goals and methods in order to act on abstract specifications and also be flexible enough to extrapolate from given information.

One of the promising research areas for intelligent agent is education and training. Such an agent can be used specifically to support and guide the interaction between user and system (Mohd. Hassin and Ab. Aziz, 2002). Interactive agent offers great promise for broadening bandwidth of communication between the system and user.

User Support Module Design

Basically, AVICENA is composed of five main modules. These modules are:

1. Database Management Module.
2. Neural Networks Classifier Module.
3. Decision Support Classifier Module.
4. Reporting Module.
5. User Support Module.

User Support Module provides explanation about concepts involved and facilitates user to use this system Through a free mixture of speech, mouse click and keyboard, the user can request information or give commands to execute certain functions (Mohd. Hassin and Ab. Aziz, 2002). Myers, *et al*. (1996) discussing strategic directions in human computer interaction, advocated that while "the forms and output generated by computer based systems are currently defined by the system designer, a new trend may to be increasingly allow the user to determine the way in which the computer will interact and to support multiple modalities at the same time".

With this respect, we have attempted to make the interaction interface to be user friendly as possible. To achieved this end, we have decided to include:

- Interactive Agent Character
- Voice Recognition Technology
- Text to Speech Technology

To foster a relationship with the user and to encourage the user to interact with the module in a natural manner, an anthropomorphic agent is used. Based on research work done by Nass and *et al*. (1994), suggested that there is a tendency to treat computers as a human entity, which in turn results in human based social response. Therefore, we have decided to use Microsoft Agent Technology. This technology introduces the use of a character based animated and speech enabled avatar which will serve as the medium between the module and the user (Mohd Hassin and Ab Aziz, 2002), (Goh and Teoh, 2002) (Zakaria et al, 2002).

In addition, voice technology has been taken into consideration. The use of this technology allows the user to manipulate navigation of the module. The information processing flow within the system is given in Figure 1.

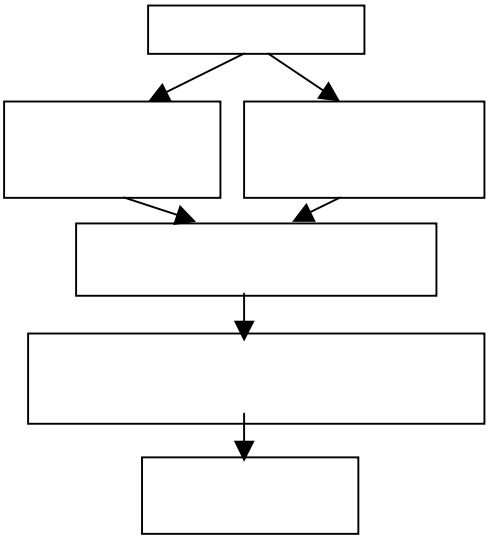

Figure 1: Information Flow within the module

Rule-Based Engine contains facts of decision rules coded in procedural *IF-THEN* form. The example of rule-based structure is depicted below (Figure 2)

```
Start:-
    Input:= User Queries:
    Output:= Action / Feedback:
     Do Until User Queries = No More Query Or End
        Load Agent Character.Path = Agent("Merlin")
        Let User.Input = User Queries
      Match (User.Input = List of Queries)
        If Match.Found = True
            Then
        Agent.Action=Display (Explanation/Feedback)
       Else
        Agent.Action = Request (Correct Input)
      End If
     Loop
End:-
```

Figure 2: IF-THEN Structure in Pseudo-Code

The output from the module is expressed through voice interaction and textual presentation using several agent animated gestures. The examples of animated gestures are listed in Table 1.

Table 1: The Examples of Animated Gestures

State	Example of Use & Animation
Hearing	When the beginning of spoken input is detected. (The character leans forward, nods or turn head showing response to speech input).
DoMagic1	Character prepares to display something. (Waves hand or wand).
Confused	When the character don't understand what to do. (Character scratches head).
Greet	When the user starts up the module. (Smiles and waves).
Read	When the character reads something to the user (Displays books, reads and look back at user).
Sad	When the character is disappointed with user's choice. (Frowns or looks disappointed).

Implementation

This module is developed using Visual Basic 6.0, a visual programming language. The minimum computer resources requirements needed to run this module are:

- Operating System : Windows 98 and above.
- Processor: at least Pentium 166 MHz & compatible.
- 32 Mb RAM, Compatible Sound Card.
- Microphone and Speaker.
- 32 kb free space for each *Microsoft Agent DLL Language* Components

The agent components are downloadable from Microsoft Agent Downloads website (refers the URL given): *http://www.microsoft.com/products/msagent/downloads.htm* The interactive agent chosen for this module is named "Merlin', the character of famous gothic wizard (Figure 3).

Figure 3: The Merlin

The module runs in two folds. The user can activate this module either using "Help Agent" button or by saying "help Agent".

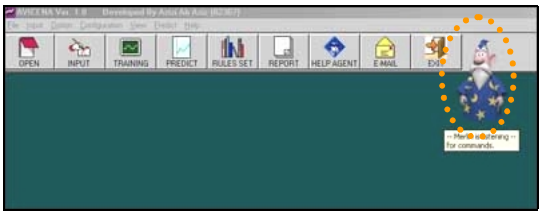

Figure 4: Main Screen

Dotted circle at Figure 4 shows an interactive agent waiting for user command. The agent will aid user in two main functions. First, the agent will cater general assistantship for overall system operation (eg: modules involved, buttons, how-to-use and functions). Figure 5 shows agent implementation for above purposes.

Figure 5: User Support Option in Main Menu

Second, the agent will probe into each system module and provides details about particular experimental parameters involved. For example, if user queries related to Database Management Module, the agent invokes this module and explains selected user query. Figure 6 and 7 shows the implementation of interactive agent in Database Management Module.

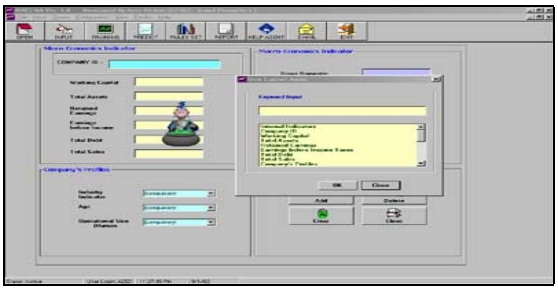

Figure 6: User Support Option in Database Management Module.

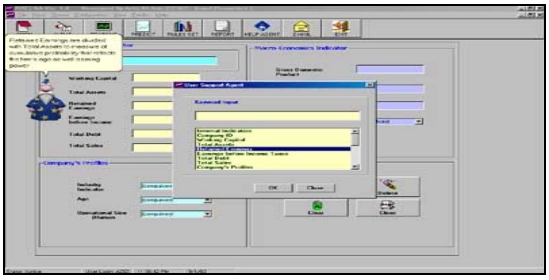

Figure 7: Explanation Process in Database Management Module.

We have successfully implemented an interactive agent to support user query over selected system functionality. The style of interaction facilitates user and allows better user understanding.

Conclusion and Recommendation

Animated interactive agents introduce a new paradigm for instruction that is based on concept of shared ability and cooperative interaction between humans and computers. Our user support module provides an ample space of social interaction and allowing natural assistantship takes place. In addition, it provides better navigation support facilities. It can be concluded this module provides basic design framework to build better multi-modal based user support module.

The future research directions would include strengthening the cognitive aspect of human interactions, social exchange between agents and humans (such as eye contact, body language and gaze). Furthermore, enhancement in voice recognition technology will cater variety of spoken language (Currently, our module only permits American –English pronunciation). Result from these researches can provide valuable technologies for development of interactive and adaptive user support module.

Acknowledgements

We express gratitude to all graduate researchers in Postgraduate Research Laboratory for the support. Also, many thanks to Associate Prof. Fadzilah Siraj and Mr Azizi Zakaria for the supervision given.

Biographies

Mohd Hafiz Mohd Hassin, currently is a final year undergraduate student (majoring in artificial intelligence) at School of Information Technology, Universiti Utara Malaysia.

Azizi Ab. Aziz, is a graduate student who engaged in hybrid intelligent algorithms classifier research. His research is funded by Ministry of Science, Technology and Environment Research grant.

References

Fleming, M. and Cohen, R. (2000). User Modeling in the Design of Interactive Interface Agents, Dept of Computer Science, University of Waterloo, NSERC Research Report.

Goh, O.S and Teoh, K.K (2002). Intelligent Agent for Electronic Management, Proceedings of The International Conference on Artificial Intelligence in Engineering and Technology, June 2002, Sabah.

Janca, P.(1995). Pragmatic Application of Information Agents: Theory and Practice, BIS Strategic Decisions.

Knapik, M & Johson, J.(1998). Developing Intelligent Agents for Distributed Systems, New York, McGraw-Hill.

Lieberman, H. (1998). Integrating User Interface Agents with Conventional Application, Conference on Intelligent User Interface, San Francisco.

Min, C., Jun, L., Yuquan, J. and Shihai, D. (2001). An Architecture for Multimodal Multi-Agent Interactive System. National Natural Science Foundation of China Report. (Project 9433020).

Mohd. Hassin, M.H and Ab. Aziz, A.(2002). Interactive Agent Approach for User Support Module (AVICENA System), Seminar Cabaran Cabaran Alaf Baru Pengurusan (TEMPO 2002), Julai 2002. Kedah.

Myers, B, Hollan,J and Cruz,I. (1996).Strategic Directions in Human Computer Interaction, ACM Computing Surveys, Vol.28, No.4.

Nass, C.S, Tauber, J & Ellen, R.(1994). Computers are Social Actors. Proceedings of CHI94, Boston.

Zakaria, A., Siraj, F., Ahdon, M.F and Mat Hussin, M.Z.A. (2002), PEAGENT: An Interactive Web Based Educational System Using Animated Pedagogical Agent, Proceedings of The International Conference on Artificial Intelligence in Engineering and Technology, June 2002, Sabah.