

Intelligent Agent Technology in E-Commerce

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Abstract: Use of Internet has surged at an exponential rate in recent years. In particular, it has led to many new and innovative applications in the area of E-Commerce. In this paper, we introduce an intelligent agent termed AINI, the Artificial Intelligent Solution Humanoid. We also show how current e-commerce technological trends can be enhanced by using AINI. AINI is a chatterbot integrated with 3D animated agent character. Speech Technology and Artificial Intelligence Markup Language (AIML) is utilised. This agent technology is mainly used to improve customer services and to reduce customer reliance on human operators. By using artificial intelligence techniques, AINI is able to provide appropriate answers to service inquiries. In this paper, issues on Intelligent Agents Technology, Speech Technology, AIML and the use of 3D animated character in E-Commerce are discussed.

1. Introduction

In this cyber age, business-to-client (B2C) transactions such as online shopping and online banking have huge social, economic and commercial implications. For example, online shopping or banking offer both convenience and many choices. They eliminate the need for travel and one operates within the comfort of the home or office. Goods and services may be obtained without the need to negotiate queues, crowds, traffic and of course, the unexpected natural elements such as weather [1]. However, it is recognized that such facility is not necessarily user friendly and convenient as one may think. In particular, when a retailer is far away and e-mail messages are not instantly responded. Users are frustrated in dealing with uncertain and unreliable unknown systems. According to the technology research firm, Forrester Research, one of the comments on today's web services is "DUMB, BORING, and DUSTY" [2]. On the other hand, the Internet is changing the way companies interact with customers. The high-speed Internet is supplanting yesterday's "brick and mortar" businesses with web sites offering products and services on a 24x7 basis [3]. With the new era underway, companies must prepare to utilize Internet-based communication to the best of their benefits and be ready to face the perils of a new competitive landscape. To many businesses, one of the main challenges is to improve customer services on general enquiries, sales and supports. In addition, it is

necessary to increase the productivity and efficiency in these important business operations. Typical areas with much room to improve are: to engage in application or problem specific conversations, to boost the learning capability on new vocabulary and terminologies, to increase the accuracy on word and speech recognition, to enhance the portability of the core technologies and to widen the application areas.

Research by Datamonitor has stated that *“U.S. businesses lost more than \$6.1 billion (US\$) in potential Internet sales in 1999 because of poor online customer service, and estimated that an industry-wide failure to resolve the problem could lead to at least \$173 billion in lost revenues through 2004.”* In addition, Datamonitor also reported that 7.8 percent of online transactions initiated by consumers are abandoned because of poor customer service. It is definite that more and more companies have realized that live interaction is required to promote customer loyalty [4]. These studies have indicated that customers prefer having Intelligent Agent and with speech-enabled to answer their queries and needs.

In this paper, we report the development of an intelligent Agent technology using AINI chatterbot deployed by using Artificial Intelligence Markup Language (AIML). The main application is in e-commerce in order to enable web businesses to be more interactive. In this social interaction model, the agent offers to help the customers with information it has already acquired. The new breed of agent is highly customizable, allowing e-tailers to brand them as they wish. The "agents" also aim to assist and reassure the customers by displaying appropriate emotion. For example, if an agent cannot answer a particular question, it expresses disappointment and tries again. Alternatively, it may prompt the user toward another channel of service. If the customer expresses interest in a particular product, the agent will suggest related items. If a transaction is completed, the agent will thank the customer and invites him or her to re-visit. The following sections describe the objective and various features of the intelligent agent.

1.1 Objective

The objective of this project is to create a chatterbot namely AINI, which is, adopted from the previous ELIZA and ALICE chatter bots. AINI chatterbot is different because it has facial expressions and emotion represented by a 3D animated character called “eBee”. The technology has been initiated and created by research teams at the Multimedia University, Malaysia. We have included voice recognition technology in the human computer interfaces which enhances the trust factor in the E-Commerce web sites by humanizing the interface design. This also makes the process of buying and selling more interesting. eBee is able to guide the user in the transaction and to motivate the user by presenting an engaging manner. This results in a longer interaction time and a high quality E-Commerce web site.

In this system, Customer Relationship Management (CRM) is emphasized which aims to help and respond to the customer needs. Building a strong relationship with the customers is an important element of e-commerce. AINI is unique because it helps customers in a similar way to a human sales person. AINI provides customers with quick answers as if they were conversing with a human online. This improves

customer interaction on the web, hence build strong and loyal relationships. AINI also adds a "human" element of personality represented by the eBee agent character.

1.2 Use of BOTS in E-Commerce

Intelligent Agent or Bots are important companions in ECommerce. Apart from making the transaction more interesting, they can be used to help users by providing expert advices and assist the users in their decisions on what to buy. Intelligent Agents could help to reduce information overload, increase productivity and to achieve competitive advantages. Intelligent agents however do not necessarily to be present upfront on the Internet. They can perform equally well at the background. However, the Internet is where the intelligent agents have spawned much interest and imagination from the public. The Net also offers great opportunities for the deployment of intelligent agents. Currently, there are already a few e-commerce web portals using chatterbots such as Archangelis, CGIsupport.com, Coolware, Inc, Artificial-Life.com and Botizen.com.

Many businesses today are seeking to increase the service level and the ease of use of their web sites. "Chatter bots" programs that interact with users in natural language are great advances in customer services. A chatter bot often presents a human-like image, and allows a user to type questions in daily languages which are responded to the best of the bot's knowledge. Chatter bots can be programmed to converse on any subject including products and services that are on offer. Chatter bots can assist in e-commerce in a number of ways. Bots represented by a 3D Animated Character will assist the users according to their specifications and returns with recommendations on the products which meet the requirements. The "salesperson" could also provide product or service information and sales advice. In addition, they can help "troubleshoot" if problems occur. [5]

In order to run the Intelligent Agent Technology, we have developed AgentValley as a prototype of online shopping website. AgentValley plays an important role in E-commerce online shopping. AgentValley is created with an aim to reduce customer reliance on live agents by providing more appropriate answers to service inquiries. The convergence of Intelligent Agent system and Internet technologies offers the customer the freedom of choice while interacting with the web site. The exciting new possibilities for customer interaction include online shops, chats and collaborative browsing. The Internet browsers of both the agent and the customer are linked and could be controlled by either party. In addition, voice technology and 3D animated agent character or avatars are also incorporated.

BOTizen.com, launch by VQ Interactive Sdn Bhd and it is a well known MSC Status company in Malaysia, states that "The AI technology provides BOTizen with the expertise to communicate with users in Natural language, text or speech. Throughout the discussion, a customer can be guided and consulted, BOTizen is able to display the appropriate web pages, answer questions and even make relevant recommendations." [6] As for Artificial-Life.com, launch by Artificial Life, Inc. one of the listed companies in Nasdaq, announced the introduction of a new class of e-commerce software that answers online customer needs. Unlike shopping bots that merely compare prices, Artificial Life's new e-commerce application will allow

online customers to interface with virtual assistant robots that the customer then sends on missions to help them make smarter purchases [7]. They also announced results for the second quarter year to date 2000 revenues are \$4,343,318 compared to same period revenues in 1999 of \$1,324,551, an increase of \$3,018,767 or 227.91%.

2. The Technology

There are a number of chatterbots currently being used in e-commerce, e-learning, e-government and similar environments. AINI performs with improved and enhanced services. The agents communicate using AIML that facilitate high-level corporation and interoperation among the agents. Architecture of AINI is illustrated in Figure 1 below.

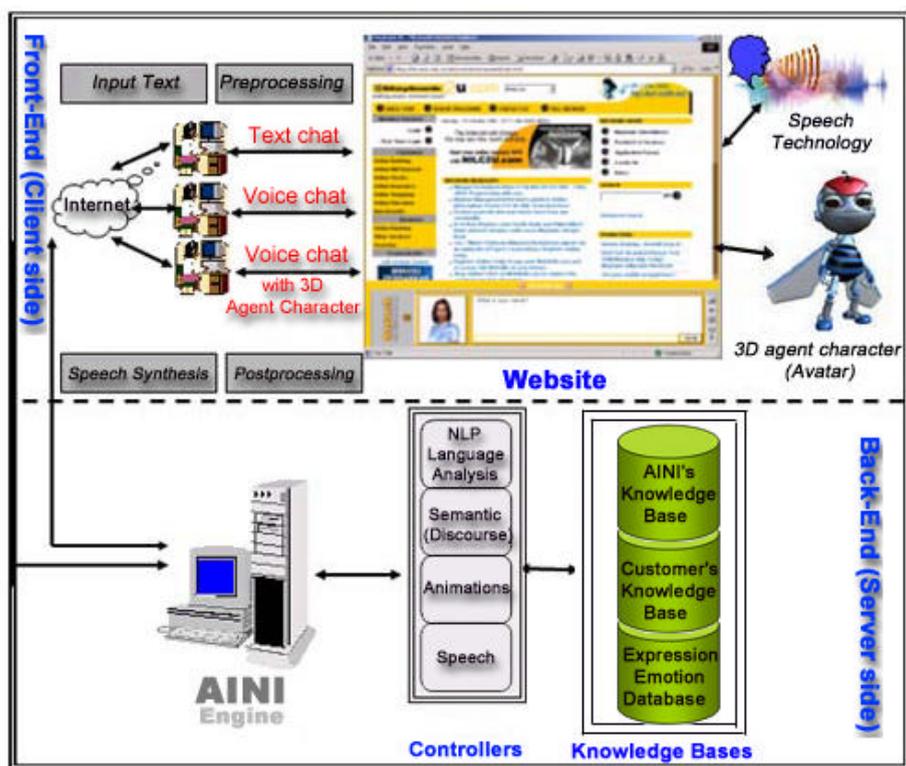


Fig. 1. Figure 1: Architecture of AINI

The backbone of AgentValley system is a unique intelligent agent framework that is the AINI Intelligent Agent with an AIML-based engine, which processes AIML tags. Moreover, it is a natural language artificial intelligence chatterbot able to deal with an understanding of textual language for the system. Case Based Reasoning (CBR) technique is used because it maps well onto the AINI algorithm. The CBR uses an

explicit database of problem solutions (cases) to address new problem-solving situations. The CBR “cases” are the categories in AIML. The bot will attempt to match the input query of the user with relevant information that is available in its knowledge base.

AINI searches the application's knowledge base as well as other enterprise data sources connected to the system. It aims to return appropriate responses to the inquiries. The knowledge represented in the patterns is represented in the AIML specifications of XML. The goal of AINI is a totally integrated solution by incorporating existing database server domains in the Internet

AIML is an XML language extension with specifications for programming chatterbots. The emphasis in the language design is minimalism. The simplicity of AIML makes it easy for developers who have prior knowledge of HTML to implement chatterbots. The categories in AIML are comparable to the rules of grammar. The algorithm finds the best matching pattern for each input. The category connects the stimulus pattern directly to the response template.

Natural Language Processing (NLP), language analysis, Semantic Template Matching, Animation engine and Speech Control are utilized. They are used in response to dialogue output requests and to generate the animated motion, speech and sound effects necessary to communicate with the user. For this subsystem, the goal is to create a convincing visual and aural representation of a character which carries out the user's requests. We have however chosen to forego the flexibility of a general text-to-speech system because such systems currently lack the naturalness and expressiveness that are required by the agent. The system consists of three types of interface called Text-chat, Voice-chat and Voice with 3D Animated Characters. These features will give the user a choice for their preferred response. This is illustrated in Fig. 2 below.

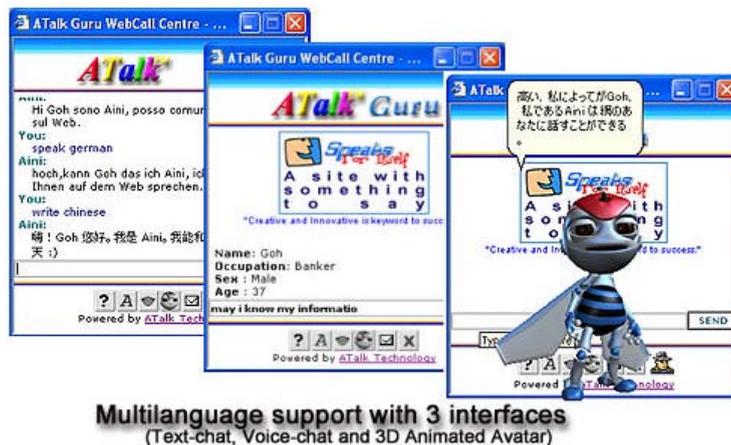


Fig. 2. Three types of Interface: Text, Chat and Animated Avatar

The knowledge base is contained in the AIML knowledge base consisting of the Customer Service knowledge base, the Speech and Animation Database, and, the Action Templates Database. Every chatterbot contains a domain independent and

reusable standard AIML libraries (the AIML knowledge base), animation and action templates. AIML provides a powerful tool to deal with sentences that contain redundant information which are words that are not essential to the understanding of the global meaning of the question. These libraries are mainly used to transform different user inputs that have similar meanings into a standard sentence. This standardized sentence is then passed onto the relevant domain specific library. The libraries containing over 30,000 categories. With the collection of categories, it is relatively easy to create a new bot with unique features applicable to specific applications. Any number of expert agents can be added to the system from third parties by adding customer service knowledge base.

Text-To-Speech (TTS) and Voice Recognition enable the computer responds to user-spoken commands and provide the user with verbal feedback. Voice recognition technology applied to Ecommerce web sites will help to encourage the users in buying, selling or browsing through the product details. As the trends of technology are moving towards wider utilization of voice recognition technologies, the feature will provide the users with easier accessibility.

3. Features of AINI

Because non-verbal signs are integral parts of the communicative process, Microsoft Agent is used to integrate gesture, intonation, and facial expression into multi-modal human figure animation. Appropriate speech, intonation, facial expression and gesture are generated by rules from a semantic representation that originates in AIML. The output of the dialogue generation is used to drive a graphical animation of a conversation. For embodied conversational agents, non-verbal behaviors related to the process of conversation called envelope feedback, is much more important than other form of feedback, such as emotional expression for the customer service. In order to interact socially with a human, an agent must convey intentionality, that is, the human must believe that the agent has beliefs, desires, and intentions. The developed bot is an agent which exploits natural human social tendencies to convey intentionality through motor actions and facial expressions.

The chatterbot allows users to quickly find a keyword or phrase in any of the conversation logs collected in the knowledge base. For example, a user wants to find a keyword "Car", the chatterbot will ask which search engine that the user wishes to display the results. It also allows the user to display only part of the conversations that belong to a certain topic or knowledge base. Or, certain parts that contain only keywords or phrases can be displayed. This permits the user to locate specific information from the conversations.

Collaborative filtering tools compare personal preferences and transaction patterns between individuals with similar profiles and buying behaviors. This technique is based on a form of referential surveying, which is a complex statistical algorithm that makes product recommendations based on purchasing patterns. The resulting germane content is presented to the customer. The collaboration comes from individual customers in essence making recommendations to others.

This inferential method of collecting personal data is done by posing questions to potential customers at various touch points. The resulting data is used to create an ever-increasing targeted dialogue. Customers are asked questions about their interests and buying habits that can be used to personalize their records.

The system also has the added feature of being able to generate valuable reports and statistics. The system will include facilities which provide utilities to run reports and statistics to the user. These reports can be used to understand and study on the type of conversations users are having on your web site. The information provided allows an administrator to customize his/her bots knowledge base to cover any information.

The system provides the administrators with a powerful tool for market research by allowing them to analyze log files of anonymous user conversations and most importantly, increase the traffic on their web-site. Another feature is that this system will track a history of interactions that a user has performed with the agents, allowing the advisor agent to keep track of services. The user profiles are created and used to associate with the customer's interaction. The log files created for bot conversations as well as e-mail questions and responses are saved in the profiling database. These files provide an invaluable source of information. Examples of the reports are shown in Fig. 3.

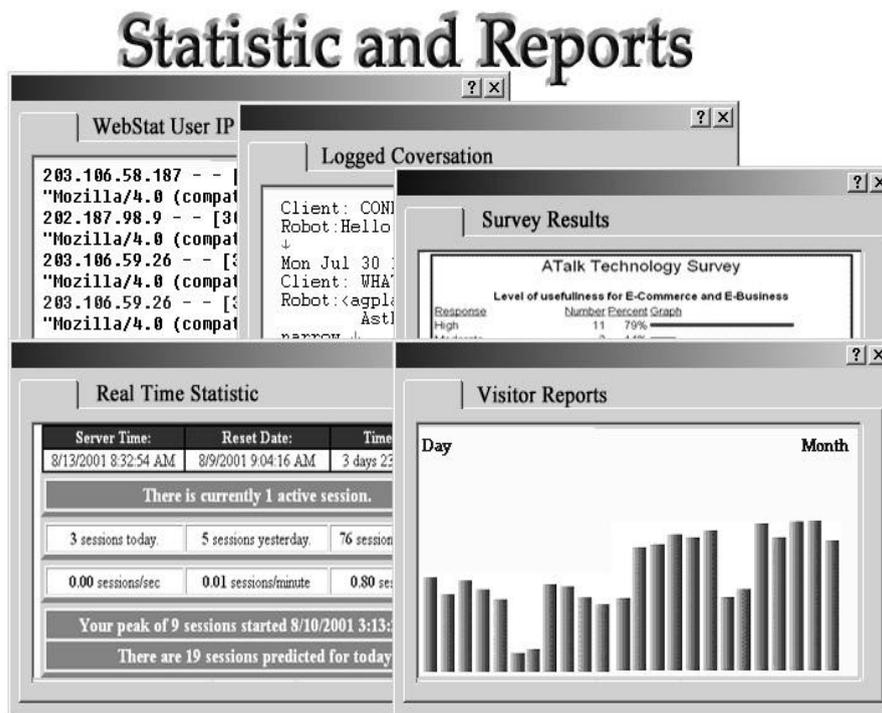


Fig. 3. Displays of Statistical information and Reports

An AIML knowledge base can be constructed in multiple languages such as English (British or US), French, Japanese, Korean, Italian, German, Malay and etc. This system can translate into 5 languages such as Italian, German, Japanese, French and Spanish by using Systran™ machine translation system. We also integrated Online Dictionary, Online Database (connect directly to any existing company database) and online Search Engines such as Yahoo, Google, altavista.

4. Conclusion

Intelligent Agent and Speech Recognition technologies including Agent Characters are viable solutions to many current problems in today's complex E-Commerce web sites. The present problems are mainly due to the fact that many current E-Commerce technologies are not as user-friendly as it seems. Users prefer to have "someone" to guide them on online activities. In addition, the use of keyboard is not as natural as interaction with voice and speech. The use of intelligent agent is capable to implement a companion or a virtual salesperson on the web site. The agent is capable to guide the user in the buying/selling process. In this paper, the use of Intelligent Agent, Voice Recognition and Agent Characters are presented as the essential components in the AINI system to enhance the E-commerce operation. Further works are carried out to evaluate the effectiveness of the system in practical systems.

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