Personal Healthcare Assistant/Companion in Virtual World

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Abstract

We propose to create a virtual personal health care assistant in the virtual world Second Life that accompanies the user, via an avatar, through interactions with healthcare databases answering the user's avatar's questions. This paper explores various ways to promote healthy in a virtual world environment by integrating several existing technologies.

Overview

The popularity of virtual worlds makes them an ideal platform for promoting healthy behavior to the masses. These environments have become a part of everyday life for thousands of people (Second Life Residents Statistics 2007) who have started to "live" in these worlds and attend group activities with friends in them. They use these alternate realities to seek information about all aspects of life. For example, HealthLands in Second Life (SL) is a popular landmark that provides healthcare information. A virtual world can be a very effective medium for promoting healthy behavior. This paper addresses the ways in which existing technology can be integrated to deliver this information in virtual worlds

Sites such as HealthInfo Island (2009) or CDC Island (Casanova) provide consultations with virtual doctors, run videos, or display poster boards promoting healthy behavior. We propose to go beyond this and develop a personal health care assistant that will accompany a person's avatar and display appropriate gestures or non-verbal behavior to increase the persuasive value of the responses provided to a user's healthcare questions. A user's actual identity is not revealed in SL, so we anticipate that people will be more comfortable interacting and exploring various diseases and concerns and that it will be easier to promote preventive healthcare than in other media. With millions of people interacting in these worlds every day, using these environments to promote healthy behavior will be both productive and cost effective.

Virtual Health Care Companions Integrate Multiple Technologies

Our proposed virtual health care assistant/companion will automate an avatar, incorporate a chatbot, imbue it with the ability to display appropriate non-verbal behavior to accompany its dialog, integrate the chat with existing healthcare information sources, and provide the assistant as a companion that accompanies an avatar on its travels.

Automated Avatars

Human communication is a highly complex activity expressed extensively through non-verbal behavior. A critical milestone in the field of virtual humans is the development of displaying non-verbal behavior. The University of Southern California's Institute for Creative Technologies achieved this when it developed the Interactive Virtual Human (Gratch et al. 2002). These automated characters exhibit emotion using the Nonverbal Behavior Generator (NVBG). The NVBG analyzes the syntactic and semantic structure of surface text as well as the affective state of the Embodied Conversational Agent (ECA) and annotates the surface text with appropriate nonverbal behaviors. The input and output to this system is in XML format, or, more specifically, in Functional Markup Language for input messages and Behavior Markup Language as output messages (Lee and Marsella 2006).

The incorporation of NVBG in Second Life will enable avatars to display non-verbal behavior. These avatars can be used as personal assistants or healthcare workers who provide the requested healthcare information

The believability of avatars is increased when their gestures and behavior reflect the dialog they are experiencing. Avatars communicate with other avatars in the Second Life via chat. Normally, avatars can perform gestures only when relevant gestures are explicitly entered by the avatar's user. We propose to make the avatars display non-verbal behavior prompted by text typed by the avatar's human counterpart. This can be done by

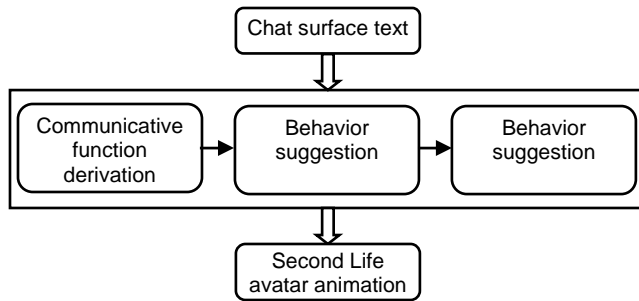incorporating the NVBG in Second Life. Figure 1 shows the integration of NVBG with chat in Second Life.

Figure 1. Avatar's behavior generation process in Second Life.

Chatbot as Virtual Companion

A chatbot is an agent that simulates intelligent conversation with a human. We propose to create a *virtual companion* that acts as a personal healthcare assistant and consists of an automated avatar with an embedded chatbot. This virtual companion will accompany the avatar as it moves through the virtual world and provide solicited advice on such topics as healthy eating habits, exercise, medicine, and diseases, or be an observer who provides unsolicited advice and helps the user analyze his/her own behavior. Figure 2 shows the interaction between the chatbot and a healthcare database. Chat text entered by the avatar's owner is sent to the personal assistant which then retrieves relevant information from a healthcare database. The text is analyzed and appropriate gestures are generated in the companion response to the text.
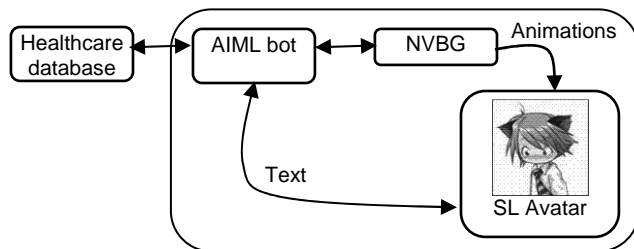

Figure 2. Personal healthcare assistant in SL.

We plan to implement the AIML chatbot shown in figure 2 using a Pandora chatbot, a web based hosting service for bots based on Artificial Intelligence Markup Language (AIML) and Artificial Linguistic Internet Computer Entity (A.L.I.C.E.) and supported by the AIML free software community. Pandorabots allow the user to create and publish custom bots, and make them available to anyone online. Through AIML the knowledge in the bot can be enhanced to enable it to conduct a realistic conversation. The assistant then comes to life and engages in conversation with the user's avatar.

Integrating a Healthcare Database with the Personal Assistant

We plan to integrate the companion with a healthcare database using using RebeccaAIML (RebeccaAIML). RebeccaAIML uses an embedded database and supports multi-user, multi-bot, and multi-enduser capabilities. Using this technology we can connect to any open source healthcare database such as DHIS (Open-source district health management information system and data warehouse) to provide health guidance to the user.

Status

We have created a simple virtual companion and are current exploring the chatbot/healthcare information connection. When that is established, we plan to add to the chatbot the ability to analyze the dialog produced by both avatar and companion and display in the companion appropriate emotions and gestures in response to the dialog.

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