

Designing an Embodied Conversational Agent for a Self-Access Center

Troy Rubesch

Introduction

Embodied conversation agents, often referred to as chatbots, are computer programs designed to simulate text-based conversations, or chats (Coniam, 2008a). As a form of weak artificial intelligence, the underlying mechanism of most chatbots involves an algorithm which scans for keywords in the user's input and then replies with text from a programmed database. This relatively simple design can produce interactive experiences that are quite similar to real-time text-based chat with a human interlocutor (Coniam, 2008b).

Background

In 1966, MIT's Joseph Weizenbaum programmed the first chatbot, Eliza, as a text-only program which used simple pattern matching techniques to simulate the role of a Rogerian psychoanalytic therapist. The highly contextualized therapist-patient domain proved both realistic and engaging for users with some users expressing extreme enthusiasm for interacting with the program (Weizenbaum, 1966). In the following decades, chatbots have improved substantially, but continue to use similar lexical matching techniques to select appropriate responses.

Chatbots have been readily adopted in entertainment, commerce, the public sector, and educational institutions (Kerly, Hall, & Bull, 2007). Many chatbots have been developed solely for the entertainment of users and for generating revenue through advertising. Others have been created to compete in artificial intelligence competitions like the Loebner prize or the Chatbot Championships where they attempt to convince users that they are actually human. Since the rise of web commerce, chatbots have been increasingly used as virtual agents. These programs are employed by multinational corporations such as Ikea, Symantec, and Alaska Airlines to provide information, guidance and promotion by answering frequently asked questions and suggesting relevant products and services. Chatbots have also been used, mostly on an experimental basis, in the public sector as institutional information agents. These specialized chatbots have been used in expos, museums, and libraries. In addition to acting as virtual tour guides, virtual teaching assistants, and student services agents for distance learners (Allison, 2012; Anderson, n.d.; De Gasperis, 2010; Dent, 2007; Jensen, Tomatis, Mayor, Drygajlo, & Siegwart, 2005; Kopp, Gesellensetter, Krämer, & Wachsmuth, 2005; Rubin, Chen, & Thorimbert, 2010; Santangelo, Augello, Gentile, Pilato, & Gaglio, 2006). In educational settings, researchers have found some success with experimental use of purpose-built chatbots in a large variety of fields and have shown that they can be effective in educating learners in fields as diverse as business management, special education, and physical rehabilitation (Lane, 2010, 2010; Roda, Angehrn, & Nabeth, 2001; Rodriguez et al., 2008; Takacs, 2005).

Chatbots are often cited as being potentially useful for learning and practicing

foreign languages because of their ability to provide opportunities for limitless, patient conversation to foreign language learners (Blake, 2011; Coniam, 2008b; Fryer, 2006; Fryer & Carpenter, 2006; May, 2008). Coniam completed a rigorous analysis of chatbots' potential as language learning tools (Coniam, 2008b), but there have been only a handful of published studies of how chatbots are actually used by language students (e.g. Fryer & Carpenter, 2006; Lehtinen, 2008; Sha, 2009) and virtually no research has been published examining the use of chatbots for independent (self-access) language study.

Project description

The current project involves the design, creation, piloting, and implementation of an Embodied Conversational Agent, or chatbot, to represent the Self-Access Learning Centre (SALC) at Kanda University of International Studies (KUIS). The chatbot is named "SALC-bot" and is hosted by the SALC's Let's Study English student website, located at www.elisalc.org. The chatbot was designed to serve the following three purposes: provide information about the SALC (e.g. opening hours, faculty details); provide general advice on language learning; and provide English language communication practice in an engaging and interactive format.

Research questions

Although chatbots have been used in public and educational institutions such as libraries in the past, this is the first known instance of a chatbot designed for use at a self-access center. As an exploratory project, the research questions broadly examine how student participants interact with the chatbot:

1. Would students use the chatbot to seek information about the SALC?

2. Would students use the chatbot to seek advice for language learning?
3. Would students use the chatbot for communication practice and entertainment?

As usage of the chatbot and participation in the study were completely voluntary, the researcher had no control over how many students would agree to participate in the study.

Methods

At the outset of the project, background research was undertaken, the feasibility of the project was determined, consultations with the SALC Director and external ELI consultants were conducted, and RILS funding was procured. Next, several design considerations were undertaken relating to personality, appearance, and language use.

Consultations and research indicated that the chatbot should be friendly, approachable and un-authoritarian. Consequentially, it was decided to model the chatbot's personality after SALC student helpers who are often enthusiastic about the SALC, but remain peers to student users.

To encourage user engagement, it was determined that the chatbot should be attractive and animated. To avoid confusion with the actual SALC staff, it was decided that it should take a non-humanoid and non-gendered form—a robot. This would make it clear to users that they were not “conversing” with a particular person or even a representation of a person.

As an ESL chatbot designed for EFL students, language use was a major concern. It was decided that the chatbot's language should be simple, casual, and positive. Like Eliza (Weizenbaum, 1966), it would ask questions and attempt to elicit conversation. The questions would be open-ended, but would require the user to elaborate. It was also essential that it be tolerant of EFL learners' inevitable spelling and grammar errors.

As the researcher is not a computer programmer, it was necessary to choose an appropriate host from the dozens of commercial chatbot applications available. Ultimately, the researcher settled on a private company, *inf.net*, which afforded all of the above considerations and had many other advantages as well. For example, the application integrated smoothly with the SALC website's host platform, allowed the capability to hyperlink to online resources, was easy to program, and hosted an active user forum, and included a basic personality template.

Programming phase I

The *inf.net* engine features semi-animated avatars which include a generic personality. From this basic personality, programmers can add individualized responses related to common general chat topics such as food, sports, weather, hobbies, travel, etc. Using data from the SALCs usage records, SALC-bot was programmed to advocate and promote the materials and facilities which were popular with SALC users. For example, if a student asked about SALC-bot's favorite kind of movie, it would recommend specific animated Disney films, because the SALC usage records indicate that these are quite popular among SALC student patrons.

Piloting I

After the initial programming stage, SALC-bot was piloted with ten SALC student staff members who were asked to interact with it for 45 minutes, asking it the kind of questions they received from student SALC patrons. In a focus group, they were also asked for general feedback on the experience. Responses indicated that the experience was generally enjoyable, but that SALC-bot did not “know” much about the SALC and that its conversation style could be unsatisfyingly confusing. These were understandable criticisms at this phase of the programming.

Programming phase II

The usage logs from the SALC student staff’s pilot session were then used as questions for SALC-bot’s database. That is, the pilot users’ questions were entered into the database and assigned appropriate responses.

Piloting II

Next, SALC-bot was again piloted with the four SALC Assistant Managers who were asked to interact with it for 45 minutes and then participate in a focus group session where they were asked for feedback on the experience. At this point, many flaws were identified. For example, a user who claimed to have lost a book was advised by SALC-bot to “forget about it.” The Assistant Managers also raised some criticisms with the chatbot’s personality and the flighty nature of the conversations, specifically the inability of SALC-bot to effectively deal with pronouns. These critiques were again taken into account in the final programming phase. The SALC Director, and ELI teachers, and other colleagues also provided

feedback on the functioning and appearance of the interface.

Implementation

From the first day of Spring semester, April 9, 2012, a colorful graphic link to SALC-bot was placed on the top right corner of the SALC's students website. The icon included a small banner prompting users to "click here" and "chat with SALC-bot." When users clicked on the banner, they were taken to the SALC-bots integrated page. Users were then asked if they were KUIS students and if they were, if they would agree to participate in the study. The permission statement was written in both English and Japanese, but the remainder of the interactions were entirely in English. Of the hundreds of users, 104 of them affirmed that they were students and gave permission for their chat transcripts to be analyzed for the study.

Analysis

Every conversation was examined for instances of breakdown and when the chatbot did not deliver cohesive answers, the database of output responses was altered. All of the participants' conversation logs were analyzed and coded for instances of student participants using the chatbots for the purposes of the study.

Results

Upon examining the data, SALC-bot was used over 100 times by KUIS students who agreed to have their conversations logged for the study. Within the usage logs there are several instances of students using the chatbot for all 3 purposes for which it was designed:

Revisiting the research questions:

RQ1: Would students use the chatbot to seek information about the SALC?

The conversation logs show several instances of students asking about SALC materials and facilities, including: “is there a book called Shadowing in the Salc?”; “I want to know about Modules”; and “I want to teach me how to reseave a learning advisor desk”. *Appendix 1* shows an example of this form of usage.

RQ2: Would students use the chatbot to seek advice for language learning?

Several more instances are found of this line of inquiry including: “Should I read more English books?”; “I want to improve TOEIC score.”; and “I have to study English. Especially speaking!” *Appendix 2* shows an example of this form of usage.

RQ3: Would students use the chatbot for communication practice and entertainment?

This was the most overwhelmingly popular usage of SALC-bot. As predicted, students seem to find the chatbot engaging and entertaining to use. *Appendix 3* shows an example of this form of usage.

Discussion

This study has shown that it is possible to design and construct an embodied conversation agent in a self-access center and that language students interacted with the agent for access to information and for general chat in English. While there is much to explore on this topic, this exploratory study provides a glimpse into how EFL students interact with embodied conversational agents. One can expect to see an increasing use of automated agents for institutional use in the future.

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Acknowledgements

The researcher would like to express his enduring gratitude to: the RILS Committee for their generous funding; SALC Director Jo Mynard for her support; SALC Assistant Directors Yuko Momata, Mina Onuma, Tomoko Hoshi, and Tomomi Maejima for their expertise; the SALC student staff for their suggestions; and Yuko Rubesch for her encouragement.

Appendix 1: Usage Examples

Note: All names used here are pseudonyms.

Purpose: Information About The SALC

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SALC-BOT: That's great, Ikumi. What would you like to talk about?

Ikumi: I want to know about modules.

SALC-BOT: Modules are a great way to improve your study skills. Check the SALC's modules page (<http://eliscal.org/modules/>) for more information.

Ikumi: ok

SALC-BOT: Ok then.

Ikumi: is there waiting list for one of module?

SALC-BOT: Modules are a great way to improve your study skills. Check the SALC's modules page (<http://elisalc.org/modules/>) for more information.

...

Purpose: Learning Advice

...

SALC-BOT: That's great, hiro. What would you like to talk about?

hiro: how to learn English

SALC-BOT: That's a tough one! What is your main learning goal? What do you want to do with your English skills? The learning advisors (<http://elisalc.org/advisor/>) can help you focus your study.

hiro: I have not decided yet

SALC-BOT: What do you mean by that?

hiro: I have not decided the goal

SALC-BOT: That's a short answer. Are you trying to confuse me?

hiro: no

...

Purpose: General Chat

...

SALC-BOT: That's great, mio. What would you like to talk about?

mio: sport

SALC-BOT: Sports are great!

mio: where do you live?

SALC-BOT: I guess you could say I live on the internet, but I work for the SALC in Kanda University of International Studies in Chiba, Japan. Where do you live?

mio: I live in Chiba, too

SALC-BOT: Oh, cool. Tell me about life in Chiba

mio: I play music

SALC-BOT: Playing is something humans and many non-human animals have in common.

mio: How old are you?

SALC-BOT: I'm only 1 year old, but I am very smart! Did you know that the SALC is 10 years old

mio: wow!

SALC-BOT: You got that right.

mio: How many friends do you have?