Avari: Vision, Communication Shell, and Conversational Flow

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Introduction

This summer in the Future Computing Lab, we designed and implemented Avari (**A**nimated **V**irtual **A**gent **R**etrieving **I**nformation), a virtual character who answers questions about computer science faculty at UNC Charlotte. Each of the members of our lab took responsibility for different pieces of the project. My contribution to Avari was writing software for her vision, writing the communication shell that makes all the pieces of the program work together, and designing and implementing the conversational flow for dialogue between Avari and her users.

Background

Various virtual humans have been developed to hold conversations with their users in our lab --for example, Marve, the virtual receptionist, or Charlotte, the virtual character who recruits students to the computer science program here. However, these virtual humans hold limited conversation with their users, and the target audience is mostly people who are familiar with computer science.

With Avari's character, we aimed to build a virtual agent that would be intuitive and accessible enough for anyone to approach and hold a conversation with. We took a human-centered approach, using technologies such as voice recognition, vision, and realistic character display to make interacting with her more like talking with a person than typing into a computer.

Figure 1: Avari standing behind her desk with an additional display screen

Research

- Vision software
  - Avari's camera looks at the floor to see if someone is standing in front of her
  - Uses background subtraction to decide if someone is there or not
  - When a person approaches, Avari begins the conversation
  - When a person leaves her field of vision, Avari ends the conversation
  - Implemented using Matlab
- Communication shell
  - The different components of Avari cannot run on the same webpage so they have to communicate with each other
  - Javascript holds together components of vision (Matlab), the animated agent (Haptek), the question resolution algorithm (PHP), database (MySQL), and voice recognition (SALT)

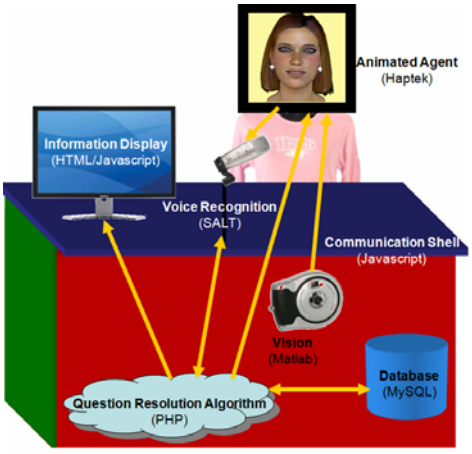

Figure 2: General architecture diagram

- Conversational flow
  - We simulate a natural but directed conversation between Avari and her user
  - Avari's phrases that prompt users are chosen at random from text files
  - An additional screen displays information that is relevant to the conversation or that helps users know what is appropriate to say at that point
  - Avari gives users more auditory and visual cues if she does not recognize their speech multiple times
  - All of Avari's conversation is logged so that we can see word for word what she says and what she recognizes users saying

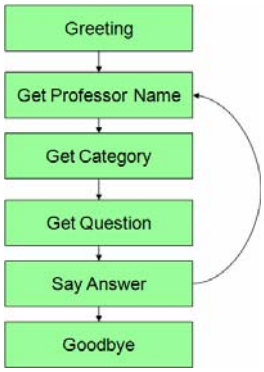

Figure 3: Basic conversational flow

Impact

- **Avari's vision is accurate enough for us to be satisfied with it, although it has not been tested outside of our lab where we aim to deploy her eventually**
- **All components of Avari are fully working and run stably together**
- **From preliminary observation of people interacting with Avari, it seems that conversation with her is fairly intuitive and natural**

Conclusions

Since we have not done any real testing with Avari, we cannot draw any significant conclusions yet. There are some skills I learned during the development of Avari, though:

- Gained experience in Matlab, Java, PHP, SALT, Haptek, and Javascript
- Became familiar with some vision algorithms
- Learned how to work with code that is not my own
- Became better at debugging code

Future Work

There are a lot of ways that we would like to evaluate Avari in the future. There are technical aspects we can quantitatively evaluate, such as accuracy of speech recognition, but the qualitative measures will probably prove to be more interesting. We would like to check Avari's conversation logs and look for patterns in what people talk about with her. We would also like to try changing her appearance to see if that changes how people interact with her or what kinds of people interact with her.