Iolaus: A Robotic Partner

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Abstract

In a social setting, it is often beneficial to have a partner that is aware of the environment and the circumstances and is able to communicate information that otherwise does not come to our awareness. Typically, these are human companions, however a robotic partner may be an alternate solution. For a robotic partner to be successful, it must naturally interact with its user, and be able to retrieve data and analyze the content. We are designing Iolaus, a robotic partner for social settings. Iolaus can be implemented as a robotic parrot perched on the user's shoulder. When the user enters a new social setting the robot parrot can be asked and attempt to answer questions about the people and surroundings, very similar to how a human partner would behave. In this phase of the project, we will be using the Sony Aibo to simulate Iolaus' information retrieval component demonstrating how such a robot can help the user access a vast amount of information in a socially acceptable manner.

Keywords: human robotic interaction, dynamic information retrieval

1. Introduction

Often people need information about their surroundings in a number of different ways. It is not always possible to have a human companion at every social setting; it might however, be possible in the future to have a robot companion. This is assuming the robot allow for normal socially acceptable interaction and is able to retrieve information dynamically and efficiently for the user. Iolaus (pronounced EE-oh-lus) is a proposed solution to this problem: a persistent robot partner that can convey important messages back to the user and help the user navigate through new environments and unfamiliar social settings.

Iolaus was part of ancient Greek mythology and played crucial role in Hercules' labours as he helped Hercules slay the Hyrda [1]. We use Iolaus, the obliging partner as a metaphor for the human robot interaction (HRI) project we propose.

This project aims to develop a robot that serves as a socially acceptable information-supporting partner. The user and the robot are to interactively communicate with each other, with the robot able to sustain sufficient knowledge and awareness of the environment in which it acts. Iolaus is designed as a companion and acceptable partner that will behave in a socially unobtrusive manner.

2. Background

Sociable robots need to perceive, recognize and interpret the behaviour of humans through multiple modes including vision, hearing and touch. [2].

3. Natural Interaction

Iolaus must allow the user to interact with it in a natural manner in a social setting. A social robot should be able to naturally interact with humans and participate in human society in ways that will be perceived as natural and socially acceptable [3]. Socially acceptable ways include conversing through a vocal interface as well as the ability to communicate and understand emotion. Ultimately, we would like Iolaus to fully support voice interaction.

Robotic emotions play a key role in improving human-computer interaction [4]. The robot can use emotions as a tool to understand and convey implicit messages to and from the user. Emotions will also be crucial in formatting user impressions for reactions in different circumstances.

4. Data retrieval and analysis

Iolaus needs to provide meaningful information back to the user. Since an autonomous robot has limited resources onboard, it will need to search for external information. This source could be a specialized database or as general as the Internet. We would like our physical Iolaus robot to be able to dynamically access the enormous information source embodied in the Internet.

5. Design

Our goal is to design Iolaus as a robotic information partner whom the user can ask for information very much as if it were a real person. Following, we plan Iolaus, to be perched on the user's shoulder very much like a parrot (Figure 1). This is convenient as the user can whisper requests to Iolaus and have it respond back very discretely since it is located close to the user's ear. Furthermore, Iolaus' response will include additional subtle physical movements (for example, head pointing) in a manner similar to a human partner responds.

From an implementation point of view, Iolaus is relatively simple since it only needs to balance on the user's shoulder (no walking required).

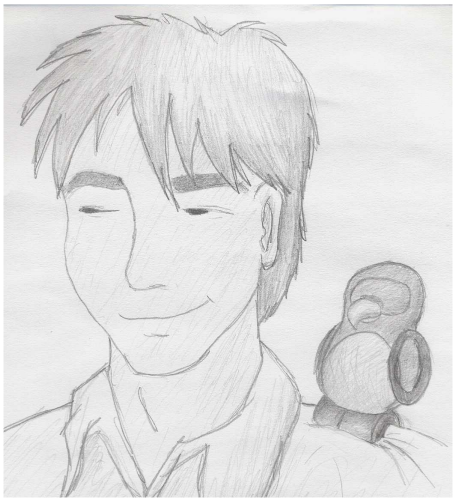

Figure 1. A conceptual drawing of Iolaus.

6. Prototype and Experiment

We are implementing the first prototype of Iolaus using the Sony Aibo ERS-7M2 robot dog, exploiting its wireless 802.11 capabilites. We will use this initial prototype for a simplified experiment testing the usability of the new robotic interface. The task will be to allow a user to ask Aibo to correctly identify and locate a person in a room. The persons in question can be physically located and visible in the room or simulated using a large poster showing their face. The room will contain the person the user is looking as well as a number of false choices.

Aibo will translate the user's request into a text web query and obtain the information wirelessly using a web search engine. The information requested from the search engine would be in the form of an image, as the task at hand is to compare an image in the physical world to that obtained from the Internet.

Aibo will compare the image retrieved from the web to pictures it acquired from its environment and determine if a match exists. Aibo will convey its answer for the query back by either moving towards the target person (or image) or using a synthetic voice message that will indicate its findings. Like Iolaus, Aibo must get the query from the user, translate the verbal query into text form, perform a search on the Internet for the information using the Google search engine, determine the correct match and then convey the answer back to the user.

Our current effort focused on the dynamic retrieval of information by Aibo using a wireless connection to the Internet.

7. Conclusion and Future Work

People often need to go to new places, meet new people and perform various social functions in new social settings. We design Iolaus to serve as a robot companion that can perform the function of a knowledgeable human partner without the social awkwardness associated with using various information appliances.

We are working on ways to expand the interaction with our current implementation of Iolaus:

- Develop a voice interface with Aibo so that requests and responses can be made orally.
- Add a physical interaction technique that will allow the user to cycle between multiple findings. For example, use the sensors on Aibo's paws and back to tell it to report the next image in the result set.

While the experimentation using the Aibo is a simplified form of Iolaus' planned functionality, there are important components that the Aibo prototype can help to accomplish such as the wireless and dynamic retrieval of information. The success of these components will help further the goal of realizing the completion of Iolaus.

8. References

[1] C. House, Hercules the hero: understanding the myth, 1998 Accessed Feb, 2005 http://www.yale.edu/ynhti/curriculum/units/1998/2/98.02.06.x.html

[2] C. Breazeal, A. Brooks, J. Gray, M. Hancher, J. McBean, D. Stiehl, J. Strickon, "Interactive Theatre" in *Communications of the ACM,* July 2003, Vol 46, No. 7, Accessed Feb 2005. http://robotic.media.mit.edu/Papers/Breazeal-etal-CACM03.pdf

[3] T. Kanda, H. Ishiguro, T. Ishida, "Psychological Analysis on Human-Robot Interaction," in *Proceedings. of IEEE Int. Conf. On Robotics and Automation*, 2001, Accessed Feb. 2005 http://www.lab7.kuis.kyoto-u.ac.jp/services/publications/01/01conf04.pdf.

[4] D. A. Norman, *Emotional design: Why we love (or hate) everyday things.* Basic Books, New York, 2004.