Sociable Tabletop Companions at "Dinner Party"

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Abstract. This paper describes the challenges and processes of developing a sociable interface and presents the implementation of one sociable interface, *Dinner Party*, in which a participant interacts with virtual creatures while dining alone. This paper explains how mundane objects can be sociable interfaces that interact with humans on a psychological level.

Keywords: Human-computer interaction, Sociable interfaces, Creative and expressive art experiences.

1 Introduction

In human-computer interaction, research pertaining to pervasive and ubiquitous computing [1] and tangible user interfaces [2] shows an increasing need for new interfaces that provide seamless integrations between the digital and physical worlds. Interface designers are currently exploring the possibility of these improvements in technology as tools, yet few designers approach them as sociable interfaces capable of perceiving human social behaviors and friendly communicating with people on cognitive levels.

This paper introduces a sociable interface called *Dinner Party*, which enables friendly interaction between a human and an everyday piece of furniture. While sitting by a dinner table, whenever a diner moves a cup, a fork, a spoon, or a pepper shaker, animated words describing imaginary creatures from *Jabberwocky* [3] appear on the surface of the table. These imaginary creatures move between the shadows of different eating utensils in a playful manner, forming a nice "Dinner Party" for the diner. This paper discusses the challenges in designing sociable interfaces and the processes of individuals' interpretation of objects as sociable interfaces that psychologically interact with them. This paper introduces *Dinner Party* as an implementation of a sociable interface.

2 Challenges in Designing Sociable Interface

Neurobiologists and psychologists alike have speculated that emotion is an adjusted, adaptive change in multiple physiological systems in response to the value of a stimulus from the environment. For several decades, developers have attempted to

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create artificial intelligence that has emotions. Early AI researchers were optimistic about the future of AI producing intelligence equal to that of humans. In 1965, AI pioneer Herbert Simon stated "machines will be capable, within twenty years, of doing any work a man can do" [4]. However, AI does not yet match human level intelligence because machines are not able to think.

Searle [5] criticized early AI theories, calling them "strong AI," and said "no program by itself is sufficient for thinking." Instead of using the term "strong AI," he used the term "applied AI." Duffy [6] describes an artificial system as an illusion of intelligence according to the human interpretation of the actions of AI. For example, the ELIZA program [7], which was described by Joseph Weizenbaum in *Communications of the ACM* in January 1966, engages in friendly conversation with a user on the Internet. It chats with the user based on the user's typed input even though it does not understand either the contents or the contexts of the conversation. Even though Eliza is a simple chat system, people share personal experiences with the system, forming psychological attachments.

3 Psychological Notions

The projective intelligence in sociable interfaces is supported by the psychological notion of intentionality and perception.

3.1 Intentionality

A philosopher and psychologist in the 19th century, Franz Brentano introduced the concept of "intentionality" used in philosophy and cognitive science to explain why people believe that machines can think without any human level intelligence. He coined the term "intentional inexistence" [8] to explain mental phenomena. People have beliefs because certain objects trigger certain attitudes and behaviors (e.g., "The shower head is sad because it drops water.") The view is also supported by philosopher Daniel Dennett [9] in *Intentional Stance*. In his view, people apply three strategies to predict the behaviors of living organisms such as plants, animals, and humans, and even artifacts. Whereas some are based on the laws of physics, or "the physical stance" (e.g., "If you heat the water at more than 100 C., the water will boil."), others are determined by design, or "the design stance" (e.g., "The design of a door knob gives clues about how to open the door."). Sometimes neither the physical nor the design stance is accessible, so another stance, "the intentional stance," can be adopted. The intentional stance treats plants, animals, humans, and artifacts as rational agents with beliefs and desires in order to further predict how they are going to behave.

3.2 Imaginary, Symbolic, and Real Orders

The French psychoanalyst Jacques Lacan [10] showed the relationship between one's "self" and one's "separated self." Lacan divides human perception into three orders: the *imaginary*, the *symbolic*, and the *real*. In Figure 1, "a" in the lower left-hand corner designates one's self, or ego, and "a'" in the top right-hand corner is a projection and a reflection of one's identity, called the *imaginary* order. The *imaginary* order includes conscious, unconscious, perceived, or imagined

identification in the outside world. They face each other in a symmetrical mirror. In this realm, one sees oneself as another person reflected in the mirror. Theories of narcissism are explained within the imaginary order. Later, in the early 1950s, Lacan introduced the *symbolic* order, in which one's identity is defined by outside contexts such as society, culture, language, or customs. Finally, Lacan explained the position of the *real* order, which is pure, and thus, only the final residues are left once all articulations are deleted.

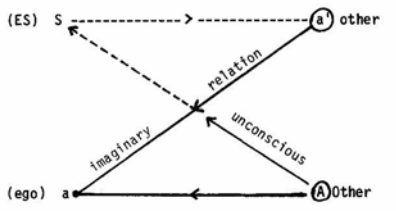

Fig. 1. Lacan's L-schema

Lacan explains how individuals perceive the world according to relationships between themselves and others and how they identify and negotiate boundaries. While perceiving, they consciously and unconsciously interpret the world as they are projecting themselves. When any objects in their surroundings display subtle cues so that a human can determine their functions, the human intuitively translates the complex behaviors of the objects into more familiar and understandable behaviors.

4 Dinner Party

4.1 Hardware/Software System

The *Dinner Party* interface consists of a computer, an IR-filtered camera, and a mirror, all inside of a table, and a plate, a cup, a peppershaker, a fork, and a spoon, all lying on top of the table. IR lighting on the ceiling focuses on the center of the table. An IR-filtered camera detects movement above the table surface, and the projector casts interactive letter animations onto the tabletop.

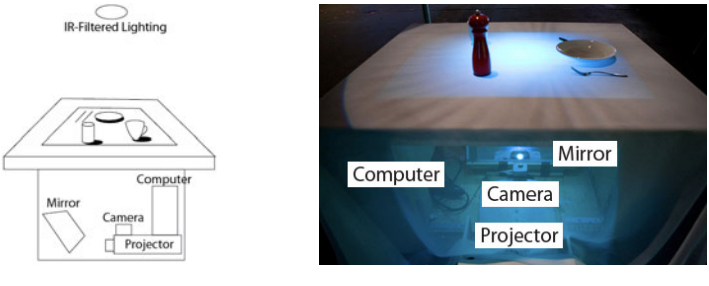

Fig. 2. Dinner Party setup

We developed *Dinner Party* using Openframeworks, an open source software framework based on the C++ programming language. Using a screenshot of the default image, we compared the default image pixels with the current image pixels on the table surface in real time. This computer vision system allows the computer to detect where the letter animations originate and move to.

4.2 Interaction

Dinner Party provides a space in which people meet and interact with the letter-shaped virtual creatures from Lewis Carroll's *Jabberwocky* [3]. When a participant sits down at the table and moves the utensils, the cup, and the shaker, the projector connected to the computer casts animated creatures hiding in the shadows of the objects. The table becomes an interactive platform between the participant and the imaginary creatures living in the shadows underneath the objects of *Dinner Party*. Creatures move from the shadow to other shadows while scattering or hiding in between objects (see Figure 3). Initially, the letters are entangled in a shape of large blobs. After a certain period of time, individual letters form sentences. Then they reveal themselves completely and display each sentence of the poem, *Jabberwocky*.

Fig. 3. Letter-shaped animation moves between shadows on the table surface

5 Conclusion

Dinner Party was exhibited at New York's Eyebeam Art Gallery in 2008 and showcased at the Siggraph Art Gallery in 2010 in Los Angeles. Hundreds of participants interacted with *Dinner Party*, and they commented that it was a "friendly" interface. Because the combinations of slow and fast movements of letter-shaped animations imitate the movements of living organisms, they trigger participants' imaginations, rendering the *Dinner Party* interface more life-like and sociable. This paper constructs two physiological notions to interpret meaning expressed in the interaction of visitors with Dinner Party. At first glance, the tabletop component of Dinner Party may not seem to serve any particular functional purpose other than as an ordinary table for food placement and dining activities. However, it transforms a mundane dining experience into a pleasant and friendly interaction with individuals when they project intentionality and perception. Although the objects, a table, a chair, and dining sets in *Dinner Party* are made of materials, people interpret

their movements as those of an organism and perceive their interactions as psychological cues. In this manner, everyday gestures and objects become meaningful when a participant engages in friendly interaction with the Dinner Party tabletop.

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