

# “Dinner Party”

## Sociable Interfaces in a Tabletop Art Project

Hye Yeon Nam, Carl DiSalvo  
School of Literature,  
Communication, and Culture  
Georgia Institute of Technology  
Atlanta, Georgia, 30332  
hnam@gatech.edu,  
carl.disalvo@lcc.gatech.edu

Ellen Yi-Luen Do  
College of Architecture  
Georgia Institute of Technology  
Atlanta, Georgia, 30332  
ellendo@gatech.edu

Sam Mendenhall  
College of Computing  
Georgia Institute of Technology  
Atlanta, Georgia, 30332  
smendenhall3@gatech.edu

### ABSTRACT

This paper explores the topic of sociable interfaces, demonstrated in an embedded tabletop application and a psychological friendship framework called “Dinner Party,” in which a user can have a dinner party with friendly virtual creatures while dining alone. In this project, we are interested in determining how everyday objects can be transformed into sociable creatures that interact with people on a psychological level.

### Categories and Subject Descriptors

H.5.1. [Information Interfaces and Presentation]: Multimedia information system; H.5.2. [Information Interfaces and Presentation]: User interfaces, input devices and strategies, interaction styles; J.5 [Arts and Humanities]: Fine arts, performing arts

### General Terms

Algorithms, Design, Experimentation, Human Factors

### Keywords

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

## 1. INTRODUCTION

Currently interface designers are exploring the possibility of ubiquitous and tangible interfaces as tools, yet few designers approach them as sociable creatures capable of perceiving human social cues and communicating with people on deeper social and cognitive levels. This paper introduces a social interface called “Dinner Party,” which enables friendly interaction between a human and an everyday piece of furniture. Dinner Party approaches the confluence of sociable creatures and tangible computing. 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 tabletop. As the diner interacts with the interface and projects his or her intentionality, Dinner Party transforms itself into a friendly, sociable interface.

## 2. THEORETICAL FOUNDATION

The perspective of computing as a sociable interface stems from the theories of friendship and intentionality, discussed below.

### 2-1. Friendship

Aristotle originally distinguished three kinds of friendship in *The Nichomachean Ethics*: friendships based on utility, those based on pleasure, and those based on virtue [1]. Sherman later clarified Aristotle’s definition of friendship: “By friendship Aristotle typically means the mutually acknowledged and reciprocal relation of good will and affection that exists among individuals who share an interest in each other on the basis of virtue, pleasure or utility” [7]. After defining and establishing the requirements of friendship, we explore how these terms apply to our tabletop interface.

#### 2-1-1. Friendship based on utility

People might not be willing to spend any length of time together unless they believe that the experience will be mutually beneficial. Similar to the theory of friendship based on utility from Aristotle, the theory of Michael E. Bratman and Philip Cohen include detailed requirements. Bratman defines three requirements for an activity to be cooperatively shared based on utility: mutual responsiveness, commitment to a joint activity, and commitment to mutual support [2]. Cohen states that one can count on the other member based on mutual beliefs of a common goal in a friendship [5]. According to the authors, when two agents rely on each other for a specific purpose, they may be defined as “friends” since they have a similar purpose, or utility.

#### 2-1-2. Friendship based on pleasure

The relationship among friends differs from other inter-subjective relationships. For relationships to become more serious, they need more intimacy, which in turn creates a happier and healthier friendship. According to Aristotle, human beings, in broad terms, are social animals and look for joy in relationships with others.

#### 2-1-3. Friendship based on virtue

Ancient Greek philosophers distinguished among three notions of love: *agape*, *eros*, and *philia*. *Agape* is unconditional love, and

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*eros* and *philia* are forms of interpersonal love, the difference being that *eros* is sexual passion whereas *philia* means caring and friendship towards others. According to Aristotle, “Each alike wish good for the other *qua* good, and they are good in themselves” [1]. The meaning of friendship based on virtue is similar to that of *philia*, including not only close friends and family members, but also business partners and one’s country at large.

## 2-2. INTENTIONALITY

According to Searle, “Intentionality is that property of many mental states and events by which they are directed at or about or of objects and states of affairs in the world” [6]. Intentional mental states are always others’ certain mental states (e.g., “I believe that God loves me.”) or directed at certain objects (e.g., “The shower head is sad because it drops water.”) People have beliefs about abstract forms because certain objects trigger certain attitudes and behaviors.

This view is also supported by philosopher Dennett in *Intentional Stance* in the following quote.

Here is how it works: first you decide to treat the object whose behavior is to be predicted as a rational agent; then you figure out what beliefs that agent ought to have, given its place in the world and its purpose. Then you figure out what desires it ought to have, on the same considerations, and finally you predict that this rational agent will act to further its goals in the light of its beliefs. A little practical reasoning from the chosen set of beliefs and desires will in most instances yield a decision about what the agent ought to do; that is what you predict the agent will do [4].

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 water to more than 100 C., 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. RELATED WORK

Dinner Party is originally inspired by other sociable artificial intelligence (AI). Sociable AI, which can interact with humans, has been explored in various media such as virtual chatting systems, commercial games, and sociable robots. The first example was the ELIZA program, which was described by Joseph Weizenbaum in *Communications of the ACM* in January 1966 [9]. Eliza provides friendly conversation with a user on the Internet. It chats with the user based on the user’s typed input. The second example was the Tamagotchi, a digital pet in a small game kit, created in Japan by Akihiro Yokoi of WiZ Co. Ltd. and Aki Maita of Bandai Co. Ltd. In the game, users raise a small virtual creature called Tamagotchi from an egg to its death, paying attention to both physical and emotional growth. Another example is the Sony Aibo, which was developed in Japan. Sony Aibo is a creature-like robot that participates in human and sociable robot interaction [8].

It detects human social cues from various sensors and reacts like a pet.

Even though attempts have been made to create sociable AI interfaces in other media, they usually do not incorporate these experiences into everyday casual routines. We believe this is a missed opportunity because embedded technology facilitates interactions between humans and sociable interfaces. Embedding social creatures in everyday objects increases their accessibility since the user interacts with familiar objects. Dinner Party embeds sociable technology into commonplace objects, a dinner table and a chair. It does not change any expected behaviors of these objects, so the participants interact naturally.

## 4. DINNER PARTY

### 4.1 Hardware System

The Dinner party interface consists of a computer, the IR-filtered camera, and a mirror, all inside of a table, and a plate, a cup, a peppershaker, a fork, and a spoon lie on top of the table. IR lighting on the ceiling focuses on the table (see Figures 1 and 2). An IR-filtered camera detects movement above the table surface, and the projector casts interactive letter animations onto the surface of the table.

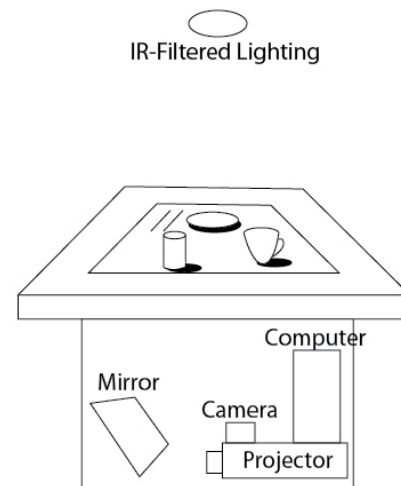


Figure 1. Dinner Party structure

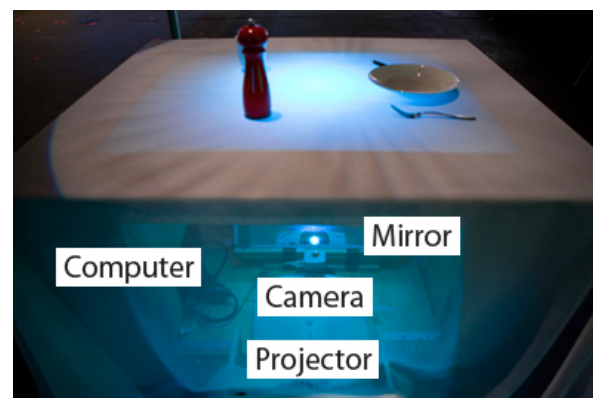
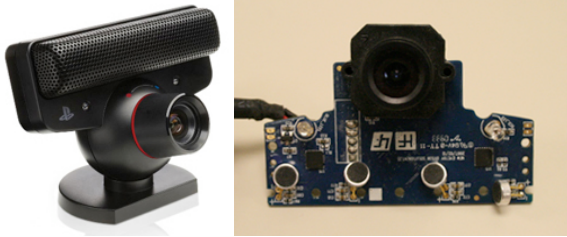


Figure 2. Dinner Party actual setup

The IR-camera is a modified Sony Playstation 3 (PS3) web camera (see Figure 3), which costs around \$35. Because of its low cost, Dinner Party is more accessible to the public. As we needed to add an IR-filter between the original camera lens and the extra mount, we opened the original PS3 camera cover and built an extra mount on top of the original camera lens. We applied an extra lens on top of the original PS3 camera lens to increase the camera's view angle (see Figure 4). Since the height of the table has a certain limit as a dinner table, we tried different angled lenses to generate the best solution.



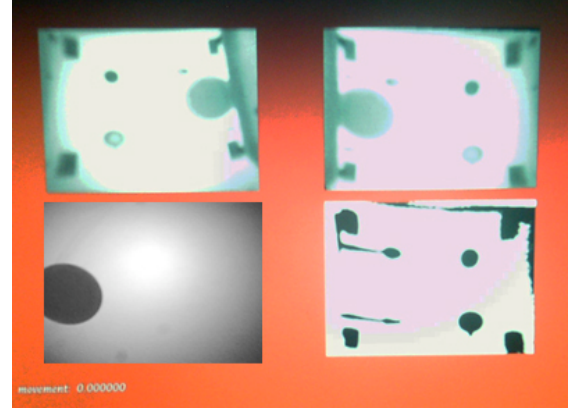
**Figure 3. Original PS3 camera (left) and hacked camera (right)**



**Figure 4. An IR-filter (left), a mount (top right) and different angled lenses (bottom right)**

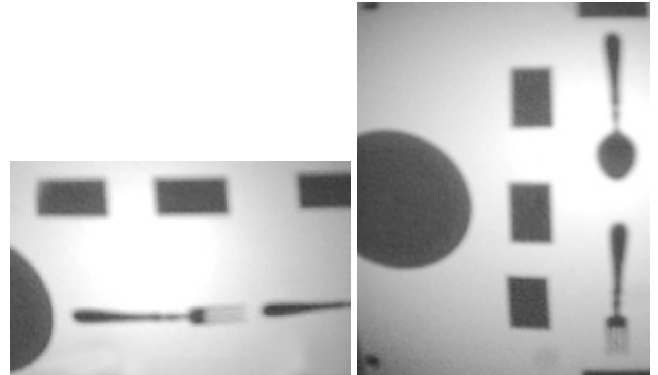
## 4.2 Software System: Computer Vision

We developed Dinner Party using Openframeworks, an open source software framework based on the C++ programming language. We used a screenshot of the shadow with a plate on the table as a default image to compare pixel differences with the current image on the table surface in real time. The computer vision system allows the computer to detect where the object shadows are and where the letter animations originate. Once the animation is activated, the letters are cast underneath the shadow as blobs and then slowly spread to form sentences in and around the objects (see Figure 5).



**Figure 5. A comparison (bottom right) of the default image (bottom left) and the current image pixel (top right)**

The IR-filtered camera underneath the table needed to be adjusted to a certain angle so that the entire table surface could be seen. We needed to calibrate the camera to capture all four corners and to make a straight line in each vertical and horizontal direction (see Figure 6).



**Figure 6. Camera calibration in vertical and horizontal directions**

## 4.3 Interaction

*Dinner Party* provides an environment in which people meet and interact with the virtual creatures from Lewis Carroll's *Jabberwocky* [3]. It includes a chair, a table, and a table setting for one person (see Figure 7). A participant can sit down at the table and move the tabletop utensils, the cup, and the shaker. The objects cast virtual shadows on the tabletop with animated creatures hiding in the shadows. The table becomes an interactive platform between the participant and the imaginary creatures living in the shadows underneath the dinner utensils. Creatures move from the shadow of the main plate to other shadows while scattering or hiding in between objects (see Figure 8). Initially, the letters are entangled in a shape of large blobs. Individual letters form sentences after a certain period of time. Then they reveal themselves completely and display each sentence of the poem.



Figure 7. One user's dinner set



Figure 8. Letter-shaped animation moves between shadows on the table surface

## 5. CONCLUSION AND FUTURE WORK

Dinner Party may not serve any particular functional purpose other than as an ordinary table. However, it reinterprets an everyday dining experience into a pleasant and friendly interaction. Dinner Party provides an experience with feelings of caring, happiness, and comfort. These positive feelings refer to the pleasure and virtue aspects of Aristotle's theory of friendship.

Everyday gestures and objects become meaningful when a participant engages in friendly interaction. In our solitary modern society, we might feel less lonely if we had an imaginary friend.

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 this art installation, and in their comments, they stated that it was a "friendly" interface. Because the combinations of slow and fast movements of letter-shaped animations imitate the movements of living creatures, they trigger people's imaginations and intentions, rendering the interface more life-like and sociable.

Currently, only the user benefits from the Dinner Party interaction. In future versions, we will add perceived mutual benefits between the user and the interface. We will continue to develop more accurate object detection and investigate other physical human input that reveals human feelings. We also plan on turning other familiar furniture and everyday objects into sociable interfaces.

## 6. ACKNOWLEDGMENTS

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