FishPong: Encouraging Human-to-Human Interaction in Informal Social Environments

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ABSTRACT
In this paper we introduce *FishPong*, an interactive system designed to stimulate informal computer-supported cooperative play (CSCP) in public spaces such as coffeehouses and cafés. *FishPong* consists of a tabletop tangible user interface (TUI) that allows users to control a fish-themed video game using magnetically tagged coffee cups. *FishPong* has been designed as an "icebreaker" technology to encourage spontaneous social interaction among coffeehouse patrons. This work serves as an example of how environments might be subtly and unobtrusively augmented in order to facilitate informal human-to-human interaction.

Categories and Subject Descriptors
H.5.1**[Information Interfaces and Presentation]**: Multimedia Information Systems – *animations, artificial, augmented, and virtual realities.*

General Terms
Design, Human Factors.

Keywords
Tangible User Interfaces (TUI), Ambient Interfaces, Computer-Supported Cooperative Play (CSCP), Social Interaction, Entertainment, Games.

1. INTRODUCTION
Prior research, such as the work of Rogers and Brignull [9], has identified emerging opportunities for computational technologies to be used in the promotion and enhancement of social interaction in public spaces. Such efforts attempt to encourage human-to-human interaction by providing novel computing devices that serve as central gathering places wherein spontaneous communication may lead to the formation of new interpersonal relationships.

The present work pursues an alternative strategy in which an ambient, tangible user interface (TUI) [2] serves to promote social ice-breaking without disrupting existing behavioral patterns within a public space. Our system, *FishPong*, is designed to be inserted seamlessly into a public environment, such as a coffeehouse or café. These so-called "third places" of social life [6], have historically played an important role in the development of social networks, and therefore provide a rich context for the exploration of computer-supported ice-breaking strategies.

Prior work on computer-supported cooperative play (CSCP) [3], suggests that tangible user interfaces for gaming may provide a compelling avenue to enhanced social interaction. Mandryk and Inkpen [4] build upon this notion, further suggesting that the "free play" aspects of young children's social interactions may be effectively captured in TUI-based ubiquitous computer games.

In children, free play is characterized by a "play first, talk later" approach to interpersonal relationships. With *FishPong* we attempt to infuse this attitude into an adult social environment, thereby providing a route to overcome some of the cultural barriers that may inhibit spontaneous interaction with strangers.

FishPong is designed to allow adults enter into a gaming situation without effort and without the burden of considering the social acceptability of their actions. It attempts to invoke the characteristics of free play as identified by Mandryk & Inkpen: voluntary, spontaneous, involving pretend elements, engaging, and fun. *FishPong* achieves this by allowing users to voluntarily enter and exit the game without constraints, and by offering enjoyable, rewarding game play involving the use of fanciful digital elements that engage users both with the interface and with fellow players.

2. RELATED WORK
In our daily routines, we rely heavily on chance encounters to meet new people and expand our social networks. Increasing opportunities for such interaction has been an objective of researchers in ubiquitous computing from the earliest days.

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Weiser et al. at Xerox PARC, for example, explored the use of a computationally augmented coffeepot to promote chance encounters in a workplace [10].

Rogers and Brignull investigate computer-assisted social ice-breaking in public settings using their *Opinionizer* system [9], a large interactive display designed to promote chance encounters at large social functions. *Opinionizer* demonstrated the use of a technological system to generate a "honey-pot effect" in which co-located users were shown to engage in spontaneous conversations when present in the interaction zone provided by the system.

Schminky [8], a game system that equips players with earphones and wireless, handheld interface devices, has been deployed in a public café, and begins to explore the use of pervasive technology and social gaming to promote interaction in Oldenburg's "third places." Unlike *FishPong*, however, this system does not encourage face-to-face ice-breaking behaviors, since users must focus their attention on the gaming device, rather than on the other co-located players.

Mandryk et al. at Simon Fraser University begin to study the design of ubiquitous computer games with their *Extreme Electronic Entertainment* (E^3) project [5], a TUI-based platform for supporting free play. This work has identified critical design issues for CSCP technologies, and provides a foundation for future work on user interfaces that support free play.

3. DESIGN

3.1 Overview

FishPong consists of an interactive tabletop that serves as both the input and output device for a multi-player gaming system (see *Figure 1)*. The game play for *FishPong* is modeled on the classic ball-and-paddle video game, "Pong," which was selected for its simplicity and scalability. In this version, colorful fish serve in place of the ball, and inexpensive coffee cups with spill-resistant lids function as the paddles. Invoking the fish-in-the-sea metaphor allows us to slow down the pace of the game to a level appropriate for casual cooperative play using the TUI input devices, and further permits enhancement of the game's visual appeal without sacrificing its entertainment value.

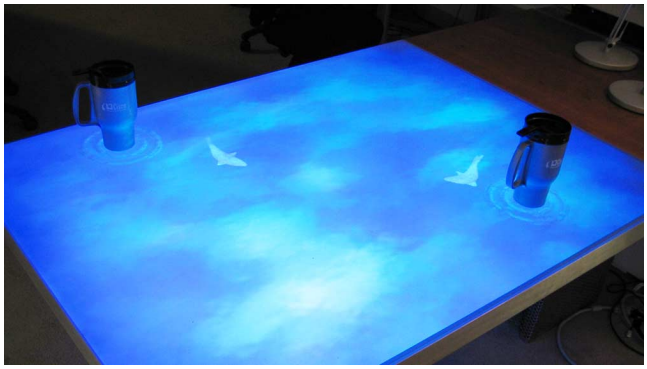

Figure 1. *FishPong* in multi-player mode.

3.2 Single-User Scenario

A customer enters a coffeehouse to purchase a cup of specialty coffee. After receiving his drink, he decides to sit at one of the open tables to take a break from his daily routine. As he places his coffee cup on the table, he notices that the cup generates digital ripples on the table surface, as if he'd placed it in a pond of water. Simultaneously, he notices a fish appearing at the far side of the table. The fish swims towards his coffee cup. Upon reaching the ripples generated by the user's cup, the fish is redirected away from the cup. The fish proceeds to swim around the table, within the confines of the table edges. The person notices that the fish is no longer attracted to his cup, but can be redirected by the cup if it is placed in the fish's path. The customer proceeds to enjoy his coffee while playing with the digital fish.

3.3 Multi-User Scenario

Another customer enters the coffeehouse and decides to sit at a table while she enjoys her beverage. At this point, the coffeehouse is moderately full, so she decides to join another customer, who appears to be sitting alone, at one of the larger tables. As she places her cup on the table, she notices that a new fish is generated on the table surface, and both of the fish swimming around the table are attracted to her cup. When they reach her cup, however, they bounce off and continue swimming in another direction. Before long, the users realize they are engaged in a game of FishPong, and continue to play collaboratively as they enjoy their coffee.

4. GAME PLAY

4.1 Idle Mode

When no coffee cups are present on the table, *FishPong* enters an "idle" mode after three minutes of inactivity. Idle mode is a special display state that uses engaging visual content to attract users that might otherwise choose to sit at a conventional, non-augmented table. During idle mode, a small number of fish (up to six) enter the display and swim around in either random or "synchronized" patterns. The fish are presented only for short intervals before exiting the display. When a cup is placed on the table, *FishPong* exits idle mode and all of the present fish swim off the screen.

4.2 One-Player Mode

The individual player interacts with the game using her coffee cup. The cup contains an embedded identification tag, which is recognized by the table sensors. As the cup touches the table, a digital ripple is generated on the tabletop display (see *Figure 2*). The digital ripple is programmed to deflect the fish much in the way the paddle deflects the ball in the video game Pong. When single-user mode is activated, the remote edges of the *FishPong* table are bounded with a white line that deflects the fish back toward the user. The objective of this game is to prevent the fish from falling of the edge of the table nearest the user. If the user fails to keep the fish on the table, a time-out of thirty seconds occurs before a new fish is generated.

Single-user game play has been designed to generate interest among spectators, who might be inclined to participate in the

game themselves, and thereby enter a shared game-space conducive to spontaneous social interaction.

4.3 Multi-Player Mode

FishPong is best played in groups of two or more. Scalable by nature, this game can accommodate as many users as permitted by the physical space. Additional players can enter the game at any time by simply placing a cup on the table. Each new player generates an additional fish, and can interact with existing fish on the table using their cup. As more users enter the game, the white bounding lines disappear, creating a situation in which multi-user cooperation is required to keep the fish "alive." The pace of the game, however, is sufficiently relaxed that it tends to be cooperative than competitive, allowing the players can enjoy their coffee and also contribute to the game.

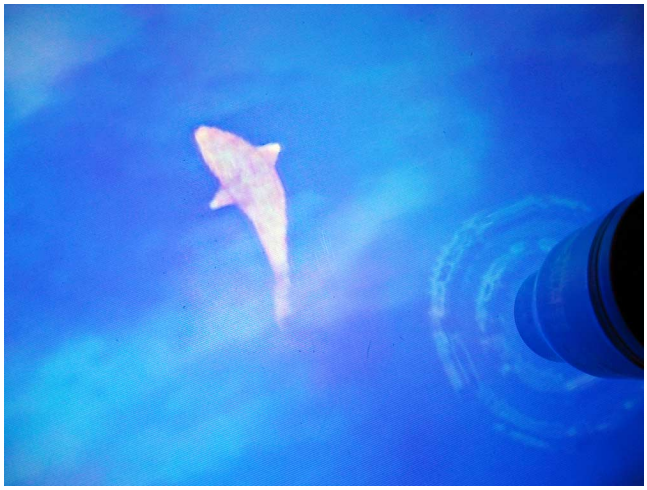

Figure 2. *FishPong* tangible user interface.

5. IMPLEMENTATION

FishPong is built on a tabletop input system, which is able to track free-standing, wireless objects on the table surface in the two-dimensional *x-y* coordinate plane. The sensing technology for *FishPong* is based on the *Sensetable* TUI platform [7] that uses electromagnetic antennae embedded in the table surface to track the position of inexpensive inductance-capacitance (LC) tags placed on its surface. A video projector mounted on the ceiling projects the graphical interface, which consists of a blue pond with user-activated ripples and digital fish. A small LC tag is attached to the bottom of each disposable coffee cup, thus allowing the table to determine the location and motion-path of the cup-based input (*Figure 2*). The table is connected to a control computer, which interprets user manipulations, and updates the graphical display according to the parameters of game-play.

The overall configuration of *FishPong* is depicted in *Figure 3*.

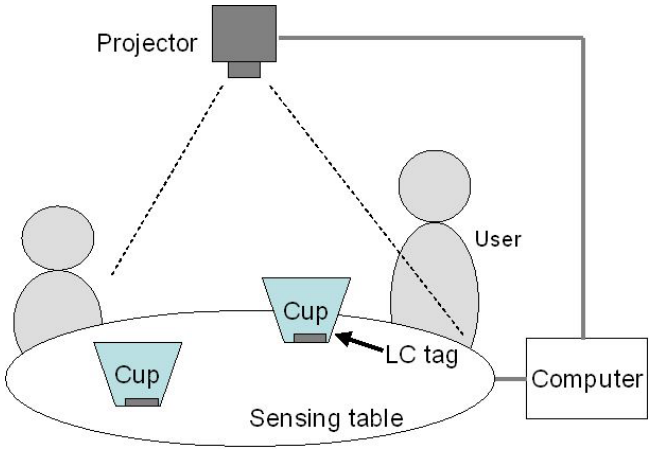

Figure 3. The system architecture of *FishPong*.

6. EVALUATION

Exploratory user research is presently underway using the *FishPong* prototype system. Participants selected from a student volunteer population have been invited to a research laboratory to discuss how people interact socially in public places such as coffeehouses. All of the participants are interviewed at the *FishPong* sensing table, and are offered soft drinks or water in tagged cups.

Overall, participants have reacted positively to the technology, often engaging with it in spontaneous play. Even without prompting, the game is frequently referred to in conversation with the researchers, supporting its efficacy as a tool for inducing spontaneous verbal interaction. When prompted to discuss *FishPong*, participants tend to support the assertion that the technology could encourage social ice-breaking in a public space. Further, most participants agree that its presence in a coffeehouse would enhance their overall experience of the environment.

7. CONCLUSIONS

Young children, upon first encounters, are often observed engaging in collaborative play without the need for formal introduction. They begin by playing together first, and thereafter conversing and ultimately developing deeper social relationships. Adults, however, are rarely given the opportunity to "play first, talk later." Instead, most introductory encounters require some form of dialogue. The development of adult social relationships and the broadening of social networks are hindered by this dependence on conversation-first encounters. *FishPong* provides an interactive game-space to bring adults together without reliance upon introductory dialogue. We believe that by creating a shared game-space between otherwise isolated individuals, *FishPong* stimulates collaborative, cooperative human-to-human interaction.

It is our belief that *FishPong* will serve as an example of how ambient and tangible user interfaces may be used to subtly and attractively augments public environments in order to provide enhanced opportunities for social interaction. *FishPong* engages users automatically, requiring no commitment or prior technological expertise, thereby encouraging adult play and—we hope—ultimately supporting informal social interaction among users.

8. FUTURE WORK

Future work on the *FishPong* system shall involve installation of the technology in a real coffeehouse environment, where its effectiveness as a tool for fostering social interaction can be empirically investigated. We will also explore possibilities for further increasing its utility as an ice-breaking technology. Potential strategies include varying game play over time to provide novelty for repeat customers, as well offering customizable interface elements, such as personalized fish that users may associate with their own reusable coffee mugs.

9. ACKNOWLEDGMENTS

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