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Keywords **–** (Ex.) Tangible User Interface, interactive design, ubiquitous computing, dining table design.

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DABLE– A Shyness-reducing Dinning Table

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Internet society is subject to reduction of "real-touch" the relationship between people. In order to encourage comfortable interaction and reduce shyness between first-date-couple, we use TUI technology to design DABLE – a shyness-decreasing table. The display of DABLE changes with users' interactions to strengthen their confidence and pleasure during dinning.

Keywords **-** Tangible User Interface, interactive design, ubiquitous computing, dining table design.

Introduction

In modern life people seem to be in the very midst of an information explosion. Internet society reduces "real-touch" and changes the relationship between people. We receive information continuously in our everyday lives, even during eating time. Some restaurants offer TV news as an additional service. It not only causes costumers poor digestion, but also interrupts the interaction between diners (Jiang, 2008).

Since people always feel embarrassed when dining with someone not familiar, in this study we design an interaction dining table called DABLE. We hope DABLE can provide the diners with pleasure without interfering with the procedure for dining.

Shyness Psychology

Most people experience some degree of shyness from time to time in certain situations. Shyness is a kind of emotion of social anxiety. Shyness means a lack of calm during interacting with people, and it's not equal to introvert. Shy people may feel anxious and embarrassed in psychological aspect and heartbeat fastening and blushing in physical aspect. Being judged and getting along with the opposite sex cause shyness most easily.

Lacking social skills is the main reason for feeling shy. Shy people can be trained to learn social skills by being taught, consulting examples, role playing, reinforcing, feeding back and homework (Hollander & Bakalar, 2005; Su, 2001). In this paper, we present a design for reducing such kind of shyness.

Tangible User Interface

An interface can be seen as the bridge between the world of the product or system and the world of the users (Schubiger, 2005). Since Weiser (1991) published the book entitled "The Computer for the 21st Century," human-computer interaction has changed in many aspects. The procedure of computing, for example, changes from "input-process-output" to "sense-compute-act" (Chen, 2008). People can interact with computers more naturally and freely without the limitation of space. The followings are some related research fields:

Natural User Interface (NUI)

Rauterberg & Steiger (1996) mentioned that a system with a NUI supports the mix of real and virtual objects. As input it recognizes (visually, acoustically or with other sensors) and understands physical objects and humans acting in a natural way. NUI is realer than Augmented Realty (AR) and Virtual Reality (VR) because AR and VR cannot simulate all physical qualities in the real world.

Physical Interaction

Sato & Lim (2000) generalized eight models to explain the connections among human intention and action, objects, environment and media space. In this research, DABLE's interface is based on H-P-M-P-H model which is a model of computer-mediated human to human communication.

Tangible User Interface (TUI)

Ishii & Ullmer (1997) presented three key concepts (figure 1):

(1) Interactive Surfaces: Transformation of each surface within architectural space into an active interface between the physical and virtual worlds.

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(2) Coupling of Bits and Atoms: Seamless coupling of everyday graspable objects with the digital information that pertains to them.
(3) Ambient Media: Use of ambient media such as sound, light, airflow, and water movement for background interfaces with cyberspace at the periphery of human perception.

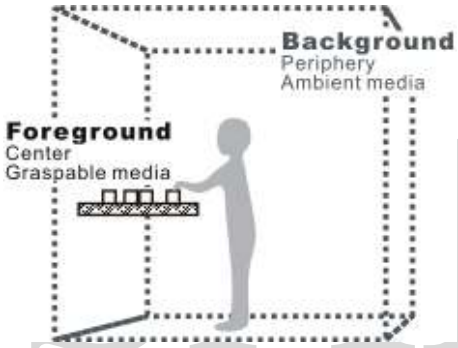

Figure 1 Tangible User Interface
(Redrawn from Ishii & Ullmer, 1997).

NUI, Physical Interaction and TUI are the same kind of interface. User uses physical objects to operate and gets feedback by senses exited. The H-P-M-P-H model in Physical Interaction even connects two users through the interface. Because TUI has the clearest rules, we call an interface like this Tangible User Interface.
A number of TUI applications have been developed at laboratories. As the space is limited, we hereby take three examples.

The first one is the reactable (Jordà, Kaltenbrunner, Geiger & Alonso, 2003), which is a collaborative electronic music instrument with a tabletop tangible multi-touch interface (Figure 2). The instrument was developed by a team of digital luthiers, working in the Music Technology Group at the Universitat Pompeu Fabra in Barcelona Spain.

Figure 2 reactable (Jordà et al., 2003)

The second one is the Audiopad (Patten, Recht & Ishii, 2006), developed by MIT Media Lab and is a set of interaction techniques for electronic musical performance using a tabletop tangible interface (Figure 3).

Figure 3 The Audiopad (Patten et al., 2006)

The last one is Weather Report (Hochenbaum & Vallis, 2008), a piece of the Brick Table. It can sense some puck-like controllers and finger tips and reacts in a musical way.
The three works above are all TUI musical instrument design using puck-like controllers to operate the system. Weather Report can also sense and trace user's finger touch.

DABLE Design

We use TUI to design the interface and hope DABLE can bring the diners pleasure and reduce embarrassing atmospheres without interfering with the procedure for dining. Good interfaces are invisible (Schubiger, 2005). We use normal tableware as controllers, but not additional puck-like controllers. The system can give the users visual reinforcing and feeding back according to their frequency of interaction to strengthen their confidence and initiate new topics.
DABLE is the name that means Table for Dating. DABLE is an interactive dining table for restaurant dates. Couples can use DABLE to complete restaurant routine such as ordering meals by TUI technology. DABLE provides comfortable and pleasant atmosphere through little games to reduce embarrassment.

DABLE is a 800*750*750 (mm) square table. In order not to influence the visual display, we combine traditional dining table with tablecloth in DABLE's form. The table surface is made of gray translucent acrylic (Figure 4). We consult the reactable (Jordà et al., 2003) and use the reac TIVisio technology (Kaltenbrunner, M. & Bencina, R., 2007) to build the structure of DABLE. The table surface is made of gray translucent acrylic. Beneath the table are a camera, a computer and a projector continuously collecting and computing the data of the movement of the tableware and users' finger tips and projecting the result on the table (Figure 5)

The interface of DABLE includes graphic and text display. The graphic part is the circles around the tablewares and the lines between them and the graphic will change following users' act. The text part displays around the main dish plate and can be scrolled and by rotating the plate. The main color is pink which fits the

romantic dating theme.

Figure 4 DABLE's appearance

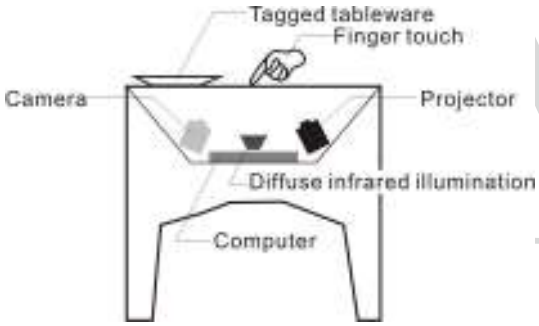

Figure 5 Inside DABLE

When ordering a meal, users can touch the text to select from the menu, and the lines will connect to the related tableware (Figure 6). Touch the meal name again to confirm the order. While waiting for serving, a psychological test according to the orders will appear around plates to initiate a talking topic. When users start eating, there will be an active curve between their plates. The curve will change its extent according to their frequency of interaction. It can be a reinforcing for social occasions, the more interaction, and the stronger visual display will be (Figure 7).

Users can not only operate the system through virtual interface, but also use normal tablewares to interact. The table and tablewares are corresponding to the controllable foreground in TUI's features, and the tablewares are corresponding to the graspable media, and the projection display is corresponding to the background.

Figure 6 Ordering

Figure 7 Dating condition

Discussion

Because AR and VR cannot simulate all physical qualities in the real world, we choose TUI technology to design DABLE – a shyness-decreasing table. Dating couples are supposed to complete restaurant routine and feel easy and pleased with DABLE. The display changes following users' interaction and it can strengthen their confidence and encourage them to take the initiative. Nevertheless, further usability tests of DABLE are required to support the above design intentions.

Acknowledgements

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