Tangible and Collectible Entertainment System with Capsule Vending Machine

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ABSTRACT

We developed a tangible entertainment system that enables to play video game with physical collectibles as game components. It consists of a capsule toy vending machine with LCD panel, capsule toys with embedded RFID tags, an RFID sensor board and a computer.

Nowadays a huge amount of collectibles is sold: baseball cards, dollhouse miniatures, character figures, candy tins, and so on. Usually, collectibles are finely formed so that they satisfy owner's desire of possessions. On the other hand, collectibles in video game become popular. Those collectibles often have some special features such as magic power, but lack neither tangibility nor attractive form.

Our system is designed to combine these two advantages of virtual and real game components.

1. INTRODUCTION

In recent years, there has been a significant effort to develop tangible game components, that externalizes game components of video games from inside to outside of video display. Tangible game system provides intuitive interface that emulates traditional board games that are familiar to us, and enables to combine both advantages of board games (tangibility, intuitive interface) and video games (flexible input and output, computer aided game play).

Currently most of effort is aimed at externalizing game components such as player's pieces or scoring markers. Basically these components are used during a game play. Players do not own those components before a game, and they return the components after the game although they temporarily own some components during the game.

On the other hand, collectable game component is becoming popular. For example, many kinds of trading card games,

Figure 1: System overview of Narrative vending machine

e.g. "Magic: the gathering", are developed and played all over the world. Not only in table games, collectibles can be seen in video games too. For example, in "Animal Crossing: Wild World"[1], players can collect various collectibles such as cloths, insects or fossils. Especially in multiplayer network games, such as "Ultima online"[4] or "Second Life"[3], collectible is very popular and important game feature.

Usually, collectibles in real world such as miniatures or trading cards are finely formed or printed so that they satisfy owner's desire of possession. On the other hand, collectibles in video games often provide special features. Typical instances are magic items that provide special power to a player. Moreover, some video games give special bonus to the player who completed all of collectibles in the game world. In other words, those collectibles give some practical merits in the game world to players who won them.

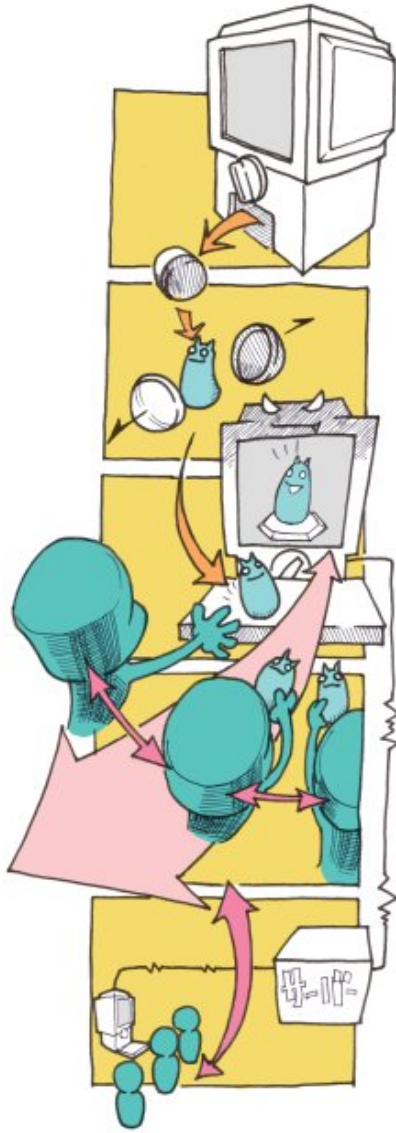We developed a tangible entertainment system that exter-

Figure 2: Application scenario of the system: the player purchases a collectible (randomly selected), then put it on the sensor board to play the game. The player can put more collectibles simultaneously, and cooperate with the other players. The system can be connected to the other system via the net, that allows competitive online game.

nalizes collectibles in computer world and enables to play with them as tangible game components. We hypothesize that our system not only satisfies players' desire of possession, but also improves the game experience by allowing to play the game with the tangible collectibles.

2. SYSTEM ARCHITECTURE

Our entertainment system consists of a collectible vending machine, a sensor-embedded game board, and collectibles. The vending machine has a LCD on its front surface and it is connected to a computer. Collectibles are played on
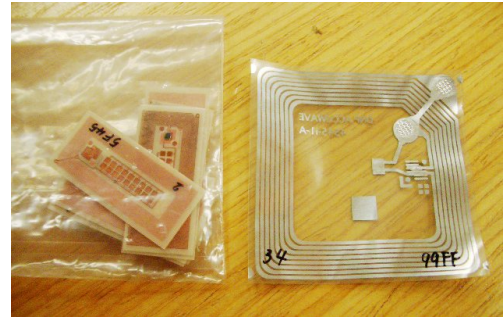

Figure 3: Two types of RFID tags.

the game board. The sensor in it recognizes collectibles and transmits their IDs to the computer. Figure 1 shows an overview of the system.

At the beginning, a player insert a coin to the vending machine to buy a collectible, then a capsuled collectible is dispensed. Typically a collectible is selected randomly. The player opens the capsule and put the toy on the game board to play the game. The player can put any collectibles of his own collection. Cooperation or trading with the other players is allowed.

2.1 RFID Tag

RFID tag/sensor system is used to recognize collectibles on the sensor board. We employed Nippon Signal's IC tag reader that enable to scan at most 40 RFID tags on a sensor board simultaneously. Its scan range is 5 cm above the sensor, and it took around 1 second to scan 40 tags. RFID tags are shown in Figure 3. We embedded these RFID tags into collectibles. The current system recognizes the type and numbers of collectibles on the game board, but does not track the positions of them. However, it would be able to support positional input by using multiple sensor boards or some other sensing device.

2.2 Capsule Toy

Capsule toy and capsule toy vending machine are very popular culture in Japan. We employed a traditional capsule toy vending machine that is operated without power. The diameter of capsules is 48 mm, therefore the RFID sensor can recognize tags in collectibles on the board certainly.

3. APPLICATIONS

We developed two applications on this entertainment system.

3.1 Narrative Capsule Toy

The first application consists of six characters and the system shows their stories by animation. Figure 4 shows four of them and a capsule. Each of them has their own background story and players can see the animation movies when they purchased a collectible. When a capsule is dispensed from the vending machine, the capsule is caught on the sensor board and it is recognized, then the corresponding movie is shown on the display.

Then when an additional collectible is put on the board, the
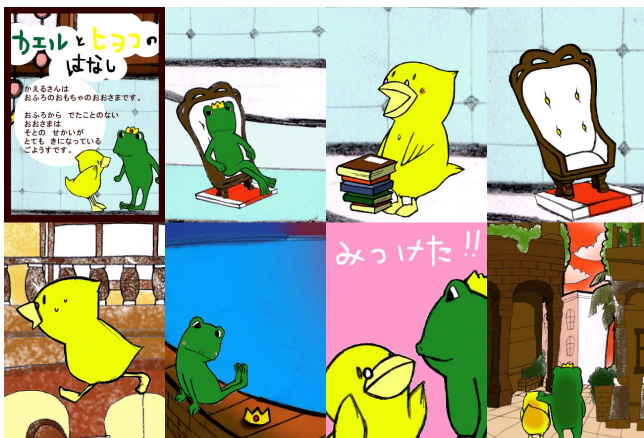
Figure 4: Figures and capsule

Figure 5: Screenshots of animation movie of Frog and Chick

sensor recognizes two characters, and the system shows a movie corresponding to the pair of the characters. Figure 5 shows some screenshots of the movie of "Frog" and "Chick". By introducing multiple RFID tags sensing, it enables to provide variations of story telling and the players have fun of discovering the stories.

Because all tags are different to each other, the system can recognize not only the type of collectibles, but also the number of them. Therefore, it is able to provide varied result according to the number of the collectibles. For example, when a "Duck" and a "Chick" are put on the board, the duck teaches how to fly to the chick, but it will not succeed (Figure 6, left). However, when more than three ducks are put with the chick simultaneously, the result will be changed (Figure 6, right).

3.2 Battle Game
Our second application implements a semi-realtime battle game (Figure 7). The basic architecture is same to the previous application, but this system allows the player to put or remove collectibles at anytime during a game. This application provides five characters (Figure **??**, 9) and each
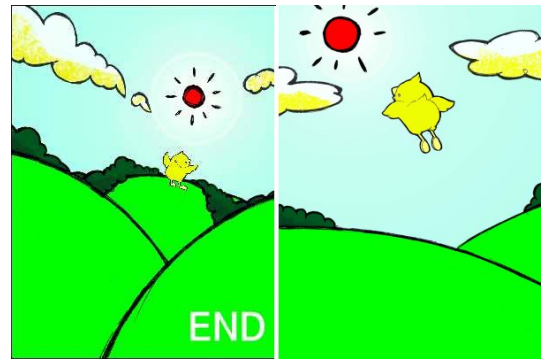

Figure 6: Variations of the result

character has different properties.

At the beginning of a game, an opponent character is displayed. The task of the game is to bring down the opponent character, but each character has different weakness and the player should to put appropriate characters in appropriate sequence. Currently the game rule of this application is quite simple, like "paper-rock-scissors". If the appropriate character is not put within seconds, the player lose the game.

The game rule would be able to complicated by allowing positional input, or parametric input that is introduced in the previous application. In addition, we plan to introduce multiplayer competitive game over the network. [1]

4. FUTURE WORK
Currently each collectible has a unique ID in a tag, but the data is static. But the RFID tag system we employed allows to rewrite the data from the sensor board, so that status of the character can be stored in the tag. This will expand the design possibility of the game, for example the character can grow after the games, like role playing games.

5. REFERENCES
[1] Animal Crossing: Wild World.
    http://www.animal-crossing.com/wildworld/.

[2] Sangokushi Taisen.
    http://www.sangokushi-taisen.com/.

[3] Second Life. http://secondlife.com/.

[4] Ultima Online. http://uo.com/.

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[1] This kind of game application is already released as computer-aided collectable card game, "Sangokushi-taisen"[2]. Each game cabinet has a flat sensor board and each player manipulates multiple cards on it. The type and positions of the cards are recognized. Two players battle against to each other over the network.

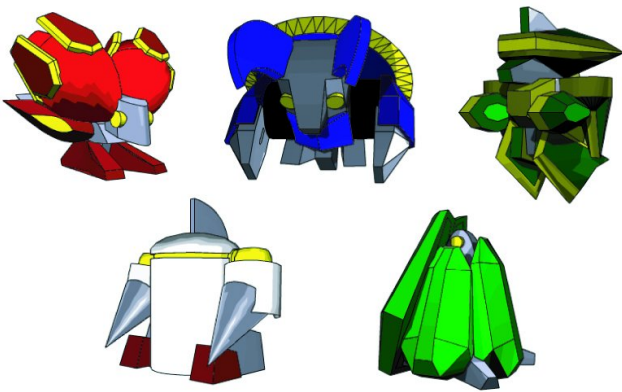**Figure 7: System overview of Battle game prototype**

Figure 8: Characters of Battle game prototype

Figure 9: Figures (mock-up)