Anywhere, Any-device Gaming

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ABSTRACT

This poster describes a multi-player networked Pong game that can be played in real-time on mobile devices and stationary PCs. Through this game we intend to explore the realm of the next generation of games which, we believe, will incorporate elements of mobility, multiple connectivity methods and playability on different types of devices. The system comprises the Sony-Ericsson P800 phone, a central game server, and personal computers. The client-server model has been used so that all interaction is done through the game server. The server can host multiple games at the same time. Each game has two players and a number of spectators who can view the game. The spectators can interact with each other using text messages. The Pong game is not the end to itself. This work is the core of an ongoing research project on multiple platform, multiple player mobile entertainment.

Categories and Subject Descriptors

H.4 [**Information Systems Applications**]: Miscellaneous; C.2.4 [**Distributed Systems**]: Distributed Applications; K.8.0 [**General**]: Games

Keywords

Mobile gaming, cross-device gaming, network gaming

1. INTRODUCTION

Video games have undergone a lot of change in their architecture. The early video games could be played only on stand-alone terminals. Most of these games were single player games. The games that were multi-player required the players to connect to the same terminal and sit close together. With the arrival of the internet age, multiplayer games evolved to the next level. Players could now sit far away, each connected to his own PC. Examples of such games are Quake2 [1], Unreal Tournament [2]. But the individual player still had to remain seated at a fixed place. The advent of powerful mobile devices has removed this restriction. One such example is the recently launched Nokia N-Gage [3]. These mobile devices are equipped with enough processing power enabling them to run even traditional PC based games. For example, Nokia's N-Gage supports the hugely popular PC game *Lara Croft Tomb Raider* [4].

However, cross-device games have recently been explored. By cross-device games we mean games that involve stationary (computers, game consoles, etc.) as well as mobile devices and allow real-time data exchange between them. Sony

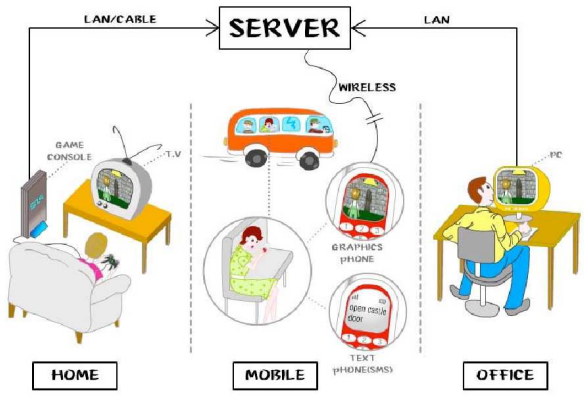

Figure 1: *Anywhere Gaming* system

Corporation released the PocketStation for its highly popular game console Sony Playstation [5] in 1999. PocketStation allows users to save their game data from the PlayStation and play the game on the portable PocketStation. These devices enable players to continue the same game on two different devices, and thus are a step forward towards anywhere gaming. However they are still not true anywhere gaming devices because they don't allow simultaneous play of a game among multiple players on different devices.

In this paper we describe a cross-device Pong game. This game is the first stage of work in our ongoing research on novel multi-platform, multi-device *Anywhere Gaming* system.

The rest of the paper is organised as follows: section 2 briefly describes the concept of the *Anywhere Gaming* system. Section 3 describes the Pong game we have implemented. Section 4 describes the architectural components of the Pong game system. Finally, we present conclusion and future work in section 5.

2. ANYWHERE GAMING SYSTEM

The user base of PC based online games is very large and the future potential of mobile gaming is huge. However at present, both these gaming worlds are relatively separate, and there is no seamless link from the PC based gaming environment to the wireless mobile environment.

We are developing a new system, *Anywhere Gaming*, which will enable players to access the broadband gaming environment on the internet even when they are moving. Players will be able to play the same game using multiple devices such as PCs, mobile phones, PDAs, and laptops. This will allow the player to access the game from anywhere at anytime.

A typical scenario is shown in figure 1. It shows three players playing a multi-player game using different devices. One of the players is connected through her game console. Another is playing the game on her mobile phone while travelling on the bus. The third player is using his PC to play the game. As can be seen from the figure, the most important component in this system is the server which has to support multiple connectivity methods for the same game being played simultaneously on multiple devices.

The server can also be used to support seamless migration from one device to another when playing an online game. For example, consider a player playing an online game such as *EverQuest II*[6]. At home she can play the game on her game console, connected to the internet. Then in the day time while on the move or sitting on a bus or train, she can continue to play the game seamlessly. In other words, there is no interruption no matter what device she is using. Later in the day, she may decide to continue playing using her PC. The *Anywhere Gaming* system will handle connections from all these diverse devices.

3. GAME DESCRIPTION

Our initial game is a modification of the famous Pong game. In the original Pong game, 2 players can play at a time. The aim of the game is to score goals by hitting a ball over the other end of the screen that is protected by the opponent. Each player uses a keyboard or joystick controlled bar to hit the ball. The game continues till someone first scores a certain number of goals.

Our modification allows the 2 players to play over a network (Bluetooth, Wireless LAN, or LAN). We refer to these 2 players as "pong players". Apart from the pong players, there are "spectators" who can view the game on their devices, which can be mobile or stationary. We will refer to these spectators as "pong spectators". Pong spectators interact with other pong spectators using text messages. These messages are also visible to the pong players. This promotes interaction between many persons simultaneously.

Figure 2 shows the screen view on the P800. The text message at the bottom of the screen is a comment from a spectator. Figure 3 shows a screen shot of Pong game on the PC. We have added features such as "angle shot","direct shot" and speed control. Angle shot allows players to hit the ball in a different direction. Based on laws of Physics, if the ball is moving in the same direction as the moving bar, the ball rebounds with a faster speed after collision. However due to constraints of playability, we have put an upper limit on the maximum speed of the ball.

The unique part about our modified Pong game is that it allows seamless integration of wireless and wired communication, and allows the game to be played on mobile as well

Figure 2: Screen view on the P800

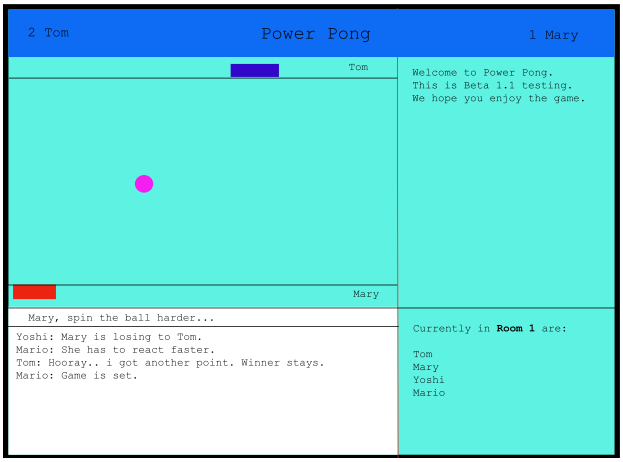

Figure 3: Screen shot of the game on the PC

Figure 4: System Architecture

as stationary devices.

4. SYSTEM DESCRIPTION

There are three main architectural components in the game

1. The central game server
2. The mobile device
3. The stationary device

Figure 4 describes the system architecture. We have used a client-server model for the game. As shown in figure 4 the clients can be either mobile devices, such as a mobile phone, or stationary PCs.

The central game server: The central game server is the crucial component of the system. It is responsible for keeping all the clients synchronized. All the data transfer between various clients takes place through this central server. To support connectivity with both wired and wireless devices, the central server is equipped with multiple connectivity technologies. The present version of the central server supports Bluetooth, LAN and Wireless LAN connections. Within the server, there are different processes running. One of them is the game engine, while others handle network connections. These processes communicate using standard Interprocess Communication (IPC) techniques.

*The mobile device:*For our system, we chose the Sony-Ericsson P800 phone as the mobile device. The P800 runs on Symbian OS version 7.0. It has Bluetooth capability and a stylus touch screen display. The P800 communicates with the central server using Bluetooth. To play the game, the player uses a stylus to tap on the screen.

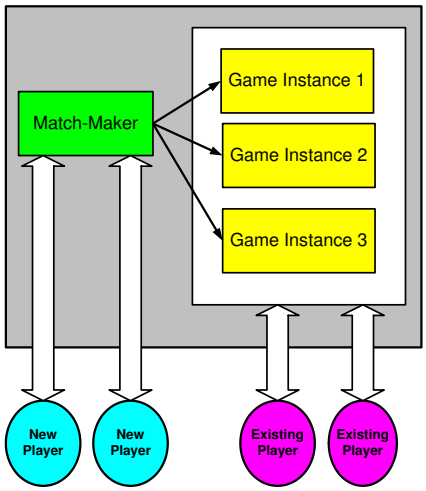

Figure 5: Game Server architecture

Stationary device: The stationary device is a PC running on Windows OS. It communicates with the server using the LAN. To play the game from a stationary device, the pong player can use the keyboard keys. Pong spectators can use the keyboard to type their messages.

4.1 Server Architecture

The *Anywhere Gaming* system is a server-driven system. The server can host multiple games and for each game it maintains the authoritative game state. Specifically, the server performs the following tasks:

- Provide match-making service so that new players can join as Pong players or as Pong spectators.
- Create new game instances.
- For each game instance, maintain game state and update all member players.

Figure 5 explains the architecture of the server. The *match-maker* handles connection from new players and presents them with a list of available games to join. Players can also initiate a new game if they desire. The *match-maker* maintains an upper-limit on the number of game instances that can be created on the server.

Figure 6 shows the how the *match-maker* handles new connections from various devices. The *match-maker* has two processes:

1. The *match-maker* core process that does the housekeeping work of maintaining the list of players and other related work. It creates new game instances once enough players have joined and are ready to play.
2. The communication process that listens for requests from Bluetooth-device players and LAN-device players.

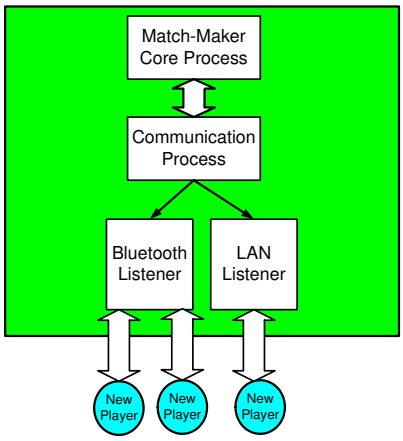

Figure 6: Processes within the *Match-Maker*

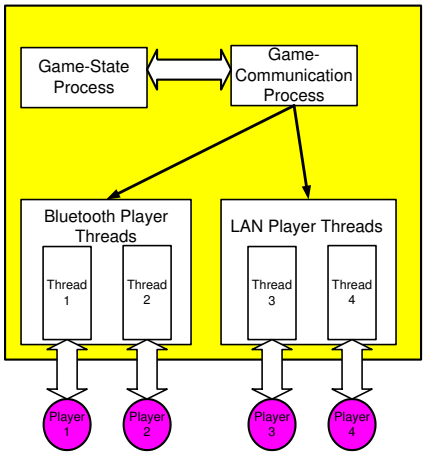

Figure 7: Processes within a game instance

Once two players have joined as Pong players, the *match-maker* creates a new game instance and the game begins. Each game has two Pong players and a number of Pong spectators. Pong spectators can join or leave anytime during the match. Figure 7 shows the processes within a game instance. Each game instance contains two processes - the *game-state* process, and the *game-communication* process. The *game-state* process is concerned with maintaining the state of the game, while the *game-communication* process is responsible for handling connections with various players. It creates a player thread for each player who is connected to the game. Events reported by various players are relayed to the *game-state* process. The *game-state* process then updates its state and instructs the *game-communication* process to update the other players.

5. CONCLUSION AND FUTURE WORK

The Pong game implemented in our project allows interaction of multiple mobile and stationary devices. We used Bluetooth connectivity for the mobile devices and LAN connection for the stationary devices. One drawback of using Bluetooth was that the mobile device users had a limited mobility of 10 meters from the game server. We will be using high speed 3G connections such as CDMA instead of Bluetooth in the near future. In this way, multimedia phone users would be able to play games even if they are far away from the game server. This work is a first step on our main research goal of "Anywhere Gaming".

6. REFERENCES

[1] www.quake2.com.

[2] www.unrealtournament.com.

[3] www.n-gage.com.

[4] www.tombraider.com.

[5] www.playstation.com.

[6] http://everquest2.station.sony.com.