

Pervasive Gaming with the Nintendo DS

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ABSTRACT

As part of on-going research in pervasive gaming, the Mobile Technology Group (MTG) at the Georgia Institute of Technology has recently begun employing the Nintendo DS as a pervasive gaming device. This paper outlines the rationale for this design choice, the technical approaches we have explored, and our first Nintendo DS pervasive game, PictoHunt.

Keywords

Georgia Institute of Technology, Mobile Technology Group, Pervasive Gaming, Nintendo DS, WiFi Triangulation

INTRODUCTION

It has been argued that the mobile phone is not a gaming console and that games designed to be played on or with a mobile phone should give close consideration to the device's unique affordances [1]. Above all, the mobile phone is a communications device with the most pervasive of its increasingly diverse functions being the ability to make voice calls, send text messages, and store contact information.

A significant percentage of pervasive games have adopted the mobile phone as their primarily computational component and have done so recognizing the device's communicative nature. Throughout the MTG's experience this choice has typically been made out of necessity and convenience rather than particular design aesthetic. The sheer number of individuals with access to mobile phones yields a sizeable potential player pool. Additionally, server-side solutions such as SMS parsers and IVR applications help bridge gaps in what is a proprietarily segmented, semi-open computing platform.

While recognizing the advantages of pervasive gaming with a mobile phone, the MTG has also recognized the disadvantages of this design choice. Furthermore we have become interested in designing pervasive games utilizing

devices specifically engineered for gaming purposes, namely the Nintendo DS.

THE CHALLENGES OF MOBILE PHONES

The MTG concerns itself equally with technical implementation and cultural implication. As such, the majority of our challenges involve bringing the former to the latter. Specifically with regards to mobile phones, we find ourselves divided between designing basic experiences that nearly all mobile phones can accommodate and creating more elaborate experiences that require high-end mobile phones and peripherals.

As mentioned, in designing these "basic" pervasive games we tend to rely upon server-side solutions such as SMS parsers and custom-made IVR applications. While we feel that it would be incorrect to consider these games lesser or inferior to their more process intensive brethren, the limited toolset does create a certain level of homogeneity across designs. Alternatively, developing elaborate experiences that require high-end mobile phones and peripherals presents a different set of challenges in bringing pervasive gaming into the realm of popular culture.

In facilitating these elaborate pervasive gaming experiences for the public, we have found that there is significant overhead in either supplying individuals with the required devices and technology or installing the required components on their mobile phones. This overhead includes concern over the sizeable cost of these devices, liability over loaning them out or allowing them to be augmented, and the time required to learn how to properly operate the device and play the game. The sum of these factors often leads to a disappointing gaming experience.

THE APPEAL OF THE NINTENDO DS

In considering the Nintendo DS as a pervasive gaming device, the condition that must first be discussed is that the DS is a closed, proprietary platform. This would be a major concern if our end goal were commercial deployment. However since our aims are research-based, this is not a major concern.

As a device, the Nintendo DS has a number of highly appealing affordances out of the box. Primarily, the DS has a much larger install base than most high-end mobile phones. As of Q4 2006, 35.61 million units had been sold

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worldwide with 10.18 million of those being sold in the United States [2]. The DS' retail cost of \$129.99 USD makes it far more affordable than typical high-end mobile phones, which generally cost between \$300.00 and \$600.00 USD. Practically speaking, a pervasive game utilizing the Nintendo DS is likely to be playable by far more people than a pervasive game requiring a high-end mobile phone.

The Nintendo DS is also a device specifically engineered for play and is inherently recognized as such. Pervasive games designed for the DS can take advantage of this by borrowing from the extensive and established representational vocabulary (graphics, control schemes, etc.) of the platform. Whereas high-end mobile phones typically employ varying representational vocabularies depending on the device's manufacturer and carrier. As a side-note on the DS' design, its rugged, armored casing furthers its appeal for pervasive gaming where devices may be jostled or dropped during the course of play.

A final point of consideration for the Nintendo DS is that it is a carrier-free device. With mobile phone-based pervasive games, administrators must be concerned with ensuring that players have devices and that those devices have carrier coverage. Furthermore if players are supplying their own devices, they may be wary of game play that would result in additional charges to their service statement. While this means the DS does not enjoy the same fundamental network connectivity as a mobile phone, we believe that this seeming deficiency can be overcome via the DS' WiFi capabilities.

DEVELOPING FOR THE NINTENDO DS

While development for the Nintendo DS isn't as straightforward or well documented as development for mobile phones, there is an active homebrew community [3]. The tutorials provided by the community cover the basic concepts needed to create a traditional Nintendo DS game.

During the course of our research, the MTG has identified three modes of functionality essential for pervasive game play on the Nintendo DS. Those functions are:

- 1) **Locative Functionality-** A Nintendo DS needs to have a sense of where it is whether specifically or relatively.
- 2) **Communicational Functionality-** A Nintendo DS needs to be able to communicate to with a central server and other player's Nintendo DS's.
- 3) **Presence Functionality-** A combination of the first two modes, a Nintendo DS should be aware of when it is in the presence of another Nintendo DS and be able to act accordingly.

While there are examples of commercial Nintendo DS games exhibiting each of these functions, they are not currently found in the typical homebrew developer's toolset. The MTG has begun to develop DS software libraries for each of these functions with emphasis placed on achieving results with off-the-shelf functionality. The

first design challenge we are addressing is locative functionality for the Nintendo DS.

NINTENDO DS LOCATIVE AWARENESS

While it is relatively simple to outfit a Nintendo DS with a GPS [4], such an action does not comply with our off-the-shelf design aspirations. Based on the DS' capabilities, WiFi triangulation seemed like the obvious solution for our locative needs.

The MTG DS WiFi Triangulation Library is based on Steven Stair's DSWIFI Library [5]. We have extended the original code to include location detection and mapping functionality. In the library's final version, the software will scan for WiFi sources in a given location, taking note of the source's relative strengths over time, and will automatically store that location in the library's cartography registry. Our current tests are primarily concerned with taking into account the frequent inconsistencies in an access point's signal strength.

PICTOHUNT

The first pervasive game demo we have developed for the Nintendo DS is PictoHunt, a photo-scamper hunt. In PictoHunt, players are encouraged to explore an area. When they arrive at a PictoHunt-mapped spot, they are shown a picture on the touch screen of their Nintendo DS. The picture shown on the display has been modified to add or remove what would be persistent features in the physical world. The player then has a limited amount of time to match the picture with its source in their physical location and identify the three to five modifications that have been made to the picture they have been shown. The activity is scored, and then repeated over as many locations as desired.

We believe that this style of game play is not only of interest to the pervasive gaming community, but also may be of use to tourism-related fields; particularly those invested in the concept of "Travel 2.0."

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