The Virtual Raft Project: A Mobile Interface for Interacting with Communities of Autonomous Characters

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ABSTRACT
This paper presents a novel and intuitive paradigm for interacting with autonomous animated characters. This paradigm utilizes a mobile device to allow people to transport characters among different virtual environments. The central metaphor in this paradigm is that virtual space is like land and real space is like water for virtual characters. The tangible interface described here serves as a virtual raft with which people may carry characters across a sea of real space from one virtual island to another. By increasing participants' physical engagement with the autonomous characters, this interaction paradigm contributes to the believability of those characters.

Author Keywords
Tangible interfaces, Intuitive interfaces, Mobile devices, Autonomous characters, Interactive animation

ACM Classification Keywords
H5.2. Information interfaces and presentation (e.g., HCI): User Interfaces; I.3.7 Three Dimensional Graphics and Realism: Animation

INTRODUCTION
The Virtual Raft Project is a multidisciplinary project that seeks to create communities of believable autonomous characters that inhabit heterogeneous networks of computational devices. The project's goal is to enable characters to break the plane of the traditional desktop screen. To this end, we have designed an interactive installation featuring a novel tangible paradigm for interacting with the characters. This paradigm involves the use of a mobile device, such as a Tablet PC or handheld computer, as a "virtual raft" by which a character may be transported among several virtual islands (see Fig. 1). By enabling the character on the raft to react in real time to the raft's motion in real space (see Fig. 2), this installation encourages participants to become physically engaged with virtual characters. We believe that this physical engagement can lead to an increase in the believability of the characters.

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Figure 1: When a mobile "virtual raft" is brought near a virtual island, a character may jump on or off it.

INTERACTION
In the interactive installation, each of three fixed computer screens displays a virtual environment inhabited by a small community of animated characters. These characters exhibit simple autonomous behavior such as gathering around a central campfire (see Fig. 3) or approaching people who come up to their screen. The three screens serve as islands –

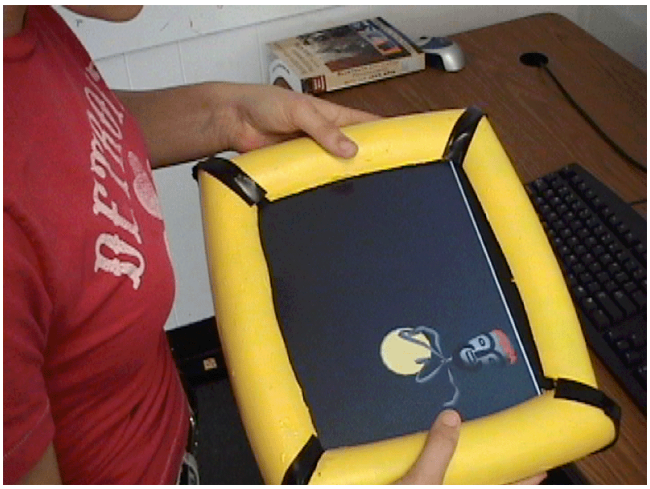

Figure 2: The raft may be used to carry the character to other islands. While on the raft, the character reacts to the physical motion of the device.

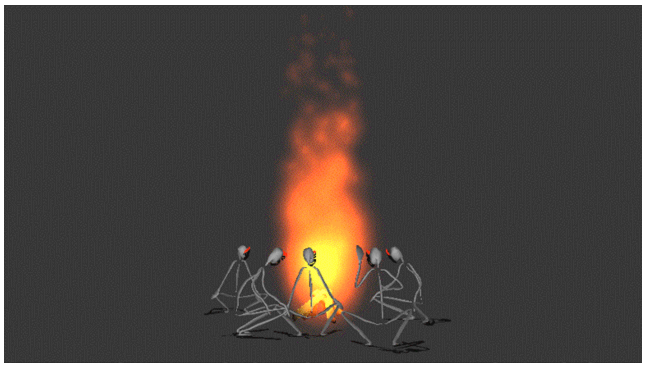

Figure 3: A community of autonomous characters gathers around a camp fire on one of the virtual islands.

the members of one community roam freely on their own screen. The islands are separated by a gulf of real space that is not traversable by synthetic agents without assistance. The primary interaction for human participants is to help the characters migrate among the three islands. People can do this by means of a virtual "raft" – a Tablet PC that can be moved in physical space by a human interactor. When this virtual raft is brought near one of the islands, a character may jump off the island onto the raft.

Once the character jumps on, it then needs to balance on the raft. The raft contains accelerometers that detect the motion of the raft in two axes. The participant may give the character a smooth ride by carrying the raft carefully, or may simulate stormy seas by tilting and swaying the raft. The smoothness of the ride on the raft affects the emotional state of the characters, which is expressed through the style of their animation. When the person brings the raft up to another island, the character may then jump off. Through this mechanism, the person may determine which characters should inhabit each of the different islands. Once a character has been transported to another island, it begins to interact with the other individuals on that island. Currently these interactions are very simple; a goal of the project to date has been to create an interactive platform through which researchers may explore autonomous agent communication and learning as individuals are introduced to and removed from different communities.

TECHNOLOGY

The technology in this installation builds on a variety of previous research projects. The core interface technology is a form of tangible interface [2], allowing a participant to physically transport a virtual character. The interface is also inspired by toys such as Tamagotchi [1], where virtual characters are embodied on handheld devices, and computer games such as Animal Crossing [4], where characters may be transported from one virtual environment to another on a non-interactive memory stick. The project described here is unique from these predecessors in that it uses 3D graphics, accelerometer data and high-speed networking to create believable characters on the mobile device itself.

The characters in this installation use simple machine vision to detect humans and the virtual raft when they approach their island. The characters' autonomous behavior is derived from the work of Bruce Blumberg's Synthetic Characters Group at the MIT Media Lab [3]. The system is written in Java and uses JOGL for the graphics [5].

INNOVATION AND RELEVANCE

A great deal of research has contributed to the creation of believable animated characters. Researchers have made characters look more believable with lifelike hair, skin, clothes etc., sound more believable through expressive speech synthesis, and act more believable through artificial intelligence and autonomous agent techniques. The goal of the project described here is to create an interface to autonomous characters that will contribute to their believability as well. By allowing the character to jump instantaneously from desktop to mobile device and to animate similarly on both sides of the jump, the system maintains the illusion of believability across these heterogeneous devices.

As computer programs become more autonomous, it may be relevant to consider metaphors that are more suited to interactive autonomous systems than the desktop metaphor. This project lays the groundwork for a novel "Island Metaphor" that frames the relationship between people and autonomous computational systems, and between real and virtual space. While it is unlikely that this metaphor will supplant the traditional computer desktop, it is possible that the Island Metaphor could serve as a useful way to think about future computational systems and potentially extend the capabilities of computational technologies.

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REFERENCES

1. Bandai, "Tamagotchi." Japan, 1996.
2. H. Ishii and B. Ullmer, "Tangible bits: towards seamless interfaces between people, bits and atoms," in *Proceedings of the SIGCHI conference on Human factors in computing systems*: ACM Press, 1997, pp. 234--241.
3. D. Isla, R. Burke, M. Downie, and B. Blumberg, "A Layered Brain Architecture for Synthetic Creatures," Proceedings of the International Joint Conferences on Artificial Intelligence (IJCAI), Seattle, WA, USA, 2001.
4. Nintendo, "Animal Crossing." Japan, 2002.
5. D. Twilleager, J. Kesselman, A. Goldberg, D. Petersen, J. C. Soto, and C. Melissinos, "Java technologies for games," *Comput. Entertain.*, vol. 2, pp. 18--18, 2004.