Don’t Touch Me: multi-user annotations on a map in large display environments

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ABSTRACT
Touchless interaction techniques do not require physical contact while interacting with a system so to allow natural interaction with digital information, made tangible in the physical world through pervasive screen displays. In this project we explore the use of Nintendo Wii Remote controller as a touchless interface for interacting with map based applications in large displays environments. A prototype (Don´t Touch Me) was developed that allows users to collaborative place multimodal annotations on a map: pictorials, auditives and haptics.

Categories and Subject Descriptors
H.5.2 [**User Interfaces**]: *Input devices and strategies*

General Terms
Design, Human Factors.

Keywords
Human-Display Interaction, CSCW, Touchless Interaction, Georeferenced Information.

1. BACKGROUND
Touchless interaction techniques [1], by allowing user to employ hand gestures, remove the burden related to physical contact and promote natural interaction with digital information made tangible through large display surfaces. Touchless interaction can also be multimodal: in this case the interaction events embrace different human senses (visual, auditory and olfactory).

Several research efforts have been recently focused in enabling more intuitive human-display motion-based interactions (i.e. detection of natural body movement). Most of the emergent devices come from the entertainment industry, such as: Nintendo’s Wii Remote Controller, Microsoft’s Project Natal and Sony PlayStation3 Motion Sensing Controller. Besides providing a more intuitive game playing [2] (not only based on button pushing), these devices also stimulate the development of touchless interfaces that go beyond interaction styles using WIMP (Windows, Icons, Mouse and Pointers) elements (Figure 1).

The Nintendo’s Wiimote can be considered as one of the most popular devices, due to the widespread of the console. It also turns out to be one of the most sophisticated, for providing a variety of multimodal I/O functionalities. Due to its interaction capabilities and its very low cost, the Wiimote has gained significant attention within the homebrew software developer and Do-It-Yourself (DIY) communities, boosting the creation of several project involving multimodal remote interaction techniques.

In order to explore the feasibility of the Nintendo’s Wiimote for the rapid prototyping of touchless-enabled interfaces [3] we developed Don’t Touch Me, a system providing the users with the possibility to collaborative generate and place multimodal annotation on a digital map.

Figure 1. The Nintendo’s Wii Remote Controller can be exploited as a remote post-WIMP interface device.

2. TECHNOLOGY
We developed our prototype system on the top of Google Maps APIs for cartographic support. We exploited the Nintendo Wiimote as a primary interaction device and GlovePIE[1] as software library to manage the Wiimote.

2.1 Nintendo’s Wiimote
The Wiimote is a wireless device that employs the standard Bluetooth HID (Human Interface Device) protocol to communicate. It is mostly advertised for its motion sensing capabilities: users can interact with a computer system via gesture recognition or pointing by exploiting the built-in accelerometer

[1] http://carl.kenner.googlepages.com/glovepie

and the InfraRed camera tracker. Considering the output capabilities, the controller provides three possible interaction modalities: *a)* tactile, via a vibration motor; *b)* audio, via a small speaker and; *c)* visual, via four blue LEDs.

2.2 GlovePIE

GlovePIE is a software application developed by Carl Kenner, intended to emulate computer input hardware. The library also offers support to the Wiimote controller. Exploiting a simple scripting language it is possible to use the Wiimote to interact with different applications, by mapping Wiimote inputs to Mouse or Keyboard events and taking advantage of a wide library of existing script.

3. DON'T TOUCH ME

Our prototype has been designed to be integrated in C4ISR systems to improve user's interaction. C4ISR are the military functions designated by C^4 (command, control, communications and computers), I (military intelligence) and SR (surveillance and reconnaissance) in order to enable the coordination of operations. It explicitly addresses the needs of operators of a Command and Control center, who have to examine digital maps on large pervasive displays, manage georeferenced information and collaboratively develop plans and procedures. The Wiimote, by means of its accelerometer and IR tracker, makes it possible to navigate the map via simple hand gestures. Other interactions take place following a point-and-click style, by using Wiimote buttons.

Don't Touch Me is collaborative in the sense that it supports more than one user (equipped with her own Wiimote) interacting simultaneously. Referring to the space/time matrix for CSCW systems [4], available interaction modalities are: a) *same time/same place* (a group of operators interacting in the same room on the display surface), b) *same time/different place* (as the system is a web application users can also interact remotely).

It is also possible to identify different roles so to enable/disable users to perform specific actions. In this prototype, we provided two default basic roles: the *editor* and the *viewer*.

The *editor* can generate multimedia annotations. He can select geospatial regions by drawing geometrical shapes and assign a color code to each area: red meaning emergency, yellow for alarm and green for a normal situation (Figure 2).

Figure 2. Users can draw geometrical shapes for defining sensible geographical areas on the map.

It is possible to associate interactive events to these sensible areas, by exploiting Wiimote vibratory motor (haptic feedback) and Wiimote speakers (audio feedback). Editors can also record voice annotations (by means of an external audio capturing source, i.e. microphone) for other users to listen for (through headsets or external speakers).

We employed a pop-up pie menu [5] for displaying interactive choices depending on the context (Figure 3). Pie menus (circular contextual menus) are proven to supply a smooth, reliable gestural style interface for users as the circular menu slices are large in size and near the pointer for fast interaction.

The *viewer* can only navigate the map and interact with sensible areas (by selecting or simply passing over them with the pointer) for receiving feedbacks. For example an *editor* can associate a vibratory feedback to a red sensible area, causing the Wiimote of a *viewer* to rumble when passing over such area.

Figure 3. An example of pie menu in our system.

4. ACKNOWLEDGMENTS

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5. REFERENCES

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