An accessibility framework based on WiiMote

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Abstract: - Many professionals have seen in WiiMote a new tool to facilitate the accessibility of applications to people with different physical limitations. In this way, for instance, we can observe how children with some type of paralysis, are now capable of interacting with an application using the movements of the WiiMote, when previously they could not.

The issue we have is that not all people have the same mobility problems; some of them are only be able to use it to hit, others can only shake it and others may only be able to rotate it or move it vertically or horizontally. Because of this, applications configured to act according to certain movements of the WiiMote only serve to those who may perform these movements.

To fix this, the idea is to build an accessibility framework based on WiiMote, which allows a configuration depending on the user that uses it, therefore linking the actions of the application with buttons or movements of the WiiMote. In this way, each user can associate each event with a movement of WiiMote. For example, to confirm certain actions in an application, a user could press a WiiMote button, while another user could move it in any direction. Due to this, different users can use the application, regardless of the limitations that they have.

Key-Words: - Accessibility, Disability, Nintendo Wii Remote, Students, Framework, Usability

1 Introduction

The Center for Special Education, are schools that respond to the needs of students with a certain type and degree of disability. In Oviedo (Spain) there is a Special Education Center, which is devoted exclusively to students with mobility disabilities.

This center takes in students with any degree of disability locomotive. It has students who can only move their lips or move their heads, others can move one hand with spasm, there are students who can move their hands very well, but others are only able to do a move in a certain sense or direction.

The experience of the teachers of the center allowed them to realize that when computer tools are used to provide teaching, her students are more participatory, more open and more likely to interact.

At such centers, it is more important to get the participation and interaction of the learner, that teaching the traditional materials. Therefore the teachers are betting the use of IT applications in their classrooms.

The problem encountered is that, due to the diversity and degree of limitations that have their students, not all are able to use the same application. This leads to the marginalization and isolation of those students who cannot use the application.

2 Problem Formulation

Students of such schools are not capable of doing anything by themselves, needing constant attention from the teacher.

This implies that there is one teacher per student, which is responsible for informatics applications, the student being a spectator of the classes because he do not interact with them.

The problem we have with these is that not all students are able to interact effectively and independently with the software center. This is due to poor accessibility of these applications.

3 Problem Solution

The goals of our system are:

- Undertake the implementation of an accessibility framework to enable all students of the center to use the same software.

- Ensure that any development of software that uses this framework is sufficiently accessible to be used by all students at this center.

- The development of this system should not carry a high economic cost of implementation and hardware.

3.1 Similar systems

Let's see now the similar systems.
3.1.1 Evaluating the potential of the Nintendo Wii to support disabled students in education [1] [6]
This project aimed at identifying the potential of the new generation of games consoles to support learners with disabilities.

The project builds on existing research that demonstrates that video games can be used successfully in an educational context to develop skills and as a motivational tool.

The difference of this system to ours, is that it focuses on identifying the types of games and elements within them to help, students with disabilities, to overcome the game. While our system aims to ensure that, any software that use it, is accessible to all students.

3.1.2 Use of a Low-Cost, Commercially Available Gaming Console (Wii) for Rehabilitation of an Adolescent With Cerebral Palsy [2]
This article shows, the results of research carried out for to get a low cost system that can be used for rehabilitation of people with cerebral palsy.

This research has been conducted in an adolescent patient with cerebral palsy, and the conclusions that have obtained is that there have achieved positive results in the impairment and functional levels.

3.1.3 Wiimote DesktopVR [5]
Johnny Chung Lee has created a library in C# that enables the control of the Wii, the Wiimote, interact with the applications of computer.

In this way, the library allows us to detect the movements, and the degree of inclination, that we do with the Wiimote, so that depending on the event detected we can specify to the application what to do.

This project get, using an LED array and some reflective tape, and using the infrared camera in the Wii remote to track objects, like your fingers. This lets you interact with your computer simply by waving your hands in the air.

3.1.4 A low-cost multimodal device for web accessibility [7]
This article is based on the idea that web browsing, using devices such as keyboard or mouse, are not accessible to all people.

Therefore, have done a research paper, using non-disabled and disabled users and people with Parkinson's. The conclusions obtained from their work are: a versatile device as the Wiimote is a good low cost solution for all scenarios, because it is accessible for disabled people.

To demonstrate this, have developed several utilities for the Wiimote, such as the "pivot table", which the authors: "It consists of two parallel flat surfaces connected by a bar that allows the upper to swing. If move this in one direction or another, make us the cursor move. The table ignores the involuntary movements, of Parkinson's for example, because you need to apply a constant force. You can move your hands, feet, or by supporting the body".

3.2 Proposed system
The research that described above, we do note: that Wiimote is a low cost, which facilitates accessibility for disabled people, that adolescents are more likely to use such tools, and is capable of interacting with computers.

The proposed developments in the investigations views, in some cases focus on a specific software (eg games), and in other cases some kind of disability.
We have built and tested a framework, which added to an application software, make this accessible for disabled students in the center of Oviedo. This framework will enable us to set each of the actions of the WiiMote, and decide how to act when the application detects this event (Figure 3).

4 Conclusion

The developed framework allows applications that use it are accessible for students in the Special Education Center of Oviedo. In this way we get a uniform learning for most students. This prevents students feel marginalized, by not being able to use an application that their school friends can use.

As future work we are working on: incorporate the framework in complex applications, to detect new needs; and assess the use of alternatives such as Processing library, so that they can extend the accessibility to people who can only move their lips or eyelids.

References: