Tangible Multimodal Interaction on a First Person Shooter Game

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Abstract — This paper presents a computer game, in which players (adults and children) can interact with the game's avatar through different input devices in a 2D first person shooter. Computer games are interesting applications for multimodal dialogue system. Multimodal interaction has the potential to enrich the user's experience with the development of future games that make use of it.

***Index Terms* — Computer game, multimodal interaction, input device, first person shooter, aiming.**

I. Introduction

Computer games since its conception has been one of the most innovative and challenging software developments; which try to be as attractive as possible to improve the user experience.

The entertainment systems have evolved to accomplish this task, from big hits to tragic errors, which clearly has introduced new interactions paradigms in the user interface, which is the way on how the humans interact with computers [1]. We can say that the future of game and entertainment systems development is closely related to the human-computer interaction. [2], where the winner will be who offers a better user experience.

Currently the video game market wants to broaden its player's spectrum, coming to those who lack experience on this kind of entertainment, its expansion strategy has been to improve user interaction.

Video games have a wide range of interaction devices to be used by the user, but much work remains to be done. Two perfect examples are the Nintendo Wii and the Microsoft Kinect, both offer natural interaction to the gamer.

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II. Background

We envision the application of the concept of calm technology into computer gaming as described by Weiser [3] by experimenting with the interaction paradigm called tangible interfaces.

Details about them are discussed in the following section.

III. Tangible interfaces

Even though Graphical User Interface (GUI) is still the dominant paradigm for interactions with computers, we are increasingly encountering computer techniques that move beyond the traditional confines of the desk and attempt to incorporate it more richly into our daily experience of the physical and social world. Work on physical interaction started with the introduction of Computer-Augmented Environments that have envisioned the merging of electronic systems into the physical world. [4].

Over the years, a number of projects have explored this new paradigm of interaction called tangible computing. Early attempts include Bishop's Marble Answering Machine [5], "Brick" by Fitzmaurice [6], "Tangible Bits" and "mediaBlocks" from MIT media lab [7].

Multimodal systems process combined natural input modes — such as speech, pen, touch, hand gestures, eye gaze, and head and body movements— in a coordinated manner with multimedia system output. These systems represent a new direction for computing that draws from novel input and output technologies currently becoming available [8].

Indeed, tangible multimodal systems enable users to employ physical objects already in their workplace (for example, pens or other physical tools), along with natural sketch, gesture, and other input modalities to interact with information and with co-users.

This research work presents the design experience of build a computer game with tangible multimodal user interactions,

in order to allow the user to choice the controller mode according to their preferences and game complexity.

IV. THE GAME

Our work is a 2D game (as seen on Fig. 1) played from the first person perspective. The characteristics and goals of the game are simple, the user has to go through different scenarios in which you have to eliminate every enemy that appears in a limited time, giving you a score that will be accumulated over the scenarios. In this way the user get into the final stage, which faces the game's boss, which will have to defeat, once-beaten the boss, the user has reached the end of the game and discover the end of the story.

The focus of this work is the user interaction, so three different techniques were used for interaction between the user and the game.

Fig. 1. The game.

V. SYSTEM ARCHITECTURE

The main objective of this study was to enable seamless interaction between players and the avatar of the game. To achieve this, as illustrated in Fig 2 we integrated three different types of tangible multimodal interactions: Pen recognition, vision recognition and gesture recognition.

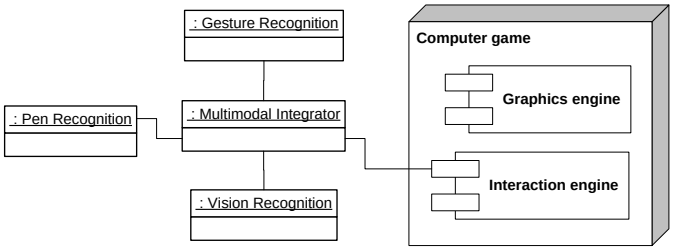

Fig. 2. Architecture of the game.

A. Graphics engine

The Microsoft XNA framework was used in order to make easier the graphics rendering, physics implementation, collision detection and all the core functionality typically used on computer games.

B. Interaction engine

The interaction engine is responsible for starting the recognition engines and for reconstructing the Multimodal Integrator (collection of finite state machines).

C. Multimodal integrator

The multimodal integrator receives the input signals from the input devices and builds a multimodal meaning for the game. Also, holds a reference to the current state of each finite state machine.

D. Pen recognition

Our game use the DUO digital pen [9] as pen input recognition, which offers the possibility of combining the use of an ordinary pen with the function of a mouse. In this way, it is possible to have the functions like a tablet without having to buy one and is simple and elegant.

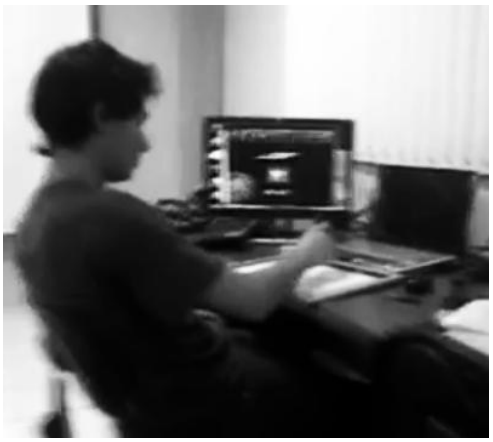

Fig. 3. Interaction with pen recognition.

Given these characteristics, the game takes advantage of them to move the cursor with the pen and use the pen tap to shoot the enemy (see Fig. 3).

E. Gesture recognition

We recreate the gesture recognition through an opensource system of shadow's detection technology [10]. The system

works with a webcam and an opaque surface that let light filters.

The user can interact with the game moving her hand through the opaque surface and shoot with the up and down of her finger, the user develops a new experience, this time with a surface that interacts on an haptic way to the person, enhancing the player's experience. (see Fig. 4).

Fig. 4. Player interacting with the gesture recognition.

F. Vision recognition

The vision interaction was achieved through the CamSpace system [11].

With the help of this technology we used two tapes wrapped in the fingers, each a different color, with the aim of facilitate the system detection of such objects, one tape for the index finger and one for the thumb, the movement of these fingers represents the game's cursor movement and the contact between them represents a shoot bye the player (see Fig. 5).

Fig. 5. Vision recognition interaction.

VI. EVALUATION ISSUES

"Task-oriented systems are usually evaluated in terms of objective and subjective features. Objective criteria include the technical robustness and core functionality of the system components as well as system performance measures such as task completion rate. Subjective usability evaluations estimate features like naturalness and quality of the interactions, as well as user satisfaction reported in post-experimental interviews. However, many of these measures are simply not relevant for entertainment-type applications, where user satisfaction increases rather than decreases with task completion time. It can even be difficult to define what the completion of the task would be" [12]. In practice, computer games are usually evaluated by professional game reviewers and by the users in terms of number of copies sold.

In the evaluation of this work game sales will not be possible to use. Instead, subjective measures will be used. They will be obtained off-line, by interviewing the users after their interactions and asking them to fill out questionnaires. Users will be asked how they perceived the quality of the multimodal interaction.

VII. CONCLUSSION

We develop a computer game and several interaction devices to control this game on a tangible multimodal way. This allows the players to control the video game's avatar through different kind of interaction devices and techniques, allowing them to play with the interaction device with which they interact more naturally.

VIII. ACKNOWLEDGMENT

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X. BIOGRAPHY

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