Low Cost Equipment for First Person Augmented Reality Systems

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Abstract

This paper proposes a low cost augmented reality system to be used on developments where the applications are intended to be in first person view. Is shown the hardware combination and an evaluation on Linux and Windows environments.

1   Introduction

AR (Augmented Reality) is the registration of a virtual content with the user's physical world. Most works in the AR field are relied on systems using third person vision provided generally by webcams, so users are not stimulated to walk or move otherwise than manipulate the desired AR application[6] [1] [5].

This paper presents a design that was developed to be a wearable AR setup.

2   Hardware Setup

This prototype has a Standard USB2.0 Webcam, a 3D webcam from Minoru[1], a Nintendo Wiimote, a Vuzix Wrap 310XL[2] as a HMD(Head Mounted Display) and a Processing Unit: Asus EeePC 1201n [3].

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[1] http://www.minoru3d.com/

[2] http://www.vuzix.com/home/index.html

[3] http://usa.asus.com/product.aspx?P_ID=sZ0sI6WqjnCHGFta

2.1   Building Process

Many projects use a safety helmet to assembly the equipment. On this work was used two head lupes, one to fix the cameras and other to fix the Wiimote.

A vest was adapted to hold the netbook and to fix the cabling. On Figure 1a is a picture of the full mounted equipments, and on the Figure 1b is shown a picture of how the equipment is mounted on an user head.

Figure 1. (a) Full mounted equipments. (b) The equipment mounted on user's head

3   Analysis

On Windows was tested the usability of the Wiimote as whiteboard and head tracker[4], PTAMM(Parallel Tracking and Multiple

Mapping)[2] and ARToolKit[3]. The 3D application of the Minoru Webcam only works on Windows, the 3D illusion is successfully achieved with the Vuzix Wrap 310. All applications also run on Linux, and as PTAMM is coded to Linux, it runs much better. The 3D webcam didn't work on Linux as it has no 3D driver available.

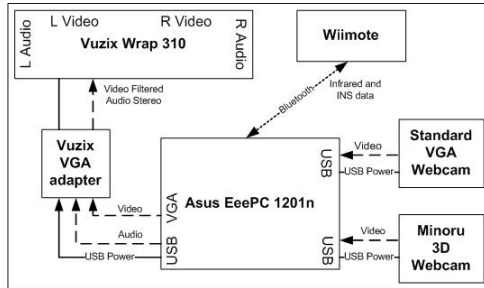On Figure 2 is possible to see an electrical and logical connection of the equipment.

Figure 2. Electrical and logical connections.

Figure 3 shows a graphic with several setups to observe what setup uses more battery. Can be observed that independent of the operational system, each load on USB drives down the usage time, and can also be seen that ARToolKit applications requires more processing that the PTAMM, using more battery to speed-up the processor.

4 Conclusion

This work defined a first person hardware prototype with three input devices: two cameras (Standard VGA and Minoru 3D) and the Wiimote infrared camera, a processing unit and a HMD output device, where the cost price isn't over a thousand dollars, and it still is capable of handle the actual AR applications, using both artificial and natural markers methods to map the physical world. It was also shown an interation possibility using the Wiimote at the Whiteboard application to control de interface and the virtual content.

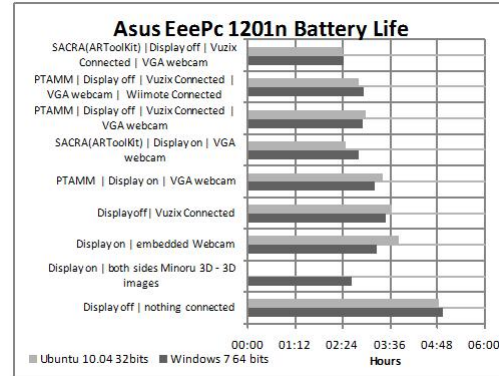With this and other related works it's possible to see an advance in wearable AR systems, if this

Figure 3. Battery life test with some setups.

trend continues, we can hopefully predict the coming of more embedded and powerful technology that will drive the applications to a more intuitive and natural combination of the user, digital content and physical world.

References

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