VR3dFPS: A Fisrt Person Shooter VR System with Joystick and Google Card Board Integration

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Abstract: The Virtual Reality (VR) applications are in growth in recent years in many areas of the knowledge, one of these areas is game experience. This paper presents a First-Person Shooter game in VR Technology using low-cost hardware and integrating VR oculus and traditional joystick, to input data to the game. Results shows that the system offer a good experience in terms of playability, immersion, input interface and being free (very low) of discomfort to the user.

1. Introduction

The Virtual Reality (VR) applications are in growth in recent years in many areas of the knowledge, which can give more immersion and interactivity to game players. Within a VR system, the player can see objects with more freedom of viewpoint and can interact using a more natural control movement, as is the control of the angle of vision by the movement of the neck. The mode of interaction and which player experiment the VR in game is totally different of the traditional ways like joystick, keyboard, mouse or camera [1].

VR junction to Digital Games (DG) is a way to improve the entertainment of the player by adding sense of presence inside the game and resulting in a more realistic experience of interaction, is like the player not only watch the game and respond to actions inserting commands, but really participate of the game by choosing the viewpoint and seeing the virtual world in 360 degrees of freedom as a real world simulation [2].

It can be a positive strategy to try player enjoy the game, but by other side some players can be afraid to playing with a totally different mode to input the actions inside the game, because the traditional methods of input have been used by many years like standards of game control interface [3].

According to [4] there are two types of VR Systems to interaction, the high cost hardware/software VR systems and the low cost VR systems. The work [5] is a good example of high cost VR First-Person Shooter (FPS) game.

In this work we have done a study of a low-cost VR FPS game using Google Card Board-like oculus, called VR Box, it is a low-cost VR oculus. We have also used a low-cost bluetooth joystick as input hardware to control character of the game doing he walk and fire.

The objective of this paper is to investigate if the integration of a VR oculus and a Joystick can be a good strategy of input data inside the game, and if that will influence in the immersion, playability and the discomfort to the player experience in VR game.

The paper follow organized this way: the next section is about materials used in the work, the third section is about the methodology applied to do the experimentations, the four section presents the results of the paper and the last one shows the conclusions and future works for this paper.

2. Materials

We have developed a VR FPS game using Unity engine (https://unity3d.com) and generating the APK file for Android OS, after that we have installed the App on Android to do the experiment using the VR Box and a joystick. The usage of the system and the hardware equipment choose for this work can be seen in Figure 1.
The hardware equipment used in this work attends to premise of being a low-cost material that can be utilized in VR systems and digital games.
The FPS game style was choose because is a classical type of 3D game and contains the mechanical system of show the scene in 360 degrees of freedom in a digital world. Beyond that, it is a very popular game style since 90 decade until now.

Fig. 1. Illustration of hardware used and the game screenshot. In a the VR Box oculus, in b the joysctick Ípega PG-9021, in c a volunteer is using the system and in d we can see a screenshot of the game.

In Figure 1, we can see at part a the oculus used on work, at part b the joystick, at part c the experimentation of the system by a volunteer and the part d is a screenshot of the FPS game.

The VR Box oculus has following details: price is $60.00, field of view is 70°, weight is 380g, has stereoscopic 3D capable and lens diameter is 42mm.

The Joystick Ípega has the following details: model is PG-9021, bluetooth is version 3.0, OS support is Android, transmission distance is 6 meters and quantity of the buttons is 19.

3. Methodology

We have done an experiment with 19 volunteers to collect data about the system evaluation, and thus make a qualitative evaluation about the system.

First of the all, each volunteer have an experience with the game, playing and trying to shoot objects and enemies inside the game, after that phase each volunteer have answered a form with 7 questions about the gaming experience.

Only 4 volunteers were female and 15 male, they range to 19 to 32 years old. Like in the work [6] we have applied 5-scale questions.

The questions were the following showed in Table 1.

Table. 2. Questions about the user experience inside the game.

Q1	Did you like your experience with the system / game?
Q2	Did you have difficulty learning to use the system / game?
Q3	Did you enjoy using the joystick with the VR glasses to interact in the game?
Q4	Did you judge the game control system interesting?
Q5	Did you experience visual discomfort when using the system / game?
Q6	Did you have discomfort when using your hands and neck to interact with the system / game?
Q7	Did you judge the system / game immersive?

So we have analyzed the answers of the volunteers to understand their opinion about the input system of the game, immersion, playability and the possible discomfort in the experience.

4. Results

The majority of the volunteers have said that have like of the game in general, in numbers 60% liked very much, 20% totally and 20% reasonably. About the difficult of learning play the game, 84% have no difficulty, 10% have low difficulty and 6% very much difficult. On characteristic of enjoy the usage joystick and VR oculus combination, 47% said totally, 42% very much, 5% reasonably and 6% few/low. About the control system being interesting, 52% said very much, 32% totally, 10% reasonably and 6% answered few. About possible discomfort caused by hand and neck movement to play, the volunteers have said, 74% not at all, 11% said reasonably, 5% answered very much and 10% said totally. About the felling immersed in the game, 32% answered reasonably, 26% said very much, 26% said totally, 10% have responded not at all and 5% said few.
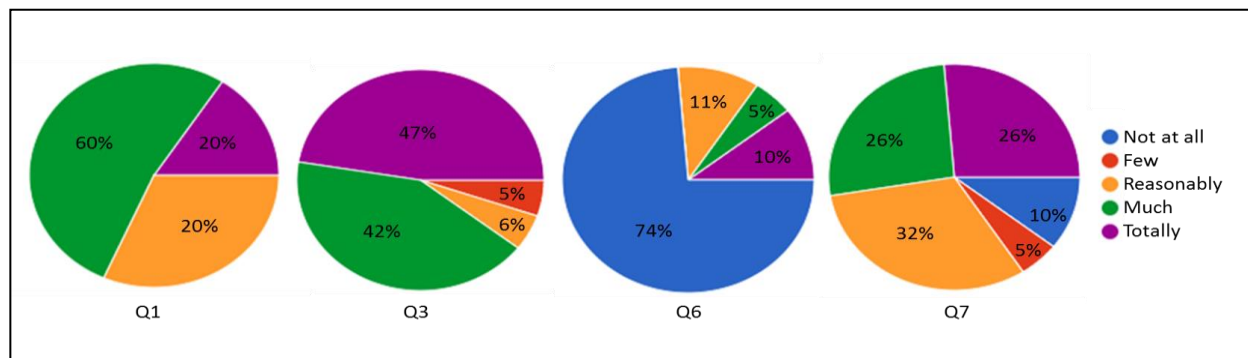
Fig. 2. Illustration of hardware used and the game screenshot. In a the VR Box oculus, in b the joysctick Ípega PG-9021, in c a volunteer is using the system and in d we can see a screenshot of the game.

The graphics in Figure 2, are about the questions showed in Table 1: Q1 (general playability), Q3 (joystick and VR integration), Q6 (possible discomfort over hand and neck) and Q7 (felling immersed), showed in section 3. These are the 4 main characteristics analyzed about the VR FPS game system of this work.

5. Conclusions and future works

The conclusions of this paper are the volunteers judge the system offer a good playability in general, about the integration of the joystick and VR Box to input data to the game The opinion of the volunteers points to a good experience of gamming in VR, on terms of possible discomfort caused by hands and neck movements to control the character. The opinion shows that majority of the volunteers judge like there is no discomfort in this components and finally, the immersion perceived in the game shows a good result, because the most of the volunteers said felling totally, much or reasonably in this characteristic.

As future work we plan to expand the game and improve the graphical components (art 2D and 3D), it would to be good to improve the Artificial Intelligence of the enemies.

An interesting changing is to use a joypad gun instead a traditional joystick one, because the game style is a FPS and it could be more appropriate.

We want to add some other experiments, maybe more objective ones like frame rate tests and a comparative of different field of view angle between two distinct VR oculus.

Another features to add is sound and music in the game, preferably 3D sound and music with stereo sources.

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