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Underwater Augmented Reality Game using the DOLPHYN

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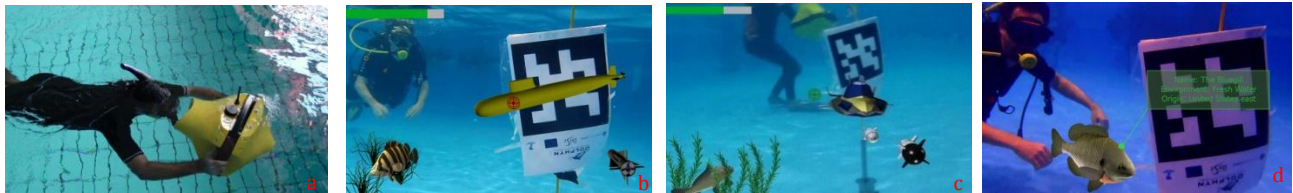


Figure 1. a: The Dolphyn device, b,c and d: the AR game

1. INTRODUCTION

The introduction of virtual and mixed realities in aquatic leisure activities constitutes a technological rupture when compared with the status of related technologies. With the extension of Internet to underwater applications, the innovative character of the project becomes evident, and the impact of this development in the littoral and beach tourism may be considerable. In fact, there are recent developments to extend the use of computers and computer components, such as the mouse, to underwater uses [1]. The Dolphyn is an underwater-computerized display system with various sensors and devices conceived for existing swimming pools and for beach shores, associating computer functions, video gaming and multisensory simulations [2].

2. DOLPHYN DESCRIPTION

The DOLPHYN (Figure 1.a) is using an x86 tablet running Windows 7, this device is dedicated to the underwater world with various sensors and devices: user interface device, web camera, GPS, thermometer and flow-meter that measure the displacement of the swimmer in the water. In addition, the Dolphyn has a wireless antenna for extended multiplayer game play and therefore multi-Dolphyns. Our device does not interfere with the diver.

Two internal modules compose the Dolphyn:

- Waterproof case which contains the tablet;
- Waterproof electronic case that is used to manage all connected devices.

3. AR SERIOUS GAME DESCRIPTION

The game idea is to explore the ocean and to discover its different species through surviving, performing tasks and collaboration. The main objective of the game is educational. It allows the divers to know the different underwater creatures, and how to preserve their environment. Thus, augmented reality techniques can be used to develop this game. By this way, we have placed ArtoolkitPlus markers [3] in the diving site. The recognition of the markers enables the Dolphyn's user (diver) to view virtual fishes, virtual marine-plants and virtual submarines.

In our case study, two scenarios of game are established:

The first one consists in protecting fishes and plants by eliminating submarines that kill the fishes and cut the plants, by pulling with virtual missiles using the Dolphyn's joysticks. The player moves underwater and handles a Dolphyn device. He can see, through the Dolphyn, fishes, plants and submarines in augmentation form (Figure 1.b and 1.c). Particularly, the augmented fishes move in various directions and speeds. The player is subjected to some constraints. First, he should not shoot the fishes neither the plants. Also, the number of missiles to shoot is limited. So, the player should be more accurate as possible when he aims the submarines.

The second scenario is educational (Figure 1.d). The user may see a variety of fishes and plants existing underwater. Annotations (e.g. fish's name, origin) are displayed besides each virtual fish or plant visible by the Dolphyn's camera.

4. CONCLUSIONS

In this paper, an underwater AR Game using the Dolphyn devices is developed. We are focused on serious and educational games. It is shown that Augmented Reality techniques can be used to extend a usual diving site with virtual objects. The developed application facilitates the AR application control using integrated joysticks.

The positive results of this work, give us new ideas to develop more sophisticated applications and to enhance new technical aspects of the hardware prototype. As well, we plan to extend our knowledge to apply the underwater AR in other applications as underwater maintenance using AR.

5. REFERENCES

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