Augmented Reality in the Field of Rehabilitation

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Introduction

Augmented Reality is created by combining virtual content on real images using the object recognition structure of technological devices. In order for us to use this technology, it is necessary to have technological devices (smartphone, smart glasses or tablet) that will identify the operation of augmented reality. In addition, one of the studies that has been identified with Augmented Reality needs to be defined on the device to be used. After these steps have been created, the images designed for Augmented Reality should be identified by the application on technological devices. As a result of these steps, the technological device detects the pictures and new images are obtained in a stationary environment (Pehlivan, 2019).

Augmented Reality is a computer vision technology in which views in a real environment are created by computers into virtual environments. It completely simulates the real world and replaces it with a virtual environment. Augmented reality is designed to improve people's perception of reality (Kalkavan, 2021).

The technologies used in Augmented Reality applications are usually created with video and optical-based technologies. The differences between the technologies created with them are the parts in which the environment created by Decoupling the virtual and real world is located. Scenes combined in video works should be Deconstructed using technological devices, as well as combining studies and the integration of glasses with real environments (Icten & Bal, 2017).

Augmented Reality applications are created in real environments on a pointer-based, marker-free and location-based basis (Akkus & Ozhan, 2017). Pointer-Based Augmented Reality is created by combining an image created in real environments with materials in a virtual environment. They work depending on the visuals. Generality is used in all areas. Artoolkit, Wikitude, Layar, Vuforia, etc. it is used in platforms (Akkus & Ozhan, 2017).
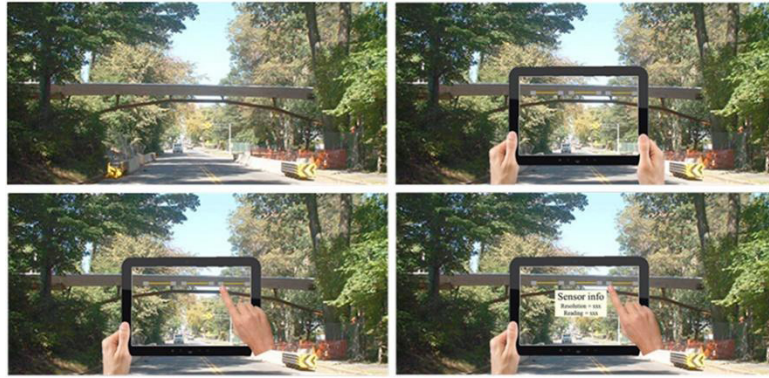
Figure 1. Pointer-based augmented reality

Markerless Augmented Reality has been used in recent years with a new generation of optical-based smart glasses. It involves the user in interaction in real environments. Education, medicine, military, tourism, etc. it is used in many fields, especially. Vuforia, ARKit, ARToolKit 6, Wikitude, ARCore, etc. it is used with platforms (Akkus & Ozhan, 2017).

Figure 2. Markerless augmented reality

Location-Based Augmented Reality is created by pointing the content created in virtual environments at specific locations using location or location information and displaying it in real environments. They use location and map information. It is more widely used in tourism fields. It is used with Wikitude and ARToolKit 6 platforms (Akkus & Ozhan, 2017).
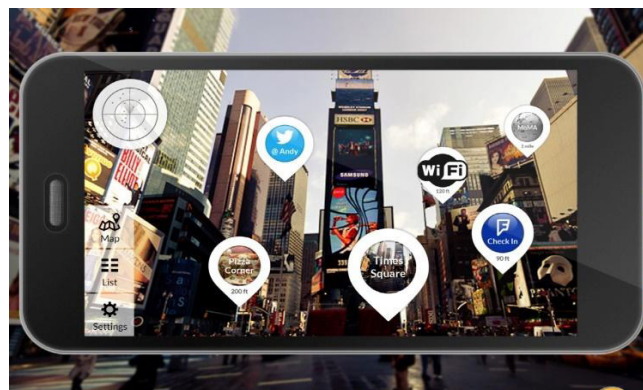

Figure 3. Location-Based augmented reality

Augmented Reality Peripherals

The peripherals used for Augmented Reality are Marker Peripherals, Hardware Peripherals, Software Peripherals, Augmented Reality Glasses (Cakal & Eymirli, 2012). Marker Peripherals constitute the positional Dec between virtual environments and real environments. When markers were first used, they were created in 2-bit shapes, while today any real-life object is shown as a pointer marker (Cakal & Eymirli, 2012).

Figure 4. Marker peripherals

Hardware Peripherals, Augmented Reality all created works are created using computer infrastructure. High-performance computers are usually used in terms of the speed of the application so that three-dimensional models can be displayed in real environments. Augmented Reality technology is often being developed on mobile technological devices. Because of this, Ipad, PC, Notebook, camera, etc. the devices can be given as an example (Cakal & Eymirli, 2012).

Figure 5. Hardware peripherals

An auxiliary interface is needed to Decipher software peripherals, real environments, and virtual environments together. Because of this, it is usually available on the market as licensed software in the software sector. These softwares consist of tools that do not provide a number of conveniences. These tools are usually composed of mobile application, modeling, marker tools and web Dec development tools (Cakal & Eymirli, 2012).

Figure 6. Software Peripherals

Augmented Reality Glasses are glasses that allow data and images to be created between real environments and virtual environments and allow users to Decode the application (Cakal & Eymirli, 2012).

Figure 7. Augmented reality glasses

Augmented Reality in the Field of Rehabilitation

Rehabilitation is the health science responsible for developing, renewing and maintaining the maximum mobility abilities that individuals can use throughout their lives. With the recently developed non-woven sensors, rehabilitation positively improves the recovery processes of individuals throughout their lives. In addition, it is thought that healing and treatment processes are shown to develop faster in individuals differently with augmented reality technologies. In this study, virtual environments are compared with the position of the individual in three dimensions and constitute the physiotherapy system by connecting the individual with real and virtual environments (Ong et al., 2012).

Figure 8. (a) A pointer icon placed on a person's head (marker) and the pointer icon is used to track the camera located on the monitor. (b) The game developed with Leap Motion and the human perspective (Ong et al., 2012).

Elements such as distraction or excitement in the nerve during rehabilitation are one of the problems in the prolongation of the diagnostic and treatment processes in individuals. For example; stress ball, door handle, etc. such objects distribute the minds of patients, allowing them to achieve the necessary measurement values. In addition, these methods are also used today to observe sick individuals through games with game consoles. It has been observed that applications in rehabilitation areas with the help of non-woven sensors have shown successful results in sick individuals. Therefore, encouraging such practices with rewards increases the speed of improvement in exercise practices, especially in children's sick individuals. Augmented reality studies created for the purpose of rehabilitation communicate with real environments by taking movements in the body parts of sick individuals in the form of specific points (Ong et al., 2012)

Figure 9. (a) Wrist flexion movement. (b) Wrist extension movement (Ong et al., 2012).

It is a study that will contribute to the rehabilitation programs of patients with emotional and physical problems.

- Sick individuals in the neurological rehabilitation group,

- Sick individuals in the orthopedic rehabilitation group,

- In the health of athletes,

- Sick individuals in the pediatric rehabilitation group,

- Sick individuals in the geriatric rehabilitation group,

- Vestibular problems

It is used for exercises aimed at control, November strengthening, balances. At the end of the exercise study, the patient's success in each movement is output as a report.

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