

Method for teaching medical imaging diagnosis, applying Virtual Reality Techniques

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Abstract

The TICS, are changing the procedures of doing many things, one of them is related to education, mainly those related to medical sciences, in teaching about the interpretation of medical images, in this article, we present a methodology for teaching and interpretation of medical images, using the techniques provided by virtual reality, The method proposes the use of the glasses as well as the possibilities of use and exploitation, which allows students to have a better experimentation. The results show that the presented method has many probabilities of use, exploitation and scaling.

Keywords

Imaging, thermal, optical, fusion, muscle, rehabilitation.

1. Introduction

Reviewing the literature, we found works where the use of virtual reality technology is resorted to, in order to be used in various educational processes, we found works related to the exploitation of virtual reality techniques as alternative mechanisms to the current ones [1]. In the analysis of the works that require the use of virtual reality technology, where it is necessary to have stable and high-speed connections that ensure the continuity of the signal in order to exploit all the benefits of its implementation [2], these same mechanisms are necessary when it is required to perform professional online games, where high availability of connectivity is mainly required [3]. In the analysis of the devices needed for the use and applications of virtual reality technologies, we find a series of devices and technologies needed, in this sense we find many devices from medical to research use, as well as a series of devices that meet the same functionality considered low cost, which make possible many applications and research [4][5].

These virtual reality techniques are being widely used in the field of health, as is the case in rehabilitation processes, when patients are doing their rehabilitation exercises, with the intention of being able to visualize the movements of the human body, in order to demonstrate the movements of the upper and lower limbs, in this sense we begin to recover the movement of the limbs from the

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conceptualization of the realization of the movement [6] [7]. Virtual reality techniques are being used in the field of education, as in the case of teaching programming courses, where these technologies are exploited in the processes of improving programming skills [8][9]. The trend of the works where the virtual reality technique is used in the compression of educational processes where the contributions of the technologies are evaluated for the benefit of being able to evaluate their effects in the compression of the subjects by the students [10].

In this article, we present a method to work with virtual reality technology, using the Oculus Gest 2 glasses, in the teaching processes of courses of analysis and interpretation of medical images, applied to medical interns and physicians who specialize in radiology.

2. Materials and Methods

The materials and methods are logically organized to describe how to take advantage of the methodology, starting with the description of the problem, followed by a description of how to implement the method, and ending with the use and applications of the method.

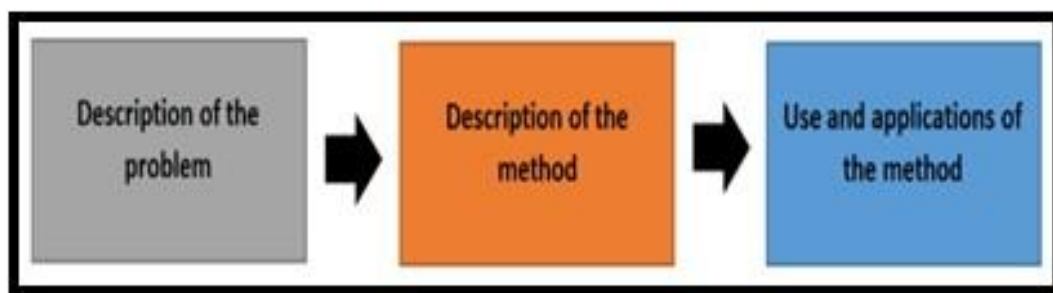


Figure 1: Methodology diagram

Figure 1 shows the block diagram of the proposed method, followed by a detailed description of each of the main processes.

2.1 Description of the problem

The description of the problem is dedicated to analyze how are the conventional procedures in the teaching of subjects corresponding to medical images, where the doctor visualizes a medical image through monitors connected to workstations, then all students visualize the monitor and begin to analyze the benefits provided by medical images, This scenario is repeated in most universities and university hospitals, where it is taught, so the proposal presented significantly changes the mode of medical diagnosis through the analysis of medical images, where the student can view the images through virtual reality glasses, as described in the materials and methods.

2.2 Description of the method

The method we describe is part of a description of how to connect from the virtual reality glasses to the medical devices directly, for this we have several configuration options, one of them and the most important is from the perspective of a class where the doctor who does the teaching work to students, the configuration begins with the installation of an application that can share what is being displayed on the monitor of the computer connected to the medical equipment, one of the applications that we recommend is Virtual Desktop, with this application we can connect many devices with the central computer, this connectivity allows us to share everything that can be displayed on the monitor, on the devices, within these devices to connect are the various virtual reality glasses, of various brands, one of the considerations that must be taken, is that all devices must be connected to the same wireless network, both the devices and the central computer.

In the following figure, we present a diagram of the configuration and use of the presented method.

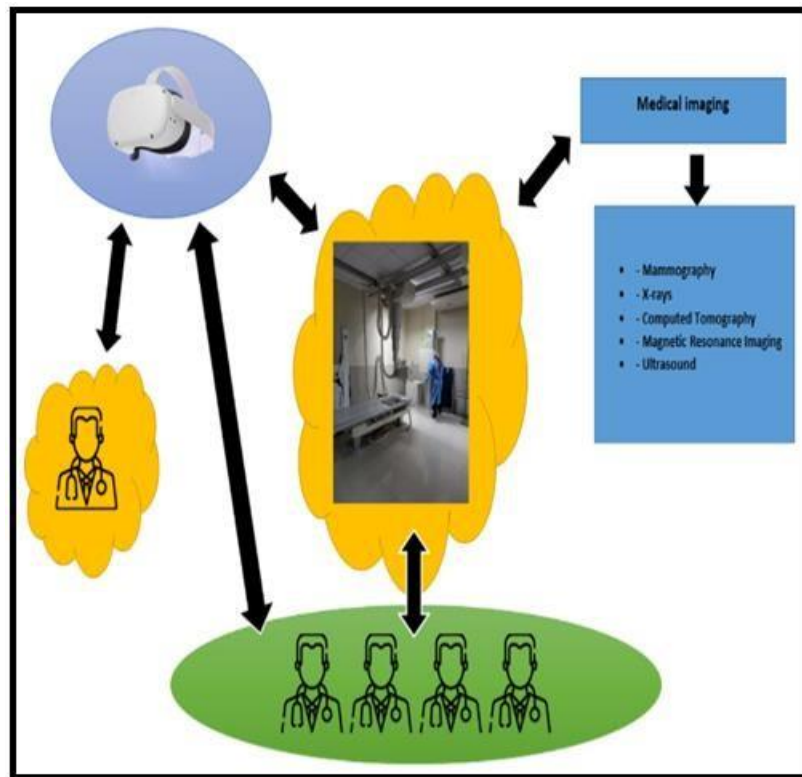


Figure 2: Method connectivity diagram

Figure 2 shows the connectivity mechanism of the method presented, starting from the connectivity of the computer equipment that is connected to the medical equipment, from where information can be shared to all the connected devices, the Virtual desktop application allows this interaction of information, in an initial configuration the teacher is in the main computer and the students are visualizing from their virtual reality devices.

From the main computer you can view different modalities of images, such as magnetic resonance images, computed tomography, x-rays, mammography, ultrasound, among others, many of which are in DICOM format, one of the advantages provided by the Virtual Desktop application, is that everything that can be seen on the monitor is replicated in the virtual reality devices. The medical images are in DICOM format, so they cannot be visualized with conventional viewers, it is necessary applications that can read DICOM format.

In virtual reality devices it is not possible to visualize medical images, in this sense the virtual desktop application allows visualization, so that all types of medical image modalities can be visualized, as shown in Figure 3.

3. Data Analysis

The analysis of the data is represented from the perspective of being able to visualize medical images in DICOM format, from different virtual reality devices, in this sense it is important to indicate that by means of the presented method it is possible to share images in many non-commercial formats, thanks to the different applications that can be executed in the main computer and these replicated in the virtual reality devices.

In addition to this feature, being able to visualize images individually helps in the educational

processes of students where it increases their visual capacity of the images through the immersion provided by virtual reality technologies.

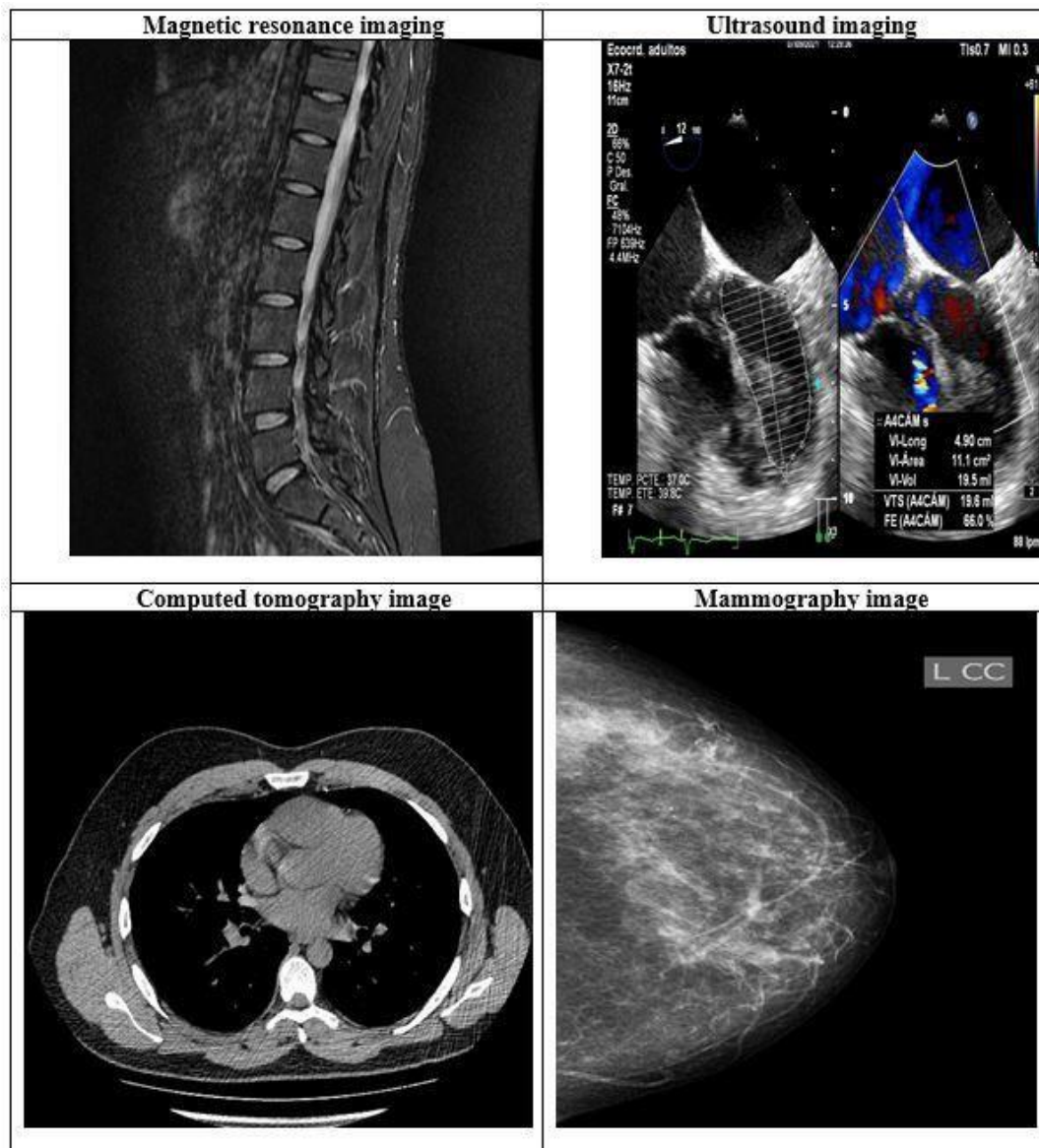


Figure 3: Example of modalities that can be displayed on virtual reality devices.

In Figure 3, we present the modalities of medical images in DICOM format, which can be visualized by means of virtual reality devices, in these cases it is necessary to indicate that different modalities of images independent of the formats can be presented.

4. Results

The results that we present at the end of the description of the method, is related to the advantages in the use and exploitation of virtual reality technologies, for the benefit of educational processes in the teaching of medical imaging diagnosis, we have in this scenario a first task that is to configure the main computer that can be connected to the medical equipment, In this sense, it is important to point out that many of the virtual reality devices do not have native applications to visualize medical images, so in order to take advantage of the technological and immersion advantages, the virtual desktop application takes advantage of all these benefits provided by the virtual reality technology.

The following is a flow chart showing the procedures to configure the devices and exploit the advantages of the presented method.

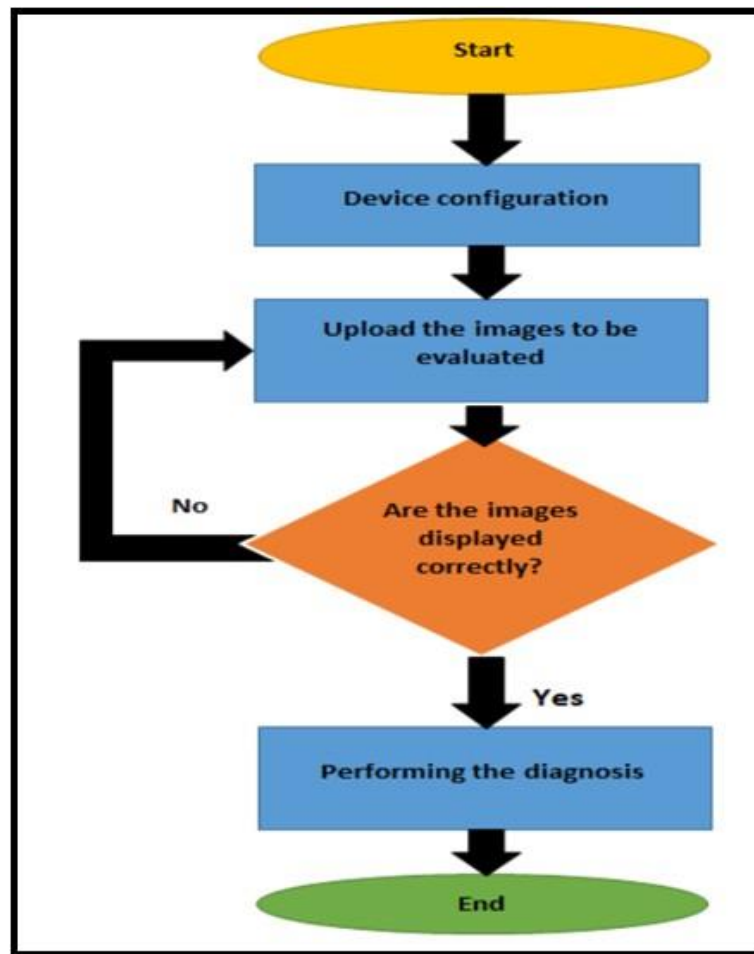


Figure 4: Flowchart of the methodology procedures.

Figure 4 shows the flow chart of the procedures to exploit the benefits of the presented method, where we start with the configuration of the devices, in this case we recommend the use of the virtual desktop application, then we perform the visualization of the images on the main computer, as in the virtual reality devices, if the images can be visualized, it is configured and can perform the activities of medical diagnostics, if the images cannot be visualized, the application must be configured in order to change the settings and resolutions for a better visualization of medical images.

5. Conclusion

The conclusions we reached at the end of this research are related to providing new ways and tools to improve the teaching processes of medical diagnostic procedures, using virtual reality technologies, which allows greater interaction and immersion on the part of students, so that they can improve the perception of the images, with the method presented increasing the interaction in the handling of medical images, as well as individualizing the teaching mechanisms. It is recommended that each student can work with his own virtual reality device, in order to be able to personalize the explanations made by the doctors who are in the teaching process.

One of the necessary recommendations is that all the devices can be connected to the same wireless network in order to be able to connect to the central computer and be able to replicate what is visualized in the virtual reality devices, it is recommended to work with an application that allows this

integration as is the case of the virtual desktop application, finally we can indicate that the method can be replicated and scaled depending on the needs in the educational processes.

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