Instructional Media Human Anatomy and Physiology Using Virtual Reality

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Abstract—In present, Technology is more modern and diverse that has become a necessity of people in this very technologically advanced age. So this is the age where technology advances play a bigger role that we chose to take technology to apply to human learning. Virtual Reality (VR) is simulates virtual environments technology through visual Perception, voice, or touch. This technology applies to the science of Anatomy and Physiology to provide new learning about cause of disease and user experience. User can study the human structure and performance of each system in the body when have disease. It's help patients to understand the cause of disease and system of body function to enable patient to recognize diseased and takes care of themselves as prescribed by doctor for the most effective rehabilitation. The technology applied to the original content is more interesting and diverse. The program will reference content from text books, resources and expert. Even though it's new technology, it easy to be for all use.

Index Terms—Virtual Reality (VR), anatomy, physiology, patients, disease, rehabilitation

I. INTRODUCTION

Learning in the 20th century only books with text and images to read and understand. That means remembering something new from self-learning is just learning from the book. That is not the best learning in the 21st century, a time when technology is very advanced. The change and improvement of the learning to be more attractive and attract more students using the technology to make the difference in learning more.

This research uses applied technology to learn anatomy and physiology. The study of the structure of organisms, including humans. User must have a good understanding of the structure and function of the body organs. This is the basic knowledge required not only physicians or medical scientist but everyone can also learn.

The technology applied to the learning may not be new. But we will bring technology that is called visual technology to apply to the above science. Virtual Reality is a technology that simulates real-world environments through visual perception through the headset as the display screen. Moreover, It's still provides libraries and packages for Unity 3D which made developing the Virtual Reality be a lot easier and faster. Hand tracking

sensor, a new for this task that is option with high performance tracking by sensors to detect hand movements and integrable to embed directly into VR headsets. User can control the direction as needed as own hand to choose object.

In this program have more than structure of human but researcher have increased knowledge about the disease caused by abnormal functioning of organs. Researcher recognize that communication problems, counseling and medical diagnoses that are medical technical information. This may make many patients don't understand exactly what doctor wants to communicate, which affecting to physician treatment is incomplete because the treatment requires elements of care from the special physician and patient's own after take home. Researcher have added program disease-learning function to help patients to understand the disease and improve their self-care.

II. COMPUTING PROGRAM

A. Autodask Maya 3D

Maya is a 3D computer graphics application that runs on Windows, macOS and Linux. It is used to create interactive 3D applications, including video games, animated film, TV series, or visual effects. It's easy develop to others program [1].

Figure 1. Program create model 3D.

B. Unity 3D

Unity 3D was used to create the Virtual Environment inside the program with C# language scripted.

Figure 2. Game engine create model 3D.

C. Visual Studio

Visual Studio Code includes the simplicity of a code editor with powerful tooling, like IntelliSense code completion and debugging. We used to develop computer programs for Implements C# scripts for Unity.

Figure 3. Program develop scripts.

III. DATA ANALYZE AND METHOD

We made 3D model by Autodesk Maya.

A. Classification

1) Human skeleton

We split the bone into 7 terms as follows.

a) Spine (vertebral column)

b) Chest (thorax)

c) Skull (cranium and mandible)

d) Arm

e) Pelvis (pelvic girdle)

f) Leg

g) Sesamoid bones

The axial skeleton of the adult consists of 80 bones, including the skull, the vertebral column, and the thoracic cage. The appendicular skeleton comprises 126. All bones have 26 pieces [2].

2) Muscles

We split the muscles into 7 terms as follows

a) Muscles of head

b) Muscles of neck

c) Muscles of back

d) Muscles of thorax

e) Muscles of abdomen

f) Muscles of upper limb

g) Muscles of lower limb

3) Nerve

4) Organs

a) Digestive system

b) Respiratory system
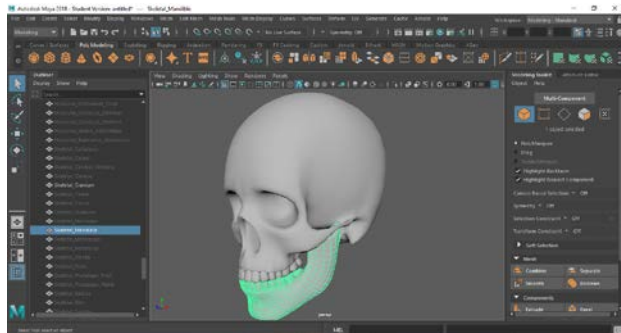
c) Urogenital system

B. Design

Figure 4. Skull section.

Modeling 3D models as shown. Starting from outline of object to surface, print textures and assembly.

Muscle molding is more difficult because the muscles are complex, multi-layered and multi-dimensional that harder than bone [3].

After that, the 3D model was used in the Unity program to create the program to use virtual reality.

In the medical technical part. Researcher have collected information from special physician [4].

C. Disease

The most of disease in Thailand that more but we choose from what diseases can patients take care of themselves first or not to be the beginning of a serious disease. From survey by doctor. Non-serious diseases often cause serious disease because patients don't pay attention to their abnormity. Probably because there is no prior knowledge of the disease and target risk. Patients neglect self-care first as a serious disease.

D. Cause of Disease

Cause of disease may have many causes. We have example that most common and easy to develop disease.

E. Cause of Disease

A symptom is any subjective evidence of disease, while a sign is any objective evidence of disease. Therefore, a symptom is a phenomenon that is experienced by the individual affected by the disease, Most doctors will give you medicine and provide self-care advice to control and reduce the risk of further disease.

IV. PROGRAM IMPLEMENTATION

Before into program, user must wear VR headset else program can't open because the sensor in headset don't detect thinks.

Figure 5. Virtual Reality headset.

After that will access the program. If the headset is not inserted, the program will not work. The system that the company set up. And the special thing of this project is control by hand tracking technology. This device is attached to the headset that makes controlling the use of headset more convenient [5].

The program is easy to use. Within the program there are human anatomy in three-dimensional as the program's home page. In order to know the details of each part of the body, you can choose to view the information of that part [6]. The information will show beside model.
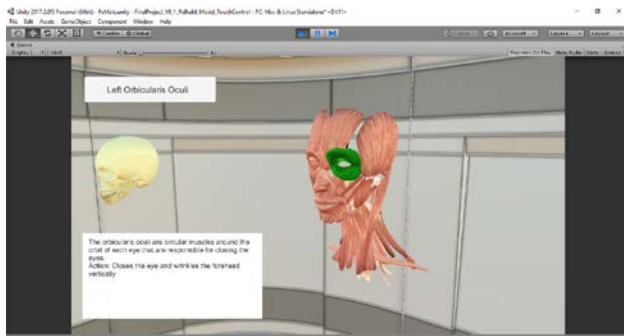
Figure 6.   Information of muscle.

Moreover, there is also a disease page. Each case will show caused of diseases by disorders within the body. Diseases shown in the program will indicate potential target diseases. How to disease and primary treatment or self-care to that situation [7]. It will be displayed in the image, animation and information to make the user easier to understand. Most patients may listen, but not imagine and understand the purpose of the doctor to explain.

Figure 7.   Disease button.

In the disease mode is divided into two parts:

A. Cause of Disease

This section describes causes of disease and show area of disease. All of which will be discussed at an early stage that may not be symptomatic but organs in the body is already abnormal.
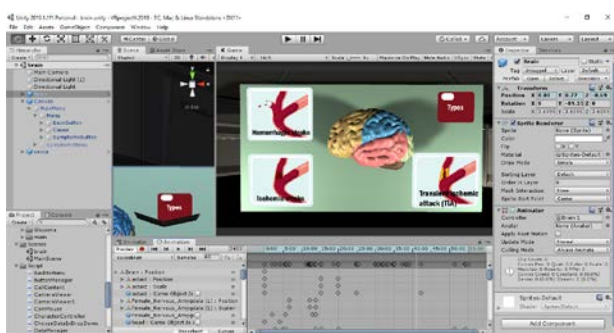

Figure 8.   Disease type.

In the first when user will choose cause of disease mode, the animation in that section will show structure, function and cause of disease. Such as stork is a part of all that creator wants to present in details of caused of disease. When brain has abnormalities in the blood vessels that make nearly brain area die. This disease can

be found about 80% of normal people and who risk to be. Caused by blood clots occur when the arteries to your brain become narrowed or blocked, causing severely reduced blood flow.

B. Symtoms of Disease

This will be the introduction of self-care in the primary with the medication as recommended by the doctor. For example, obesity should be exercised regularly, along with proper dietary control. Avoid eating sugar desserts in excess of the prescribed dose [8].

Figure 9.   Symptom icon.

A symptom is any subjective evidence of disease and it is phenomenon that is experienced by the individual affected by the disease. Health-care professionals use symptoms and signs as clues that can help determine the most likely diagnosis when illness is present.

Symptom Checker for children, men, and women, can be used to handily review a number of possible causes of symptoms that may be experiencing.

Figure 10. Symptom mode.

User will learn from images, data with audio lectures. Which will increase the response to learning more than just viewing images from the anatomical room.

V.   RESULTS

This program aids to understand and learn from the use of virtual reality technology that make users enjoy to leaning and try to understand about physical part and medical part, because user have an interactive all the time during use program.

Studying medical information through visual media allows users to better understand what the doctor wants to communicate and recommend. It is beneficial for the treatment and progression of symptoms as patients and doctors can communicate in the same language more than usual.

And device part. Hand tracking technology in combination with virtual technology [9] may not be new,

game developers most commonly used to create games for new experience games upgrade. But we use this technology for new user experience [10] in using technology for learning. Users feels more realistic than using other consoles or mouse when used.

VI. CONCLUTION

This paper proposes applying new technology to anatomy and physiology through the use of virtual technology that call Virtual Reality. This is a program that allows users to interact with the program, allowing users to enjoy and gain new experiences in learning about medical. It is very beneficial for the development of the medical field and Increase educational diversity. It is a way to study in other subjects.

As a future work, Make the program more interesting and study the user interface design, the beauty is much easier than ever. Add a variety of feature and find hand movement detection devices that was better. And to help users learn more about the disease and increase the efficiency of the media to be another medium that can mediate better communication between the physician and the patient.

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Sarinporn Visitsattaongse is a lecturer in department of biomedical engineering, Faculty of engineering, King Mongkut's institute of technology ladkrabang. She received a bachelor's degree of science in major of biology, master's degree of science in major of molecular genetic and genetic engineering and philosophy of doctoral degree in medical technology. She used to work in medical technology field in image processing, and work in molecular biology of proteins. Now current focus is about medical that may be healthcare device, home healthcare or healthcare technology.