

# **VR - OPERATION THEATRE**

## **PROBLEM DEFINITION**

According to a recent report, India produces approximately around 50,000 new doctors each year. And with so many doctors trying to practise and achieve expertise in their respective fields, the number of subjects on which they can practise surgery is an alarming low number. Every other day we come across disaster stories of medical frauds that lead to loss of precious human lives.

Our project aims at reducing that problem by providing new doctors with a platform to practise surgery on. With machine learning integrated into our VR app for various object detection, focusing primarily on human anatomy, our module would try to imitate and reciprocate the doctors' hand actions and movements thereby simulating a virtual surgery.

## **AIM**

To develop and implement a VR module that can imitate and reciprocate hand movements of a person using Electromyographic Sensors and simulate the environment of an operation theatre by assisting new doctors to identify various segments of human anatomy with machine learning functionality.

## **OBJECTIVES**

The proposed module aims

1. To design and prototype a module that would fetch electrical impulses from the human hand muscle and imitate and reciprocate the same actions in virtual reality.
2. To use machine learning using tensorflow to train our module in order to identify various parts of the human anatomy.
3. To integrate the above two features that would allow the doctor to have a virtual experience of a surgery in an operation theatre.

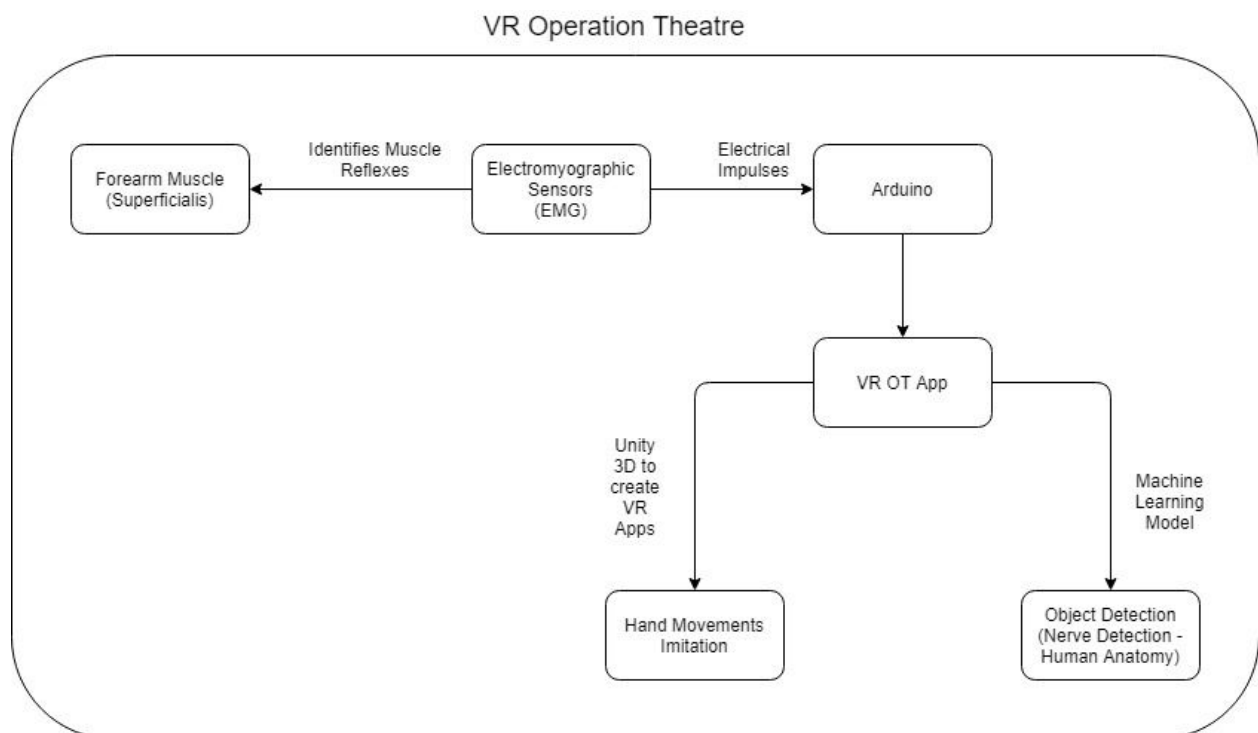
## **BENEFITS**

- ***Risk Free Training*** : One of the biggest issues faced by practical trainings is the large risk initiated by putting the trainees in a new and uncontrolled environment.

The virtual reality simulations neutralise this risk while keeping the same training features, by creating the same environment virtually and putting the trainees inside without having to worry about the risk.

- ***Realistic Scenarios*** : The simulations are built based on real-life operations and manipulations needed in after training situations.
- ***Improves Retention and Recall*** : The main purpose of a training and what really differentiate it from theoretical learning is building a muscle memory. VR trainings solves this problem by enabling trainees to use their hands to manipulate anything inside the simulation.
- ***Suitable for different learning styles*** : When doing a training with virtual reality, the trainee will have all the freedom to test anything in the simulation in order to build an in depth understanding according to his own learning style.
- ***Simplifies complex problems/solutions*** : Virtual Reality simulations are built in such a way to simplify the most complex notions and situations that cannot be understood with traditional trainings.

## METHODOLOGY



## **TECHNOLOGY USED**

### **1. *Arduino***

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

### **2. *Unity***

Unity is a cross-platform game engine that can be used to create both three-dimensional and two-dimensional games as well as simulations for desktops and laptops, home consoles, smart TVs, and mobile devices. Unity gives users the ability to create games in both 2D and 3D, and the engine offers a primary scripting API in C#, for both the Unity editor in the form of plugins, and games themselves, as well as drag and drop functionality. Unity supports the low-level APIs Metal on iOS and macOS and Vulkan on Android, Linux, and Windows, as well as Direct3D 12 on Windows and Xbox One.

### **3. *EMG Sensors***

Electromyography (EMG) is an electrodiagnostic medicine technique for evaluating and recording the electrical activity produced by skeletal muscles. EMG is performed using an instrument called an electromyograph to produce a record called an electromyogram. An electromyograph detects the electric potential generated by muscle cells when these cells are electrically or neurologically activated. The signals can be analysed to detect medical abnormalities, activation level, or recruitment order, or to analyse the biomechanics of human or animal movement.

### **4. *TensorFlow***

TensorFlow is an open-source software library for dataflow programming across a range of tasks. It is a symbolic math library, and is also used for machine learning applications such as neural networks. TensorFlow is Google Brain's second-generation system. While the reference implementation runs on single devices, TensorFlow can run on multiple CPUs and GPUs (with optional CUDA and SYCL extensions for general-purpose computing on graphics processing units).[10] TensorFlow is available on 64-bit Linux, macOS, Windows, and mobile computing platforms including Android and iOS.

TensorFlow computations are expressed as stateful dataflow graphs. The name TensorFlow derives from the operations that such neural networks perform on multidimensional data arrays. These arrays are referred to as "tensors".

### **5. *Virtual Reality***

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## **DELIVERABLES**

The proposed module will have the following deliverables :

- This device can be used for creating a surgery environment in the medical field or a machine in factory and maintenance trainings. This environment gives a controlled and realistic environment to trainees where they can acquire proper training without the major risks of real environment.
- Jobs with high precision require people who have previously encountered with such situations. Like, Nurses in hospitals. These realistic scenarios will help them learn how to deal with unexpected situations.
- It would improve the decision making skills of trainees in adverse and difficult situations.
- Training in such environment develops the trainee in all possible ways to do the job with accuracy and cope with situations too. This helps them work more efficiently and minimizes the risk of mistakes in real world.
- Games can be designed using this device as a base for better and entertaining recovery of patients. Physiotherapists can use such games to get better and fast results in conditions of patients after arm surgeries.

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