Advanced Virtual Reality

A Fascinating and Life-Changing Project
Presented in a Clear and Concise Way

Submitted to:

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1. Abstract

This report discusses the stability, findings and purpose of our Projects Prototype named AVR. User can feel the things virtually real that are actually computer generated 3D objects. Using this prototype, we can make the inaccessible things accessible. The Prototype reads and converts data from the user's hand using sensors called Potentiometer into machine learning code. The Raw data is then compiled and sent to the triggers of prototype to generate a reaction force.
The Prototype is designed on the **Force Feedback Technology** Principle and **Hooke's Law**.

1.1 Force Feedback Technology

According to this principle,

> **"**The Simulation of weight and physical appearance of an object in Computer and Virtual Reality, allowing user to directly interact with virtual objects**"**

1.2 Hooke's Law

Hooke's Law is given as Hookes Law is given as

> "The stress applied to an Elastic object is directly proportional to the strain produced in it"

Mathematically, it is given by the following expression

$$F = -Kx$$

Where,

- K is a constant called elastic constant
- x is the amount of deformation in the elastic object under elastic limit
- F is the restoring force

The –ve sign indicates that the force is restoring force, not applied force

2. List of abbreviations

- **AVR:** Advanced Virtual Reality
- **FFT:** Force Feedback Technology
- **AR:** Augmented Reality
- **GPS:** Global Positioning System
- **O-Sensor:** Orientation Sensor
- **VR:** Virtual Reality

3. Introduction

3.1 Background

Virtual Reality is a way to the next generation technology. As much as we enjoy virtual reality these days, there is still occasional urge to find virtual objects using just our hands. If all goes well, the upcoming Manus VR Glove[1] will be the first to unwarp our hands from controllers, but it will still would not be able to feel any shape nor physical properties of virtual objects.

3.2 Statement of purpose

Whenever we want to access physically the inaccessible we can access it anytime, anywhere using the AVR Glove.

3.3 Research Question

Using AVR Glove, would the user feel convenience to get a physical access to a practically inaccessible object.

3.4 Significance

Along with the client, who needs a physical access to a virtual or physically inaccessible object, AVR Glove would be the great source of employment of engineers, or Programmers to maintain the device and the field providing them to the opportunity of getting their desired job rather than excelling in education but running it due unemployment.

3.5 Limitations

User of the AVR Glove cannot access the things that are not yet built or are explicitly in accessible. Likewise a deep see creature of which we do not have enough data.

4. Material and Methods

4.1 List of components

The list of components that we have used so far is

- Arduino Nano with Atmel Atmega 328p Microcontroller
- S95g Micro Servo Motors (Used as Triggers)
- USB to Micro-USB Connection Wire
- 100K ohm Variable Carbon Resistors
- Bread Board
- 40mm Bread Board Connecting Wires
- 20mm Plastic Clamps
- Perforated Hose Clamp B-Series
- Stainless Steel Chrome Shafts
- M6 x 25mm screws

- M6 nuts

4.2 Application Software

The computer software we used in the development of our project prototype are

- Arduino IDE (Integrated Development Environment)
- Unity 5 (3D Game Development Engine

4.3 Equipped Methods and Techniques

We utilized Force Feedback principle in our prototype. The other techniques we used in our experiment are as below

- Arduino Integrated Development Environment
- Development of PCB (Printed Circuit Board)
- Breadboard Circuit Patching
- Application Development in Unity

5. Results

The purpose of the AVR Glove is to get a physical access to the objects that are apparently inaccessible. According to the measurements and calculations,

- AVR Glove has a Precision level of 75 to 85 %
- AVR Glove is not suitable to move an object having mass of larger than 500g
- Objects that need to be dragged or moved on with larger force are unable to be moved.

According to the graph shown in the **Figure 1,** more than 65 People in 100 know about the Virtual Reality headset. **Figure 2** shows that most of them don't have used it because it is quite new technology in the current race.

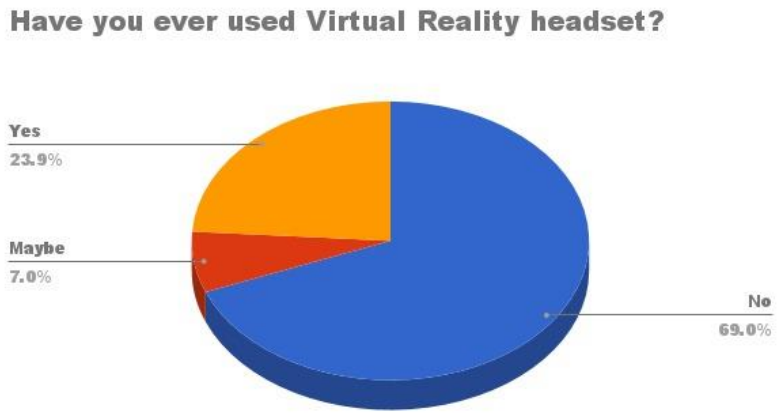

Figure 4.1. Pie Chart of people having knowledge about Virtual Reality Headset

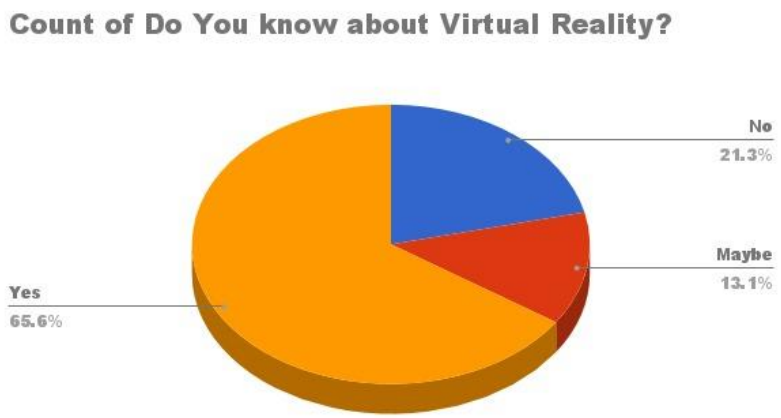

Figure 4.2. Pie Chart of people that have practically used Virtual Reality Headset

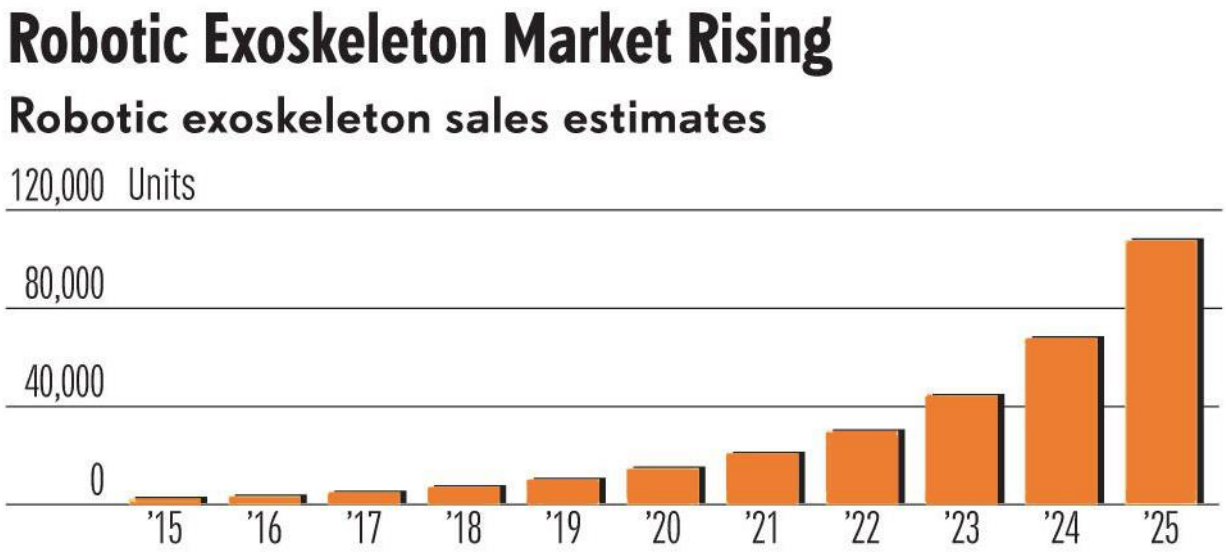

Figure 4.3 Market Rise of Robotic Exoskeleton[2]

6. Discussion

6.1 Exoskeleton

An exoskeleton is the external skeleton that supports and protects an animal's body, exoskeletons contain rigid and resistant components that fulfill a set of functional roles including protection, excretion, sensing, support, feeding and acting as a barrier against desiccation in terrestrial organisms.[3]

6.2 Triggers

A small device that releases a spring or catch and so sets off a mechanism, especially in order to fire a gun. We used micro-servo as triggers in our project. A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration.[4]

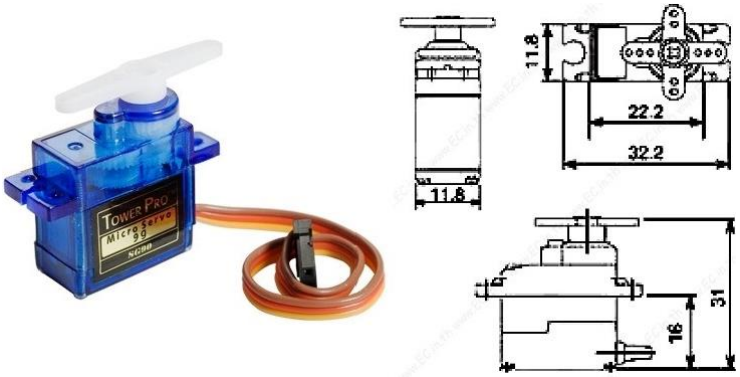

Figure 5.1 Micro-Servo sg90[6]

6.3 Sensors

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators. A 100K variable resistor is shown in **Figure 5.2**

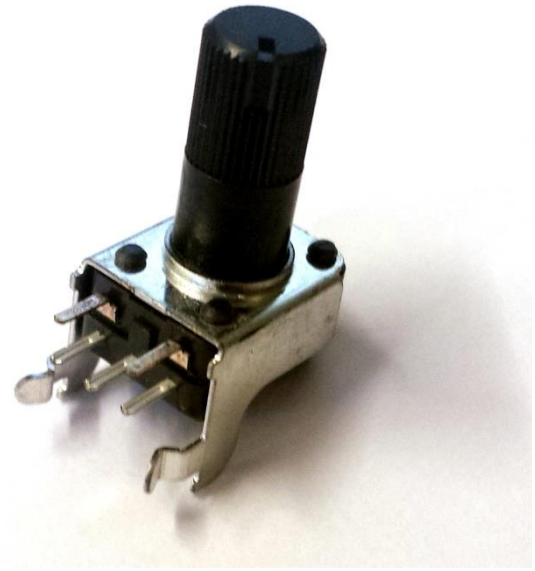

Figure 5.2 100K Attenuation Pot Variable Resistor DCS1036[5]

6.4 Prototyping Board

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one.

7. References

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