

Arduino UNO Based Glove To Enhance User Experience In A Virtual Reality Environment

Vaibhav Oza¹, Rohan Shah², Jinal Apte³, Shivam Thaker⁴, Aarti Solanki⁵.

Information Technology Universal College of Engineering Mumbai, India

Electricals and Telecommunication Universal College of Engineering Mumbai, India

Electronics Universal College of Engineering Mumbai, India

Information Technology Universal College of Engineering Mumbai, India

Electronics Universal College of Engineering Mumbai, India

Corresponding Author: Vaibhav Oza

Abstract: *Mixed Reality is an upcoming domain that focuses on enhancing the user experience to become more interactive with Virtual Reality. Hand is a part of body that allows human to touch and feel different things. VR glove is the most efficient and newest tool for a user to interact with a virtual object. VR glove is basically providing input to the Virtual World as a Virtual Object controlled by user. From the many applications of Mixed reality, a game is the best application to efficiently display the use of VR Glove. Arduino Uno connected with Flex sensors and Accelerometer gives input to the Processing IDE which acts as translator to the game, and game components act as they are provided with Keyboard input. This implementation of VR glove can further be developed to interact with various Virtual realities and Augmented realities dynamically such that the user feels as if he or she is inside the VR or AR.*

Keywords: *Mixed reality, Virtual reality, enhanced user experience, Arduino UNO, processing IDE*

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I. Introduction

Mixed Reality (MR) is a field enhanced experience speaking of games. The user can interact with Virtual environments, excitement increases when the experience of audio-visual simulation is almost real. Google Cardboard is considered one of the most efficient appliances for mobile VR experiences[1]. The combination of a handy portable device and Google Cardboard can offer an inexpensive, user friendly VR interactions. The used apparatus has to be as simple as possible, because the main centre of attention needs to be the application itself. Since our target group is Gamers, a low-cost VR experience seems to be an ideal tool for the available games in market. Recent Augmented Reality (AR) advances, such as those supported by gesture-based interaction create an ideal gaming platform ideal for desktop-based holographic applications. Wearing a VR headset can generate a unique VR gaming experience [2]. This technology has the potential to attract the interest of many people and enhance their experience with VR and AR.

II. Literature

The Domain of Mixed Reality (MR) has its roots in Virtual Reality (VR). The increase in demand of VR applications in various fields led to development of the field of MR. Both AR and VR were fabricated within the 60's. The term mixed reality was later coined to explain a hybrid of the two technologies. The term "Mixed Reality" was used as far back as the 90's, once it absolutely was utilized by firms like Mixed Reality Laboratories, however has been recently revived by Microsoft and Magic Leap to describe their MR products. Leaving aside the point of VR for an instant, and specializing in the immersive 360° expertise that it aims to project United States into, we could argue that video game began from the "360-degree view (or bird's-eye paintings) from the nineteenth century," as the virtual reality Society states on their History of virtual reality [2].

We shifted from associate degree early simulator (1929), to Morton's initial VR Head Mounted show in 1960, to modern experiencing the full world as a simulation within The Matrix in 1999. The Microsoft HoloLens is mixed reality (virtual and real objects interact), Google Glass is increased Reality (virtual objects overlay real environments), and the Oculus or HTC VIVE is a VR (a purely virtual environment)[3]. every term denotes whether or not the setting is virtual or half virtual, and to what degree an individual can move with the non-virtual setting. One of the plain winners from the emergence of VR is that the industry. plaything Star Wars 360 expertise is one example of nice adoption and implementation of video game, creating it doable for viewers to expertise storytelling in a very altogether totally different means. By saying the primary ever standalone

VR receiver (not requiring a phone or a pc to be hooked up to it) school large Facebook is on the offensive with its arrange to democratize VR.

III. Components of VR Glove

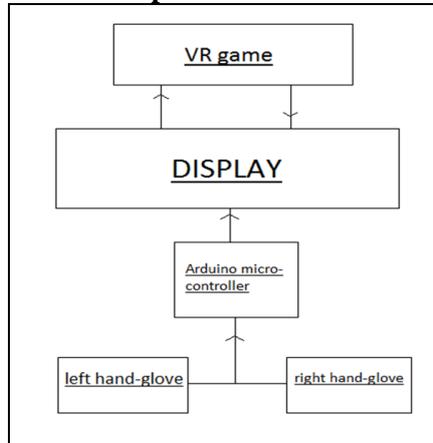


Fig 1.: Block Diagram of VR Glove

A. Gloves:

The Gloves are used to take real time data as input. The flex sensors and accelerometer are fitted on the glove which the user will use to interact with the Virtual Reality [1].

B. Arduino Microcontroller:

The Arduino Microcontroller is used to connect the sensors and give them power supply and interfaced with the Computer and Display. The Serial Monitor for the Arduino UNO along with the Processing IDE software application behaves as a translator between The Computer and the microcontroller.

C. Display:

User gets a visual output of the VR environment on the display screen.

D. VR game:

The user interacts with the VR environment of the game. The game is developed using Unity 3D and is implemented on a VR platform.

IV. Circuit Configuration

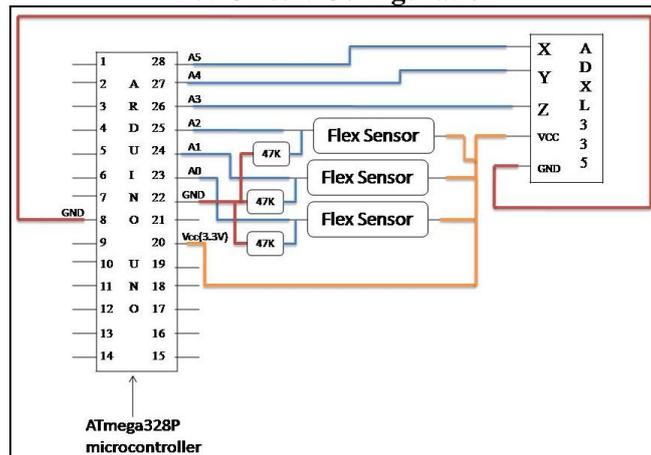


Fig 2.: Circuit Diagram of VR Glove

V. Methodology

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388, 344/314; 430:  
395, 345/331; 372:  
397, 343/333; 373:  
395, 342/333; 373:  
395, 342/333; 372:
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Fig 3.: Serial Monitor Output of Accelerometer

The above figure displays the accelerometer readings from the Glove. When the reading before the ‘/’ are above 380, 340 , the character assigned in the ‘if-else’ statement of the program prints on the display or provides input of that character to the system. Similarly, when the readings after ‘/’ go above the specific value the program provides input to the system. Also, a range is allotted to the flex sensor input to provide a specific key output.

For the Arduino UNO to provide data as input to the system, we have used Processing IDE and the code is written in processing language. The Data from the Arduino is Digital i.e. it is either 0 or 1.

VI. Construction



Fig 4.: Construction of the first Prototype of VR Glove

As shown in the above image, the first Prototype of the VR Glove has Flex Sensor and Accelerometer fitted on the Glove with Arduino on a stationary location. Flex Sensors are attached on fingers to measure the bend in a suitable way and accelerometer is attached to the back of the Palm to measure rotation on X-Y-Z axis due to movement of wrist. The construction can be extended to 5 flex sensors and one accelerometer on one hand or can also be extended to construct and integrate two gloves for maximum interaction from the user [4].

VII. Ease of Use through GUI

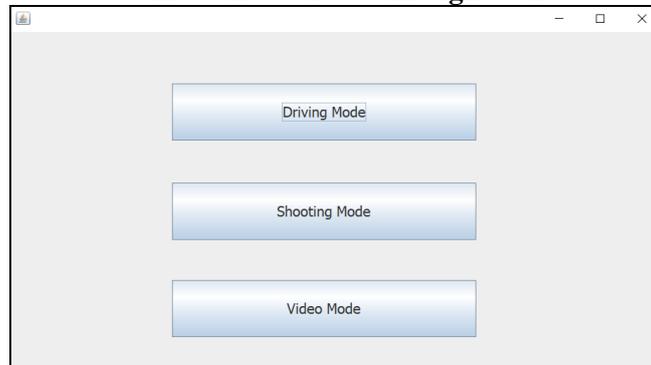


Fig 5.: JAVA based GUI for mode selection of VR Glove

A Graphical User Interface is used to select the mode in which the Glove can be used. For a “Racing Game” a user can select Driving Mode, for a “Shooting Game” a user can select Shooting Mode, etc. This GUI is created using JAVA and on clicking the button, Processing code for that mode is called and run. When the code is running. Keyboard keys for assigned keys are blocked i.e. those keys won’t provide output from the keyboard during the active duration of code.

VIII. Application

VR Glove makes the user interact with the various VR components in a VR environment. They can also be used to interact with various devices and software to increase the applications [6]. Following are some applications of VR Glove:

- Simulation of Military Training, Astronaut Training, Medical, Architecture, etc.
- Education by increasing student interaction.
- Controlling Robots.
- Gaming on various devices.

IX. Future Goals

For enhancing the User experience in various applications, following goals are to be achieved:

- To provide user a GUI to integrate each component of the VR Glove to his/her own preferences.
- To increase the speed of data communication between glove components and system.
- To construct a more suitable and robust design for efficient usage.
- To replace Flex Sensor with Micro-Hydraulic components that measure bend.
- To provide Haptic (Impact response from the VR environment) response to the user in form of vibration [2].
- To integrate with various devices such as Mobile, Gaming Consoles, Designing tools, etc.

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