

# A AMENABLY PROJECTED VR SYSTEM OF WALL MOUNTED BUTTONS

Dhanush Pandiyan<sup>1</sup>, Divya sree R<sup>2</sup>

<sup>1</sup>Department of Electronics and Communication Engineering, Kingston Engineering College, Vellore-632 059, India

\*\*\*

**Abstract** - Industrial safety is important as it safeguards human life, especially in high risk areas such as nuclear, aircraft, chemical, oil and gases, and mining industries, where a fatal mistake can be catastrophic. For providing this industrial safety they are introducing a large interactive display with virtual touch buttons and sliders on a pale-colored flat wall. Our easy-to-install system consists of a front projector and a single commodity camera. A button touch is detected based on the area of the shadow cast by the user's hand this shadow becomes very small when the button is touched. The shadow area is segmented by a brief change of the button to a different color when a large foreground (i.e., the hand and its shadow) covers the button region. Therefore, no time-consuming operations, such as morphing or shape analysis, are required. Background subtraction is used to extract therefore ground region.

**Key Words:** Virtual Reality, Virtual view, microcontroller, keil, gas sensor.

## 1. INTRODUCTION

Virtual Reality is seen as the high-end of human-computer interactions and it has the potential to target a wide range of applications. Wall mounted buttons which are used as physical UI for elevators, room rights and so on. However, changing installation locations of wall mounted buttons is not easy. In addition, changing button labels and types is not easy, too. If we can change installation locations, labels and types of wall mounted buttons easily, their UX is improved.

Redirected walking algorithms require the prediction of human motion in order to effectively steer users away from the boundaries of the physical space. While a virtual trajectory may be represented using straight lines connecting waypoints of interest, this simple model does not accurately represent typical user behaviour.

We implemented the model within a framework that can be used for redirect walking within different virtual and physical environments. It is useful for the evaluation of redirected of parameters under varying conditions. The proposed system gets user's height and change buttons' vertical position. In addition, users can change a button label and type. As a result of the user-test, the proposed system improves the problems of wall mounted buttons and has a possibility that it improves product and system UX. On the other hand, user-test shows necessity to improve buttons visibility.

The proposed system projects virtual wall mounted buttons on a wall by a projector. The Proposed system gets user's height and change buttons vertical position.

## 2. A AMENABLY PROJECTED VR SYSTEM OF WALL MOUNTED BUTTONS

Industrial safety is important as it safeguards human life, especially in high risk areas such as nuclear, aircraft, chemical, oil and gases, and mining industries, where a fatal mistake can be catastrophic. Industrial Safety reduces risks to people, and processes. Process control and safety systems are usually merged. Maintaining a safe and healthy working environment is not only an important human resources issue, it's the law.

Whether they're entry-level workers, seasoned veterans, supervisors, or plant managers, the employees need to understand health and safety risks, the steps they need to take to minimize those risks, and common safety standards and compliance procedures. Should we give special care to one of these two areas? Yes. In this project we are going to provide a solution for these risks through virtual reality. VR (also known as virtual reality) can be found in fields as diverse as entertainment, marketing, education, medicine, construction and road safety training and many others. They provide numerous possibilities for users to explore virtual realities for various purposes.

In this project we use large interactive display with virtual touch buttons and sliders on a pale-colored flat wall. Our easy-to-install system consists of a front projector and a single commodity camera. A button touch is detected based on the area of the shadow cast by the user's hand; this shadow becomes very small when the button is touched. The shadow area is segmented by a brief change of the button to a different color when a large foreground (i.e., the hand and its shadow) covers the button region. Therefore, no time-consuming operations, such as morphing or shape analysis, are required. Background subtraction is used to extract therefore ground region.

The reference image for the background is continuously adjusted to match the ambient light. Our virtual slider is based on this touch-button mechanism. When tested, our scheme proved robust to differences in illumination. The response time for touch detection was about 150ms. Our virtual slider has a quick response and proved suitable as a controller for a Breakout-style game.

### 3. BLOCK DIAGRAM FOR TRANSMITTER AND RECEIVER

#### 3.1 Transmitter

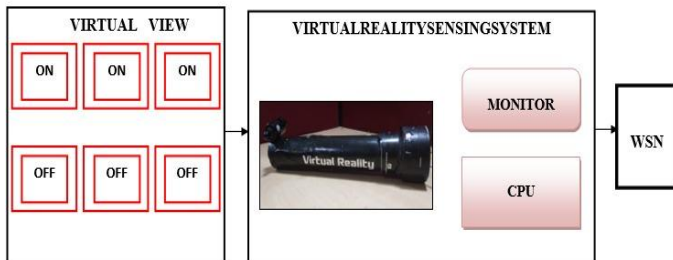


Fig -1: Transmitter block diagram

The projector will communicate with the system through USB to RS232 converter. After the option is chosen, the input is read using the camera module which capture's the fixed the image fixed within the projector.

The input image is interfaced with the PCs in which VR 1.1 software is used image processing is performed to find the selected option from the label.

The software makes the decision and sends the data on the ZIGBEE for transmission. The ZIGBEE can transmit data over long distances.

#### 3.2 Receiver

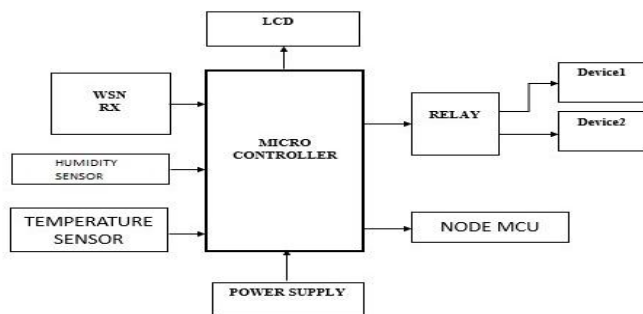


Fig -2: receiver block diagram

The data will be sent to the AVR microcontroller in which a code has been written to perform the operation based on the requirement. From there the data is further sent to node MCU used to support the AVR microcontroller which is programmed using Lus programming language. The controller preforms the desired operation through the application. The system will on/off the selected options from the label in the industry.

#### 3.4 power supply

A power supply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the

correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate standalone pieces of equipment, while others are built into the load appliances that they power.

#### 3.4 Temperature sensor

A temperature sensor is a device, typically, a thermocouple or RTD, that provides for temperature measurement through an electrical signal. A thermocouple (T/C) is made from two dissimilar metals that generate electrical voltage in direct proportion to changes in temperature. An RTD (Resistance Temperature Detector) is a variable resistor that will change its electrical resistance in direct proportion to changes in temperature in a precise, repeatable and nearly linear manner.

#### 3.5 LCD Display

Liquid crystals are a phase of matter whose order is intermediate between that of a liquid and that of a crystal. The molecules are typically rod-shaped organic matters about 25 Angstroms in length and their ordering is a function of temperature. The molecular orientation can be controlled with applied electric fields. LCD is made up of two sheets of polarizing material with the liquid crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them, which results in display of character as per the applied voltage in its data lines. The driver is provided to drive the LCD.

#### 3.6 humidity sensor

Humidity is defined as the amount of water present in the surrounding air. This water content in the air is a key factor in the wellness of mankind. For example, we will feel comfortable even if the temperature is 0 degree celsius with less humidity i.e. the air is dry.

#### 3.7 virtual sensing system

Active Webcam captures images up to 30 frames per second from any video device including USB cameras, Analog cameras connected to capture card, TV-boards, camcorders with FireWire (IEEE 1394) interface and from Network cameras.

When the program detects motion in the monitored area, it can sound an alarm, e-mail you the captured images, and start broadcasting or record a video. The program has features to add text captions and image logos to the images, to place a date/time stamp on each video frame, and to adjust the frame rate, picture size, and quality. A webcam is a video camera that feeds or streams its image in real time to or through a computer to computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and email as an attachment.

### 3.8 Flow chart

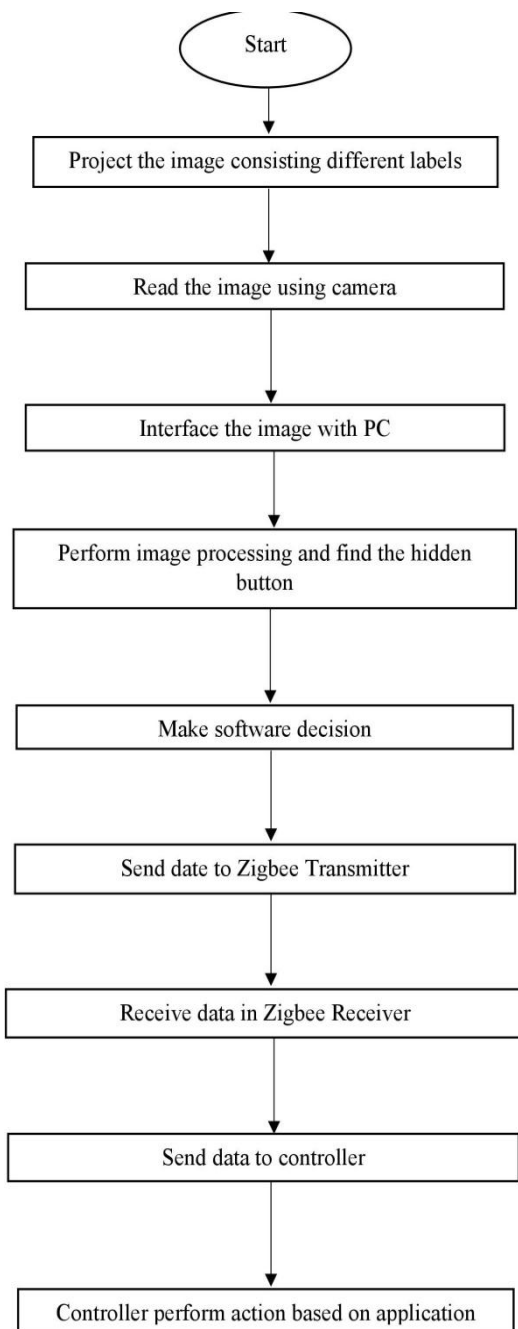


Fig -3:flow chart.

Once the labels with different options are projected on the wall, we wait for the option to be selected. The projector will communicate with the system through USB to RS232 converter. After the option is chosen, the input is read using the camera module which captures the image fixed within the projector. The input image is interfaced with the PCs in which VR1.1 software is used. Image processing is performed to find the selected option from the label. The software makes the decision and sends the data to the ZigBee for transmission. The ZigBee can transmit data over long distances. The data

will be sent to the AVR microcontroller in which a code has been written to perform the operation based on the requirement. From there the data is further sent to node MCU used to support the AVR microcontroller which is programmed using Lua programming language. The controller performs the desired operation through the application. The system will on/off the selected option from the label in the industry.

### 4. RESULTS

#### 4.1 Turning ON the device 1 from the projected label.



Fig -4: When the device 1 ON option is selected by means of virtual touch, the device starts to work.

#### 4.2 Turning ON the device 2 from the projected label.



Fig -5: When the device 2 ON option is selected by means of virtual touch, the device starts to work.

#### 4.3 selection of temperature from the projected virtual label.

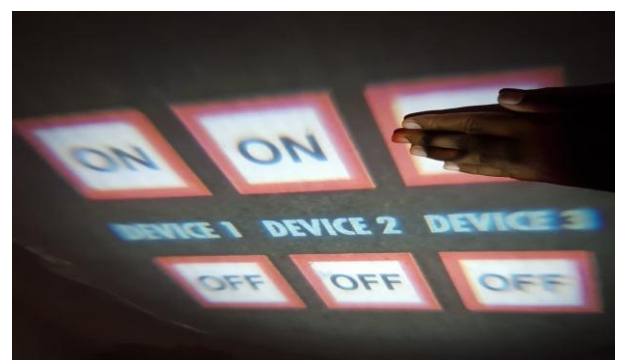


Fig -6: Selection of device 3 ON option.

Selection of this label allows us to sense the temperature of atmosphere.

#### 4.4 selection of humidity from the projected virtual label.



Fig -7: Selection of device 3 OFF option

#### 4.5 Process of simulation after detection

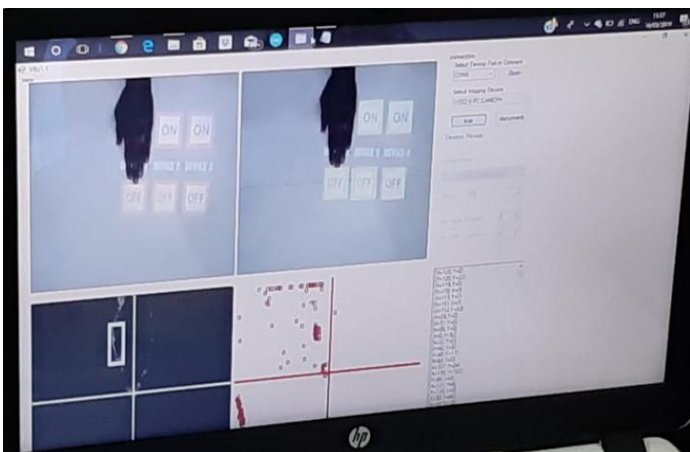


Fig -8: After detection procession using Vr1.1.

In the VR1.1 software, after detection of the device by virtual touch the image processing is performed.

#### 4.6 hardware output



Fig -9: Selection of device 3 OFF option

From the various inputs received the device will work based on the requirements from the user.

#### 4.7 login form for the user

Now login with user name and password on which you have already registered and click on "login" button.

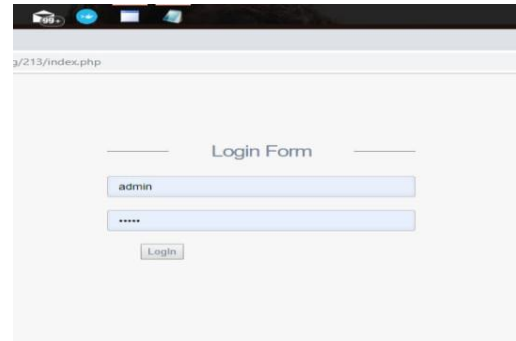


Fig -10: login page.

#### 4.8 Web page

This page indicates the final temperature, humidity calculations.

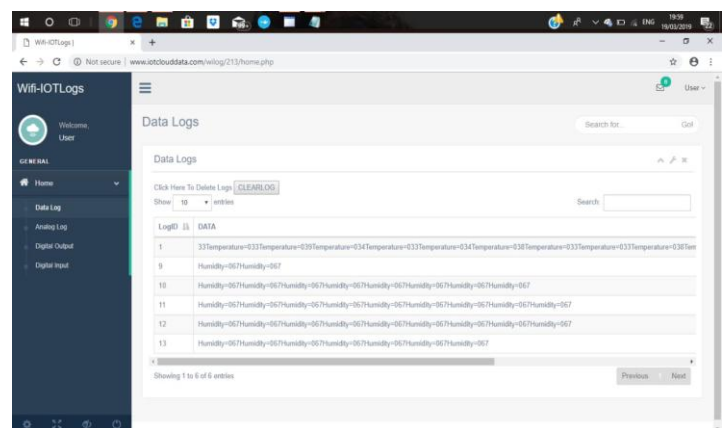


Fig -11: Temperature and humidity live monitoring.

### 5. CONCLUSIONS

In today's industrial standards safety in industries is crucial where a fatal mistake can be catastrophic. Maintaining a safe and healthy working environment is not only an important human resources issue, it's the law. Hence to overcome the hazards, risks the previous methods used various techniques like alarms, immovable devices etc., but the drawback is that of installation location is not easy and is extradionate.

Now to overcome this we are using a projector which is an easy-to-install system consisting of a front projector and a single commodity camera with a large interactive display with virtual touch buttons and sliders on a pale-coloured flat wall. The main advantage is that it is at an affordable cost. Hence this creates an awareness to the employees in an industry about their safety and allows them to work efficiently and effectively.

**REFERENCES**

- [1] L. Biel, O. Pettersson, L. Philipson, and P. Wide. 2001. ECG analysis: a new approach in human identification. *IEEE Transactions on Instrumentation and Measurement* 50, 3: 808–812, 2015.
- [2] Virginio Cantoni, Chiara Galdi, Michele Nappi, Marco Porta, and Daniel Riccio. 2015. GANT: Gaze analysis technique for human identification. *Pattern Recognition* 48, 4: 1027–1038, 2017.
- [3] Timmermans AAA, Spooren AIF, Kingma H, Seelen HAM: Influence of task-oriented training content on skilled arm-hand performance in stroke: a systematic review. *Neurorehabil Neural Repair* 2010, 24(9):858–870, 2014.
- [4] Lemmens RJ, Timmermans AA, Janssen-Potten YJ, Smeets RJ, Seelen HA: Valid and reliable instruments for arm-hand assessment at ICF activity level in persons with hemiplegia: a systematic review. *BMC Neurol* 2017.
- [5] Ali M, Atula S, Bath PM, Grotta J, Hacke W, Lyden P, Marler JR, Sacco RL, Lees KR: Stroke outcome in clinical trial patients deriving from different countries. *Stroke* 2018, 40(1):35–40, 2014.
- [6] Van Delden AE, Peper CE, Beek PJ, Kwakkel G: Unilateral versus bilateral upper limb exercise therapy after stroke: a systematic review. *J Rehabil Med* 2012, 44:106–117, 2013.
- [7] I. J. de Rooij, I. G. van de Port, and J.-W. G. Meijer. Effect of virtual reality training on balance and gait ability in patients with stroke: systematic review and meta-analysis. *Physical therapy*, 96(12):1905–1918, 2018.
- [8] S. G. Hart and L. E. Staveland. Development of nasa-tlx (task load index): Results of empirical and theoretical research. *Advances in psychology*, 52:139–183, 2016.