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A Smart Controlling Application for Home Appliances Based On Virtual Touch Screen

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***Abstract* – Augmented Reality (AR) is basically a real view modified by a computer. It uses computer generated imagery and sounds to enhance one's current perception of reality. While virtual reality (VR) describes an imaginary world that exists in computers and our minds, augmented reality is a mixture of real world and virtual world. The proposed work helps handicap people to turn ON/OFF home appliances without moving their position by fixing the set up in their wheel chair using AR. This set up also prevent the users from getting electrocuted. A projector projects the virtual keys onto the board's surface where users control the devices using a pen, finger, stylus or other device. Touch interaction on a flat surface was supported by the system. To achieve this goal, it is explored with finger's influence on the button's distortion and built a model to describe the button's distortion. As a result, the devices perform the respective action. In the proposed system virtual based display images of buttons are used. Key is pressed and then picture is captured by wireless camera, image is processed in visual studio platform to perform a corresponding task.**

Index Terms: Virtual Reality (VR), Augmented Reality (AR), Human Machine Interaction (HMI) & Virtual Touch Screen (VTS)

1. INTRODUCTION

The concepts behind virtual reality are based upon theories about a long-held human desire to escape the boundaries of the 'real world' by embracing cyberspace. The interaction with this virtual environment is in a more naturalistic manner which will generate new forms of Human-Machine Interaction (HMI).

The aim is to move beyond standard forms of interaction such as the keyboard and mouse which most people work with on a daily basis. This is seen as an unnatural way of working which forces people to adapt to the demands of the technology rather than the other way around. But a virtual environment does the opposite. It allows someone to fully immerse themselves in a highly visual world which they explore by means of their senses. This natural form of interaction within this world often results in new forms of communication and understanding.

Home automation is one of the major applications which is emerging. The home automation system is implemented using Zigbee. Its frequency is of 2.4GHz. It can link devices within 10m to 100m at a speed of 3Mbps. There exist few concerns while designing a home automation system, integrity and scalability play a vital role. Also, it should provide a user-friendly interface. This interface should also provide some diagnostic services so that if there is any problem with the system, it can be tracked down. Moreover, the overall system should be fast enough to realize the true power of wireless stechnology. Finally, the system should be cost-effective in order to justify its application in home automation. Neng[1] has presented and architecture for home automation where the system was based on a dedicated network.

This system only shows how to solve home automation problems at the software level and no hardware aspects were considered.

Yavuz et al. [2] presented a telephone and PIC based remote control system where pin-check algorithm has also been introduced. Also, to remote control of home appliances such as an oven, air conditioner and computer by telephones which offer easy usage has been investigated.

Communication takes place via a dedicated telephone line not via a Bluetooth technology. Other studies such as ones presented have examples of web-based automation. However, they are not too feasible to be carried out as a low-cost solution. Lately, Al-Ali et al. [3] introduced a low-cost Java- Based Home Automation System, without highlighting the low-level details of the type of peripherals that can be attached. Neng- Shiang Liang et al. [1] proposed advanced development in computer technology, the microprocessors are not only on the desktop but also exist everywhere. It has been common that microprocessors are embedded in Electronic Appliances (EAs) in our home today. In the past, the EAs are working stand-alone and cannot cooperate with one another. But in the recent years, these appliances can be monitored and controlled by embedded microprocessors

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and be displayed on terminals, but they are still in lack of integration. Due to the advent of advanced computer and wide-band network, the personal computer-based environment seems to be a very suitable platform for system integration.

Virtual Touch Screen using Microsoft Kinect is a depth-sensing and projection system that enables interactive touch applications on everyday planar surfaces. It provides capabilities similar to that of a mouse or touch screen. Touch screen surfaces are becoming prevalent, since they are capable of detecting theuser's actual touch points that is the points of contact on the surface. This project presents a practical solution to achieve touch on any planar surface based on mounting a single

powerful computation and easy display. Such abilities to develop an integration system. Yavuz et al. [2] proposed secure PIC based remote control system for intelligent houses been presented. With this implemented system, it is possible to safely control electricity operated domestic devices by the help of public or mobile phones from any places all over the world. Developed remote control device has been optically and electrically isolated to secure the system. In addition, the system implemented and introduced in this paper has pin-check algorithm in order to enlarge security

A wireless, ambulatory, real-time, and auto alarm intelligent tele-ardiology system to improve healthcare mobile patient monitoring system was designed, developed, and tested by Al-Rousan et al. [3]. The authors integrated current personal digital assistant and wireless local area network technology. At the patient's location, a wireless Personal Digital Assistant (PDA) based monitor is used to acquire continuously the patient's vital signs including heartbeat, lead ECG, and Blood Oxygen Level (SpO2). Through the Wireless Land Area Network (WLAN), the patient's bio signals can be transmitted in real time to a remote center for data storage and management unit. The authorized medical staff can access the data and patient's history via wireless device

Ekta Parwani et al. [4] proposed virtual touch screen using image with integrated cameras and store the same image onto integrated flash memories based on touch screen. This is especially true of Smart phones. But the smart phones are not guarantee the projector image or content dimensionality to be uniform. The content is displayed in a large format based on touch screen. Pico projector is been used as display device. Bare Finger 3D Air-Touch System Using an Embedded Optical Sensor Array for Mobile Displays has been developed by Guo-Zhen Wang et al. [5]. Normally, 3D interactive systems are used in systems with large displays and are not commodity depth camera that is a Microsoft Kinect above a horizontal surface and using a projector for projection purpose. Using Microsoft Kinect to detect touch has significant advantages: firstly, the interactive surface should not be instrumented. Secondly it is more accurate and cost effective. A Virtual Touchscreen with Depth Recognition proposed by Gabriel Hartmann et al. [5]. While touch interfaces have become more popular, they are still mostly confined to mobile platforms such as smart phones and notebooks. Mouse interfaces still dominate desktop platforms due to their portability, ergonomic design and large number of possible interactions. In this paper a prototype for a new interface based on cheap consumer-level hardware, which combines advantages of the mouse and touch interface, but additionally allows the detection of 3D depth values. This is achieved by using a web cam and point light source and detecting hand and shadow gestures in order to compute 3D finger tip positions.

The Virtual Touch Screen In Computers By Accelerometer Sensor: Nirmala Sandhya D et al. [6] enabled the virtual touch screen in computers by accelerometer sensors. In present days, few electronic devices are used to capture the resolving ambiguity in the location of the RF source. The unique property of this design is its ability to precisely reconstruct the minute details in the trajectory shape, even when the absolute position might have an offset.

METHODOLOGY

EXISTING SYSTEM

From the literature it is shown that the existing systems are more time consuming for the operation. The system utilizes wired technology & consumes more power for the application.

PROPOSED SYSTEM

The proposed system should be suitable for portable devices. To "touch" a floating 3D image displayed from a mobile device, proposed a camera-free, 3D, interactive, virtual-touch system for bare fingers. By embedding optical sensors into the display pixels and adding angular scanning illuminators to the edge of the display, a flat panel can sense the images reflected off a bare finger. The 3-axis (x, y, z) information of the fingertip can be determined by analyzing these reflected images. The proposed 3D virtual-touch system functions with a 4-inch mobile display.

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Virtual Touch Screen in the Air Using RF Signals proposed by Jue Wang et al.[8] Prior work in RF-based positioning has mainly focused on discovering the absolute location of an RF source, where state-of-the art systems can achieve an accuracy on the order of tens of centimeters using a large number of antennas. However, many applications in gaming and gesture based interface see more benefits in knowing the detailed shape of a motion. In this paper, that one can provide a dramatic increase in trajectory tracing accuracy, even with a small number of antennas. The key enabler for our design is a multi-resolution positioning technique that exploits an intrinsic tradeoff between improving the resolution and sensing and control the virtual reality. The shadow area is segmented by a brief change of the button to a different color when large foreground (i.e., the hand and its shadow) covers the button region. There is no time-consuming operation of this system. A large interactive display with virtual touch buttons on a pale-color flat wall. It is easy-to-install system consists of a front projector and camera.

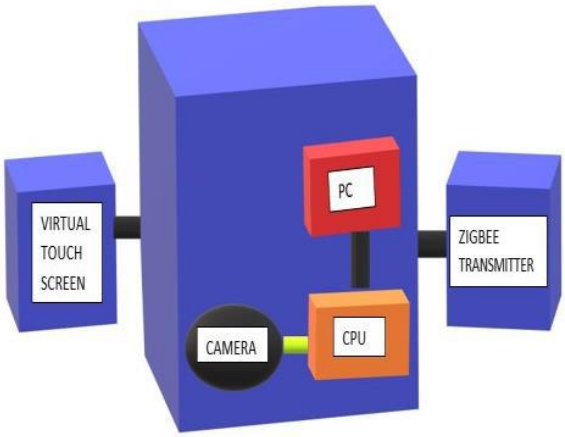
Virtual reality sensing and control

A large interactive display with virtual touch buttons on a pale-colored flat wall.

No time-consuming operation of this system

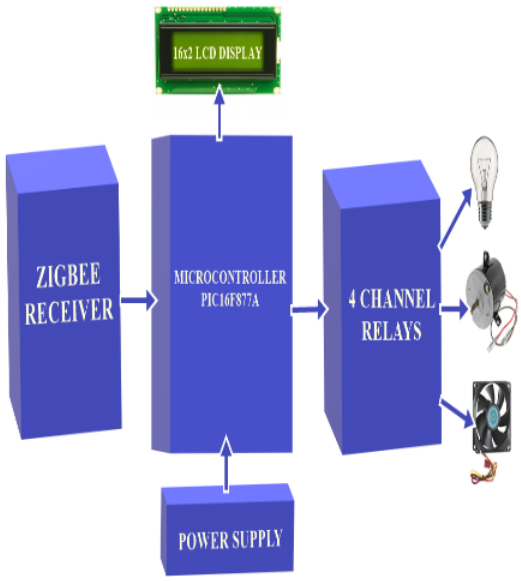
It is easy-to-install system consists of a front projector and camera.

BLOCK DIAGRAM
TRANSMITTER



Transmitter Block Diagram

RECEIVER



Receiver Block Diagram

WORKIING

Virtual touch screen:

The virtual touch screen may be a plane wall or any other flat surface.

This screen gives a feel of touching the device control unit for controlling the devices.

When the screen is touched the devices are controlled based upon the touch(either ON or OFF).

Virtual Reality sensing system:

The touch made is identified using the camera that is fixed with the virtual reality sensing device.

The touch is identified using the background subtraction methodology, through which the shadow of the finger alone is taken for controlling the devices.

Wireless Transmitter:

It uses Zigbee 1.2 for home automation.

Zigbee helps in getting the signal from the sensing system, processes it and sends to the receiver.

Wireless Receiver:

This circuit helps in receiving the signals from the transmitting unit through Zigbee.

Microcontroller:

Microcontroller is hardcoded with the inputs it has to take from the sensing unit.

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Relay Unit:
Acts as a switch, which helps in identifying the touch made and switch on or switch off the device as per the input received from the microcontroller.

RESULT AND ANALYSIS

The virtual image is projected in the screen from the projector. The virtual sensing unit along with the camera helps in detecting the touch made by the user. The methodology used in the system is background subtraction method or foreground subtraction method.

Projector

Virtual Image on the Wall

This is used in the field of image processing wherein foreground image is extracted for further processing. The following are the various categories of reference images that can be subtracted from the camera input images:

REAL BACKGROUND: By memorizing the image of the screen whenever a virtual button image is projected.
DYNAMICBACKGROUND ESTIMATION: Estimating pixel values of background at each pixel based on many input frames.
BACKGROUND SYNTHESIZATION: By predicting the image of each pixel from the mapping relation derived by comparing the projected image and the reference samples taken by **the camera during system initialization.**

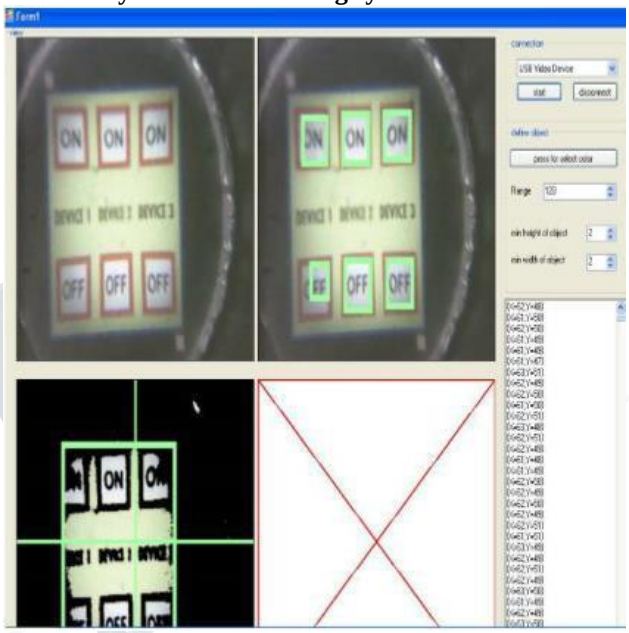

Image acquisition and processing

Camera as Sensing unit

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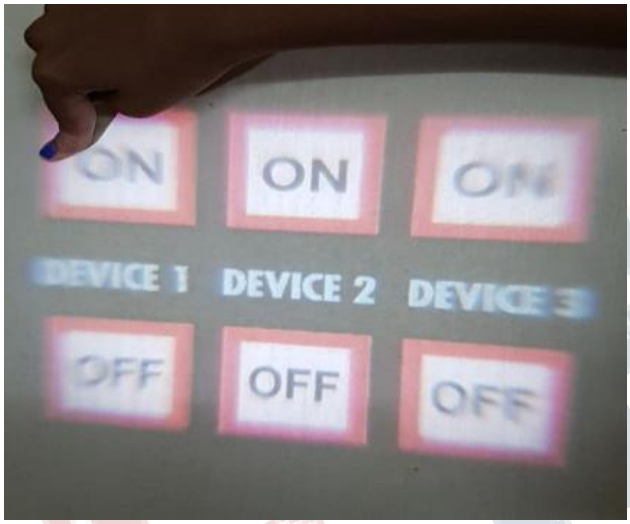
Depending upon the touch the data is sent to the micro controller. As the micro controller is already programmed the hardcoded data is sent via transmitting Zigbee to the receiving Zigbee. The microcontroller stores the program in ROM.

When the button ON for device 1 is turned ON, the motor that is connected with the relay runs.

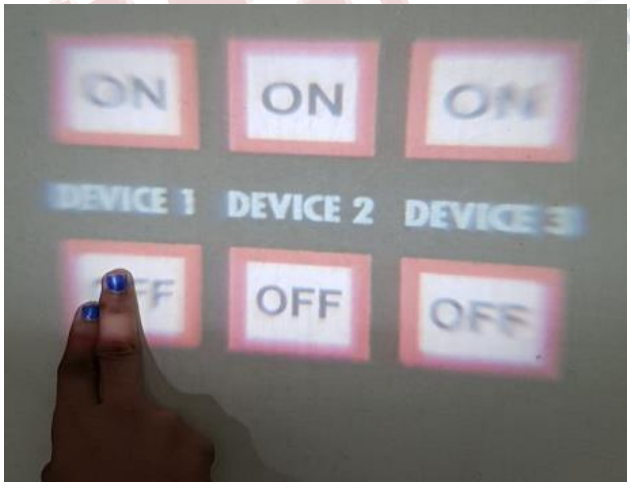
When the button OFF for device 1 is turned OFF, the motor turns off.

When the button ON for device 2 is turned ON, the fan that is connected with the relay runs

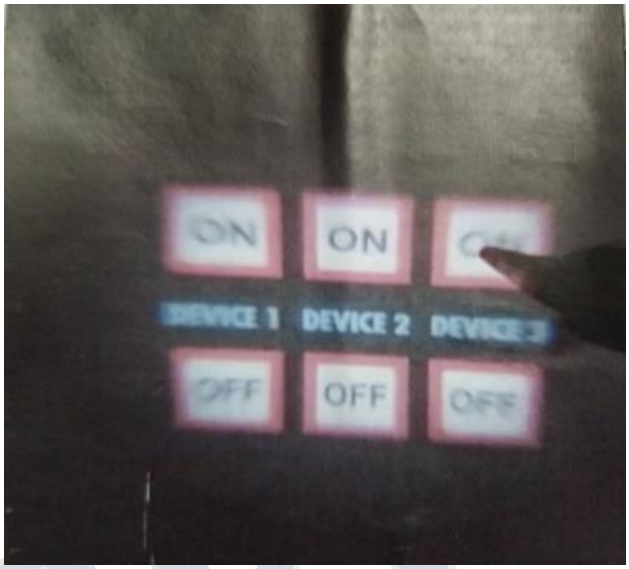
When the button OFF for device 2 is turned OFF, the fan turns off.



Device 1 ON



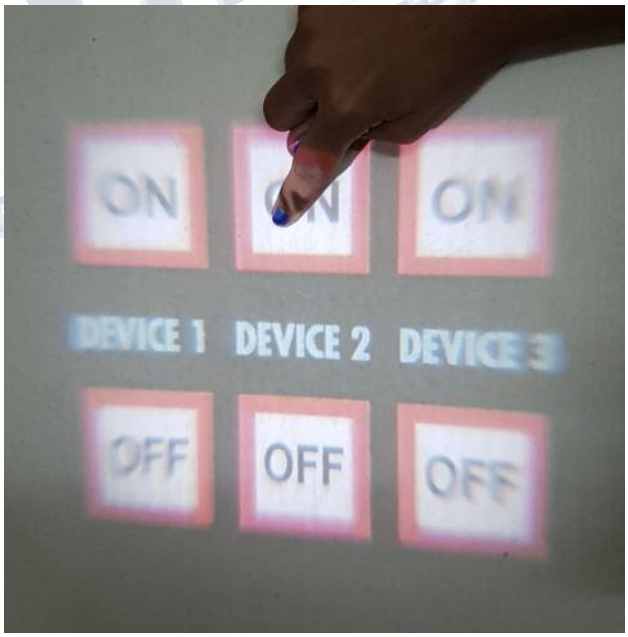
Device 1 OFF



Device 3 ON

When the button ON for device 3 is turned ON, the bulb that is connected with the relay runs.

When the button OFF for device 3 is turned OFF, the bulb turns off.



Device 2 ON

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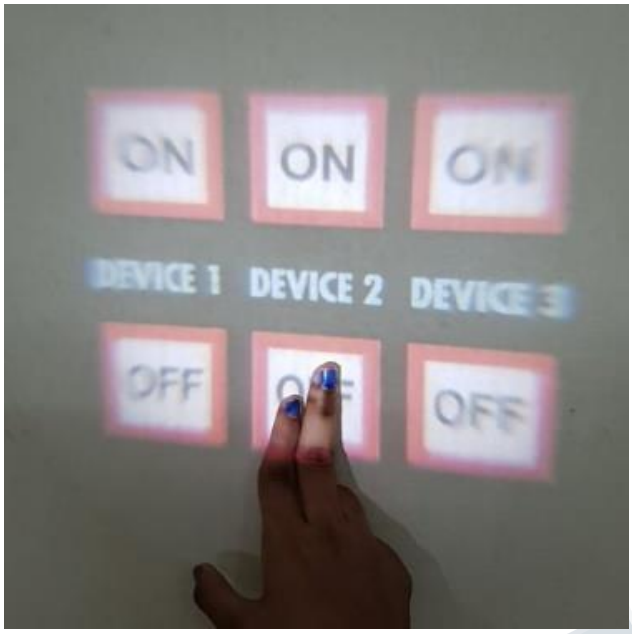
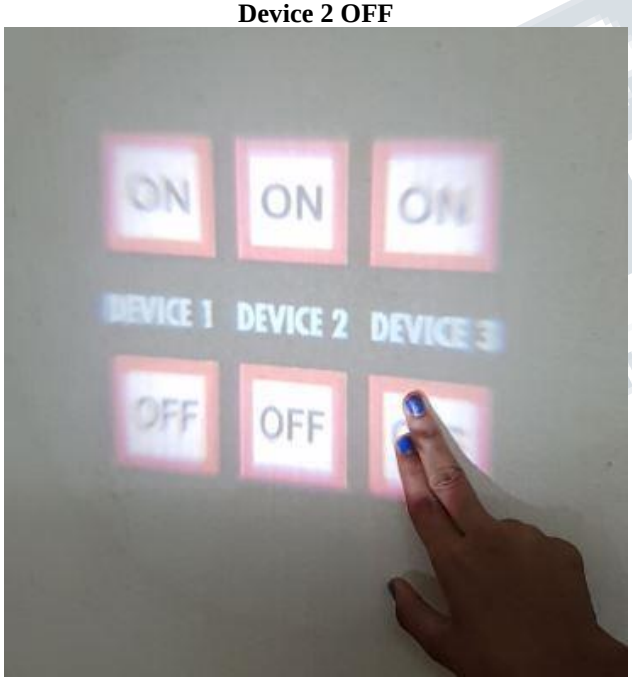


Device 2 OFF



Device 3 OFF

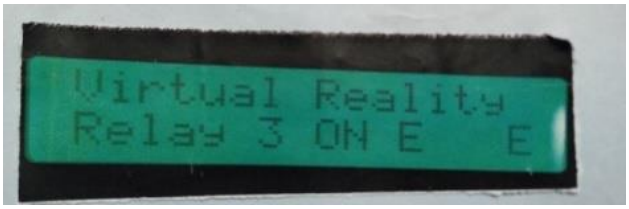
Depending upon the touch the data is sent to the micro controller. As the micro controller is already programmed the hardcoded data is sent via transmitting Zigbee to the receiving Zigbee. The microcontroller stores the program in ROM.

The LCD display shows the status of every devices. The device is switched on or off based upon the data received by opening or closing the relay unit.

CONCLUSION AND FUTURE ENHANCEMENT

In this proposed system, a large interactive display named VIRTOS, with virtual touch buttons, which consists of a projector, a pale-colored wall, a computer, and one commodity camera as a highly practical and useful projector-camera system. The accuracy of our touch button and the response of the touch are evaluated. These evaluations show that VIRTOS is suitable for practical applications. The size of the projector can be reduced in the future and can be made handy.

Response to touch



LCD Display

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