VIRTUAL REALITY APPLIANCE CONTROL SYSTEM

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Abstract

Technologies these days have made the process of design and implementation of embedded based systems for controlling home-appliances (Home Automation) more advanced and reliable. Virtual Reality has seen a growing demand for smart home automation systems. In appliance control, there is an issue of "delay time" which can be unpredictable. Thus, direct teleportation architecture is proposed. Through this specific architecture, the trajectory error of the appliance control which is controlled via the internet is minimized. An important aspect of virtual reality is that it is not only used conventionally for simulating the behavior of a system but also used in parallel with the real system to improve quality control. In this paper, we intend to present a low-cost but yet flexible, feasible, and secure virtual reality-based home automation system. Through this proposed system we will aim to control tube lights, motor, and other home appliances by giving a 230v power supply.

Introduction

Virtual Reality is the term used when computer technology is used to create a simulated environment. Instead of viewing a screen/surface in 2-Dimensions as always, users are immersed in an entire new world of viewing and interacting with the 3-Dimensional worlds. Virtual Reality has its importance and uses in a variety of fields like Military, Education, and Medicine. This technology enables humans to get immersed in a highly visual world which they explore by means of their senses. To be very specific virtual reality can aid the process of effective training of individuals virtually and this is very important in these times of pandemic. In the field of education VR bridges the gap between instructors and learners and enhance the learning process by teleporting themselves into the VR world. This is just an example of why VR can be/will be the future. Chih-Hung Wu et al.,[1] designed a Wireless Arm Based Automatic Meter Reading and Control System. This technique was used to calculate electricity using digital meter. The main advantage of this project is that it reduced the error rate. By this an error free reading was calculated. The disadvantage of this project is that it is not intimate to the user. Bo Chen et al [2]., proposed a Zigbee technology for the application on wireless meter-reading system. Here, Zigbee technology is used for getting meter reading on wireless mode. Zigbee is only used for short communication distance and it works only for peer-to-peer communication. There will be no database created in this project. And also, user will not be able to get the bill cycle at the middle of the process. Later, in 2009, Li Xiaoguang Hu et [3]., implemented an Arm- Based Power Meter Having Wi-Fi Communication Module. The technology used here is Wi-Fi. Wi-Fi technology is limited within a building. And also we cannot fetch the data from the board. Nowadays, a variety of techniques are used to hack the Wi-Fi password, thus it's not safe to access the database. Several other home automation systems are developed in order to make our life better and easier [4]-[10].

I. VIRTUAL REALITY APPLIANCE CONTROL SYSTEM

The appliance control system based on virtual reality consists of a Virtual Reality Sensing Device with 2D 328 specifications, which senses the movement of the user's hand made against a surface. This virtual Reality sensing device consists of a camera, a monitor and a CPU. This is then connected to a PC and projects the details from the PC on to a wall/surface. Since this project involves operating home appliances like Fan, TV more conveniently and without moving from one place to another, the details on the PC will be built-in options like ON or OFF OR it could be anything else required to operate a device. The camera in the Virtual Reality Sensing Device will sense the hand movements on the wall. Now if the user hand moves towards the ON sign then the camera will capture this hand movement and displays it on the PC. The PC is connected to a Zigbee Transmitter (2-Channel 5V Relay Module Version 3) through which this information is passed on to the receiver. On the Zigbee Receiver side there is a microcontroller board connected. Since the microcontroller (Arduino Uno R3) cannot supply 230V completely to the load or home appliances, there is a relay unit in the between in order to facilitate the power reaching the load through which the device is controlled. The information received by the Zigbee Receiver is processed by the software named Visual basic. Here, Proteus 8.6 is used to execute the code. Further, the Embedded C code is dumped into the Atmega controller using Arduino IDE.

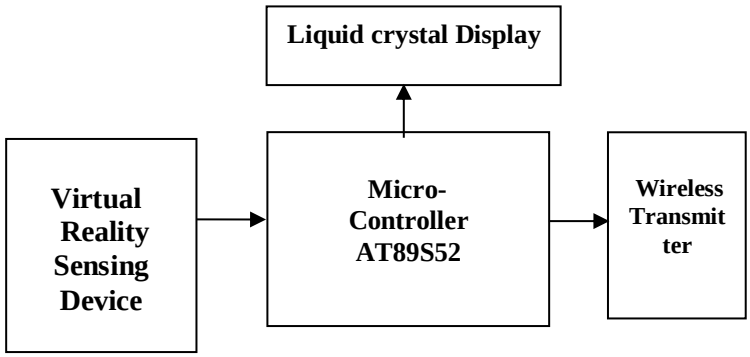


Fig. 1: Transmitter Section

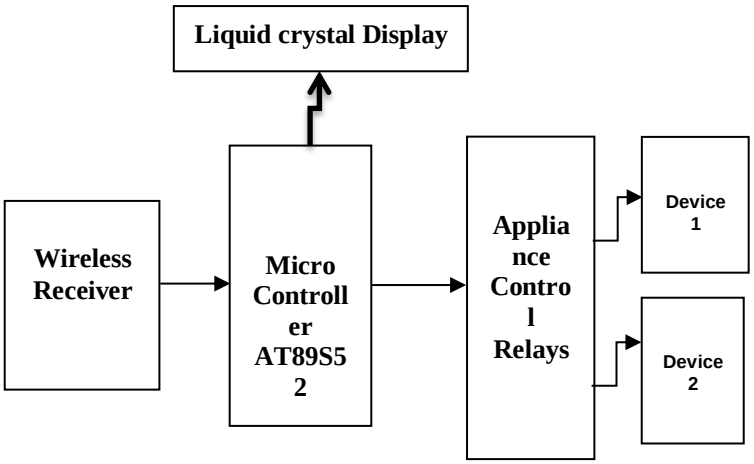


Fig. 2: Receiver Section

The transmitter section of the virtual reality appliance control system is shown in Fig.1. A Virtual Reality Sensing System (Fig. 4) is the major component in the transmission section. The Virtual Reality Sensing System consists of a camera which displays the image of the ON or OFF device option on a plain wall. The appliances can be controlled by moving the hand in front of the required device option. The Virtual Reality Sensing System captures the movement of the hand and this information is given to the PC via the Zigbee Transmitter. The information obtained is processed by the software named Visual Basic (Fig. 7).

The receiver section of the virtual reality appliance control system is shown in Fig.2. A wireless Zigbee receiver (Fig. 5) plays a major role on the receiver section. The Zigbee receiver is directly connected to a Microcontroller (Fig. 3). The control signals are given to all appliances by the microcontroller board via a relay unit. Since a direct supply of 230V to the load is not possible, there is relay unit to compensate the transfer of power, in order to switch ON or OFF the particular devices (Fig. 8).

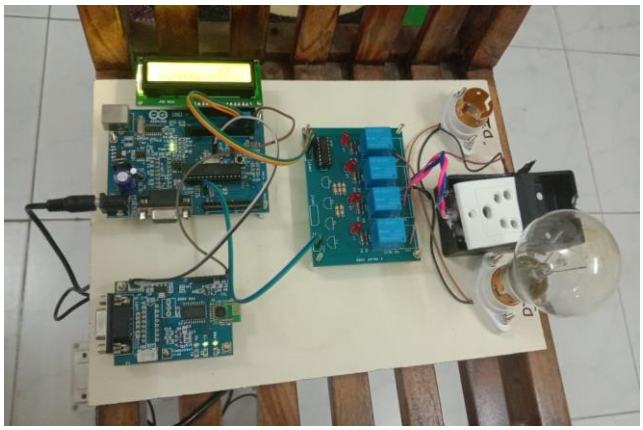


Fig. 3: Arduino UNO board, Zigbee Transmitter, Relay Board, LCD, Load

Fig. 4: Virtual Reality Sensing Device

Fig. 5: Zigbee Receiver

IV RESULTS AND DISCUSSION

The proposed system consists of both hardware and software modules. The main hardware components used are virtual reality sensing device: 2D 328P, Arduino uno R3, 2-channel 5V relay module and Zigbee transceiver. The software used for the system are Visual basic, Arduino ide and Proteus 8.6. All codes required for the simulation is written in Embedded C language. The experimental results of the proposed virtual reality appliance control system is shown below.

INPUT

The input to switch ON or OFF a particular device is sensed by the Virtual Reality Sensing Device according to the hand movement against the image projected on the wall is shown in Fig. 6.

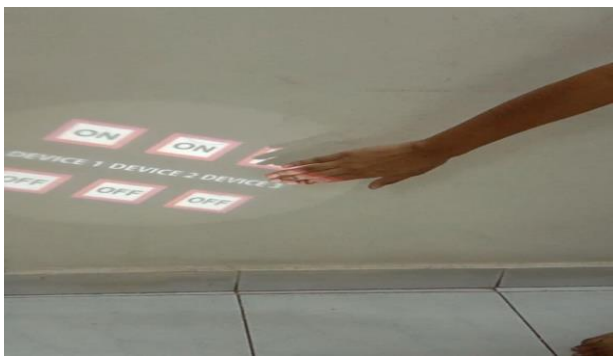


Fig. 6: Projected image

SOFTWARE PROCESSING

The information to Switch ON or OFF a device is received through the Zigbee Receiver and is further processed on the PC by using the Visual Basic Software. A screen shot of the software processing is shown in Fig.7.

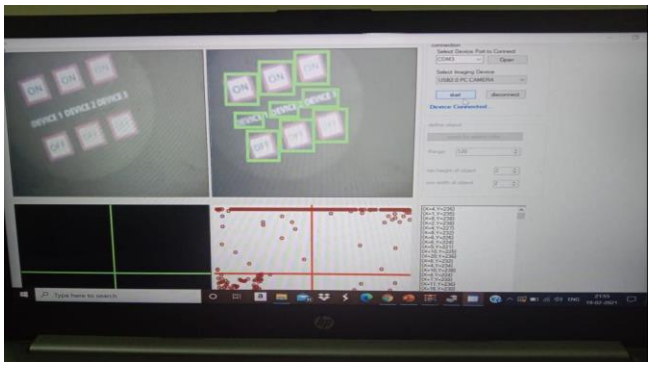


Fig. 7: Visual Basic Software Processing

OUTPUT

Based on the command received from the transmitter section, the receiver section processed the received command and the required device is switched ON or OFF. A demonstration of the proposed virtual reality appliance control system is shown in Fig.8.

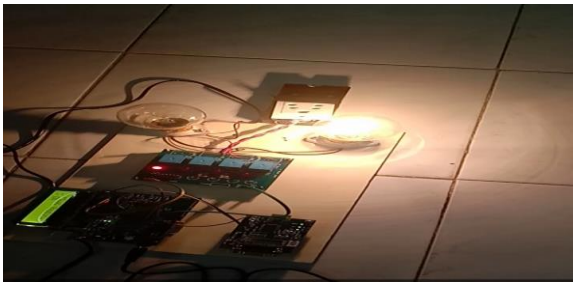


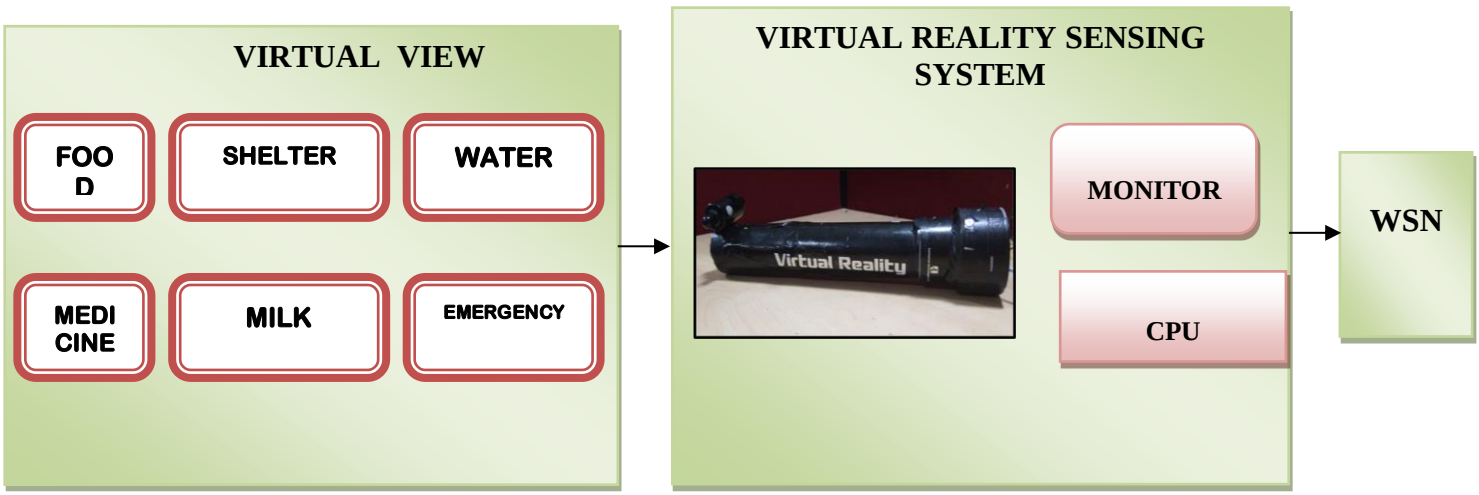
Fig. 8: Output

FUTURE ADVANCEMENTS
Projected VR system for Flood Management

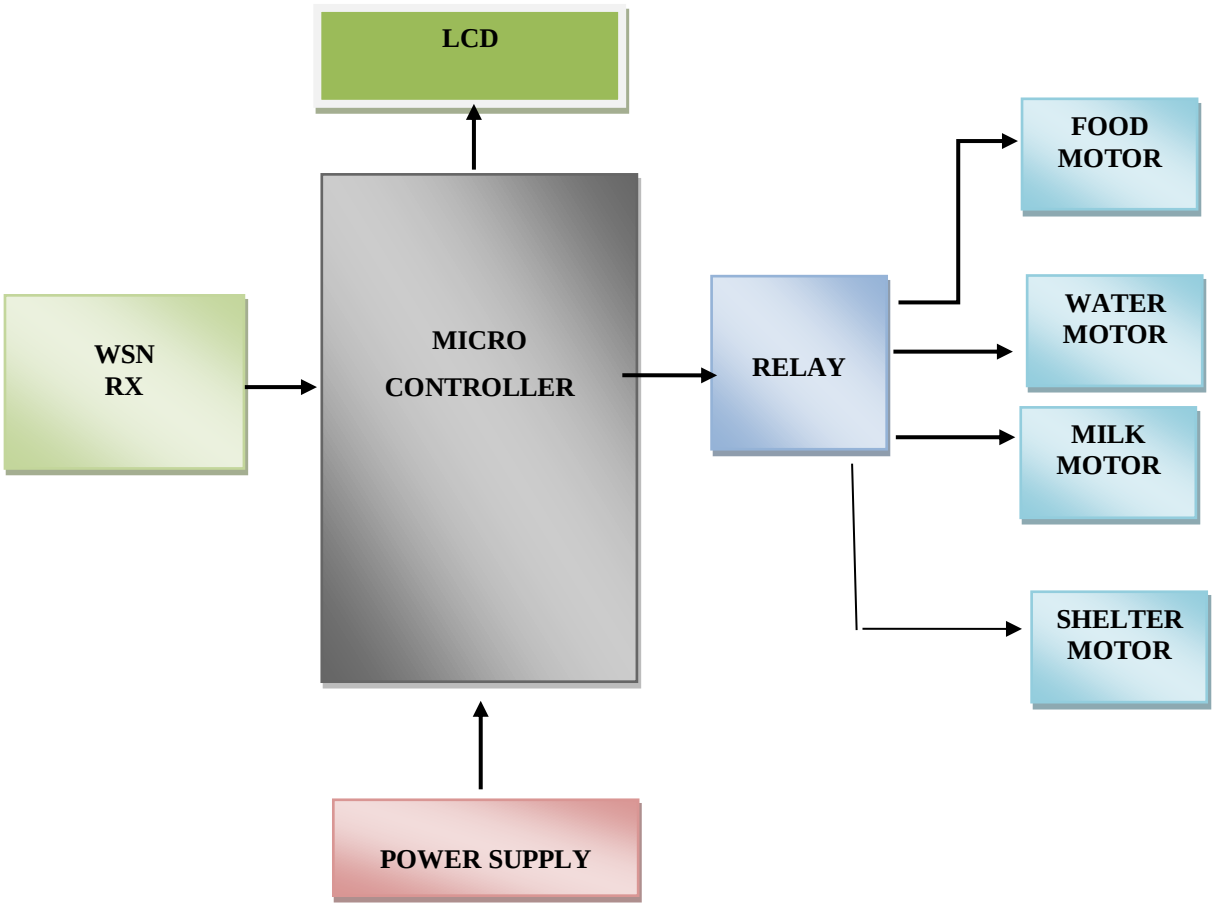
Virtual Reality is seen as the high-end of human-computer interactions and it has the potential to target a wide range of applications .During the flood, it is difficult to communicate with the people by the rescue team from the helicopter. It is not possible to interact with everyone directly. Because there won't be any mode of communication during the disaster.

The VR system helps to communicate with the people. The prediction of human motion in order to constructively steer users away from the boundaries of the physical space is done by the redirected walking algorithm. Since, a virtual trajectory might be represented using straight lines connecting waypoints of interest; this typical user behavior is not represented by the simple model. This model has been implemented within a framework that can be used for redirect walking within different virtual and physical environments. It is useful for the analysis of redirected parameters under varying conditions. In the proposed system a projection is made from the helicopter to the ground. When a person stands on a specified location, that particular message is gathered. This helps to communicate with the affected people.

Transmitter Section:



Receiver Section:



V. CONCLUSION

A virtual reality-based appliance control system is developed for controlling the home appliances using hand gestures. Thus, the experimental setup has enabled the operation of home appliances by capturing hand movements using the Virtual Reality Sensing Device. The proposed system can be used to control light, motor and other home appliances by giving 230v power supply.

REFERENCES

[1] Chih-Hung Wu, Etc., (2004) "Design of a Wireless Arm Based Automatic Meter Reading and Control System", Power Engineering Society General Meeting. IEEE 6-10, Vol.1, pp.957-962.

[2] Bo Chen; Mingguang Wu; Shuai Yao; Ni Binbin, (2006) "Zigbee Technology and its Application on Wireless Meter-Reading System", Industrial Informatics IEEE.

[3] Li, Xiaoguang Hu, (2009) "Design of an Arm- Based Power Meter Having Wi-Fi Communication Module" IEEE

[4] Neng- Shiang Liang; Li-Chen Fu; Chao-Lin Wu. Integrated, flexible, and Internet-based control architecture for home automation system in the internet era". *Proceedings ICRA `02. IEEE International Conference on Robotics and Automation*, Vol. 2, pp.1101-1106, 2002.

[5] E. Yavuz, B. Hasan, I. Serkan and K. Duygu. "Safe and Secure PIC Based Remote Control Application for Intelligent Home". *International Journal of Computer Science and Network Security*, Vol. 7, No. 5, May 2007.

[6]P. Lin and H. Broberg. "HVAC Applications". *IEEE Industry Applications Magazine*, pp.49-54, January 2002.

[7] A.R.Al-Ali and M. AL- Rousan. "Java-Based Home Automation System". *IEEE Transaction on Consumer Electronics*, Vol.50, No. 2, May 2004.

[8]B. Koyuncu. "PC remote control of appliances by using telephone lines". *IEEE Transaction on Consumer Electronics*, Vol. 41, Issue 1, pp.201-209, 1995.

[9] S. Schneider, J. Swanson and Peng-Yung Woo. "Remote telephone control system". *IEEE Transaction on Consumer Electronics*, Vol.43, Issue 2, pp.103-111, 1997.

[10] K.Tan, T.Lee and C.Yee Soh. "Internet-Based Monitoring of Distributed Control Systems-An Undergraduate Experiment". *IEEE Transaction on Education*, Vol. 45, No. 2, May 2002.