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Device Control based on Wireless Virtual Reality Technique using Artificial Intelligence

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ABSTRACT

Current technology and trend have made designing and implementation of embedded systems for home automation has increased the capabilities and features. There is a demand for smart home automation access via virtual reality. The proposed system allows the owner to access via virtual reality and control the home appliances. This is very easy to access. In this paper, we present the design and implementation of a low cost but yet flexible, feasible and secure virtual reality-based home automation system. In our proposed system we will try to control light, motor and 230v supply. This work also demonstrates the use of virtual reality in the context of the appliance control. In this project we have used image processing techniques for image acquisition, pre-processing, image segmentation and feature extraction. The user commands are captured by the camera and transmitted through wireless communication to the receiver end. Thus our project has a huge scope for training and development business using the virtual image and setting up a virtual environment.

Keywords: *Image Processing Techniques, Image Acquisition, Reprocessing Image Segmentation, and Wireless Communication.*

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. Once there we can interact with this virtual environment 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 Bluetooth technology. Its frequency is of 2.4GHz. It can link devices within 10m to 100m at a speed of 3Mbps. With this capability of Bluetooth, we propose a home automation system based on Bluetooth technology. 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. It includes few challenges like devices can be easily setup, monitored and controlled. 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

technology. Finally, the system should be cost-effective in order to justify its application in home automation. Neng 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 and Hasan 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 and AL-Rousan introduced a low-cost Java- Based Home Automation System, without highlighting the low-level details of the type of peripherals that can be attached.

Virtual Reality:

Virtual Reality board designed to meet new forms of human-machine interaction (HMI). The advantage that enables the embedded system designer to easily, quickly and seamlessly add with the microcontroller by UART to their applications.

Virtual Reality board can easily interface with PC or Laptop by the USB driver provided. By running the setup application, you can adjust the distance by viewing the camera image available in the PC or Laptop in which the optimize interaction can do.

2. EXISTING METHOD

- The existing system is literally Internet Based controlling system, so stream o data connection is required is access the devices.
- If it is related to Bluetooth technology, it Needs Network and costlier, so spending for a normal device is useless.
- A system based controlling is only done using Radio Frequency, Zigbee. In this huge data transmission is restricted.
- External devices like the system, smartphones needed to access the devices which require separate maintenance and separate charging and discharging.

3. PROPOSED METHOD

Here, we propose an alternate method to reduce the use of external devices and continuous data supply for a long term by using,

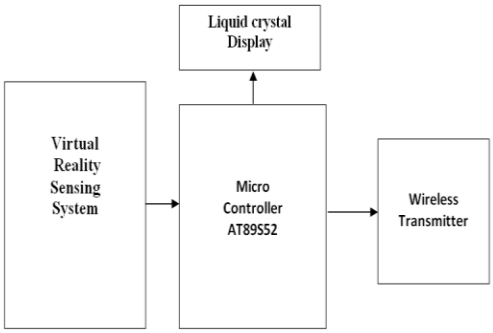
- It uses Virtual reality sensing and control, for easy access.
- Easy to access by any kind of age peoples.
- It would be so useful for aged peoples to access home appliances and to use access from anywhere.
- It sets a huge scope in training and development business by setting up a virtual environment to them and also to provide 100% efficient use.

Virtual Reality board can easily interface with PC or Laptop by the USB driver provided. By running the setup application, you can adjust the distance by viewing the camera image available in the PC or Laptop in which the optimize interaction can do.

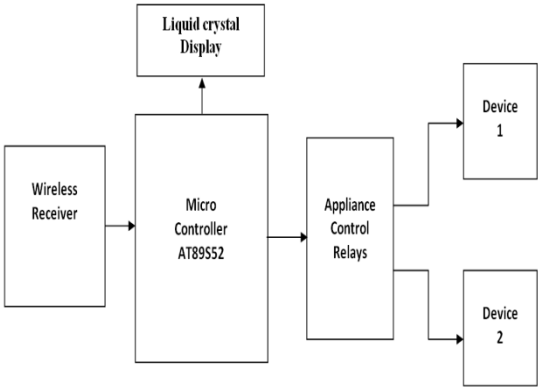
Block Diagram of Proposed System

BLOCK DIAGRAM

Transmitter



DESTINATION



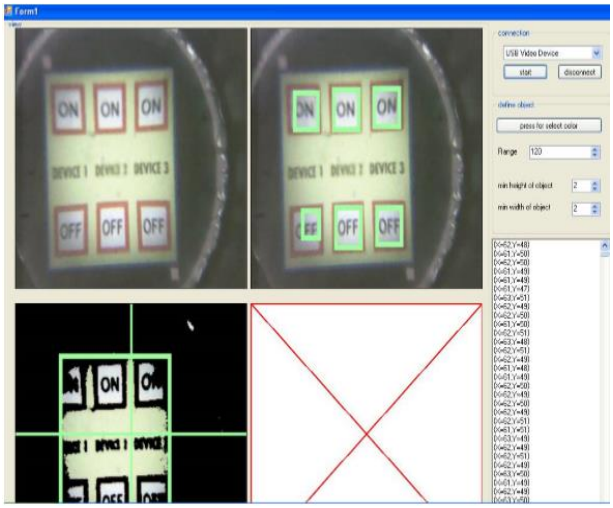
MODULES:

Virtual Reality transmitter
Setting up screen for appliance control
Sensing of user input
Wireless Transmission

Virtual Reality Transmitter

A hologram is a photographic recording of a light field, from an image formed by a lens. Every point in a hologram catches light waves that travel from every point in the object. That means wherever you look at a hologram you see exactly how light would have arrived at that point if you'd been looking at the real object. So a hologram is effectively a permanent record of what something looks like seen from any angle.

SETTING UP SCREEN FOR APPLIANCE CONTROL



The virtual image is been projected and analyzed using a camera. We have developed a C++ program to analyze the image. We input a camera image as an input image then feature detection technique is used to find out the interesting point in an image and then extracted part is mapped as a viewing coordinate of a user with the addition of a virtual environment features.

A. Corner Detection

Now, when the edges are detected so our next job is to determine the corners using those edges. Corners may be defined as the intersection point of horizontal and vertical edges. In the extraction of the image of an object, it is necessary to obtain left top and right bottom corners to define coordinate of the image.

B. Object Tracking and Recognition:

It is a technique in which an object is oriented at a virtual plane. In this an object with corners ABCDELMN is projected on a virtual environment is disturbed and values would be changed when the external object is placed in the virtual image screen.

Augmented Image = Data from feature extraction + Real World coordinate + Virtual.

WIRELESS COMMUNICATION:

ZigBee is a specification for a suite of high-level communication protocols using small, low-power digital radios based on the IEEE 802.15.4-2003 standard for wireless personal area networks (WPANs), such as wireless headphones connecting with cell phones via short-range radio. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth. ZigBee is targeted at radio-frequency (RF) applications that require a low data rate, long battery life, and secure networking.

4. EMBEDDED SYSTEMS

Embedded systems are computer systems in the widest sense. They include all computers.

Most commercial embedded systems are designed to do some task at a low cost. Most, but not all have real-time system constraints that must be met. They may need to be very fast for some functions, but most other functions will probably not need speed. These systems meet their real-time constraints with a combination of special purpose hardware and software tailored to the system requirements.

It is difficult to characterize embedded systems by speed or cost, but for high volume systems, cost usually dominates the system design. Often many parts of an embedded system need low performance compared to the primary mission of the system. This allows an embedded system to be intentionally simplified to lower costs compared to a general- purpose computer accomplishing the same task, by using a CPU that is just “good enough” for these secondary functions.

Embedded systems reside in machines that are expected to run continuously for years without errors. Therefore the software is usually developed and tested more carefully than software for Personal computers. Many embedded systems avoid mechanical moving parts such as Disk drives, switches or buttons because these are unreliable compared to solid- state parts such as Flash memory.

In addition, the embedded systems may be outside the reach of humans, so the embedded system must be able to restart itself even if catastrophic data corruption has taken place. This is usually accomplished with a standard electronic part called a watchdog timer that resets the computer unless the software periodically resets the timer.

CLASSIFICATIONS

Embedded Systems are divided into four major categories:

1 Autonomous

2 Real- Time

3 Networked

4 Mobile

Autonomous:

Autonomous Systems function in standalone mode. Many embedded systems used for process control in manufacturing units and automobiles fall under this category. In process control systems the inputs originated from transducers that convert a physical quantity, such as temperature into an electrical signal. The system’s output controls the device. In standalone systems, the deadlines or response times are not critical. An air-conditioner can be set to turn on when the temperature reaches a certain level, measuring instruments and CD players are examples of Autonomous Systems.

Real-Time:

Real-Time embedded systems are required to carry out specific tasks in a specified amount of time. These systems are extensively used to carry out time-critical task in process- control. For instance, a boiler plant must open the valves if the pressure exceeds a particular threshold. If the job is not carried out in the stipulated time, a catastrophe may result.

Networked:

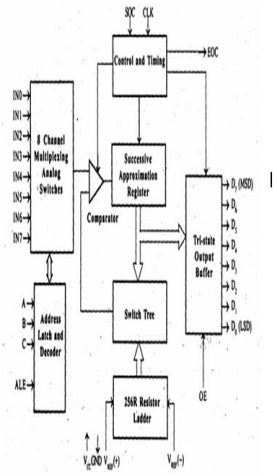
Networked embedded systems monitors plant parameters, such as temperature, pressure, and humidity will send the data over the network to a centralized system for online monitoring. A networked-enabled web camera monitoring the plant floor transmits its video output to a remote controlling organization.

Mobile:

Mobile gadgets need to store databases locally in their memory. These gadgets have powerful computing and communication capabilities to perform Real-Time as well as non Real-Time tasks and handle multimedia applications. The gadgets embedded powerful processor and OS, and a lot of memory with minimal power consumption.

Block Diagram

Block Diagram of ADC0809

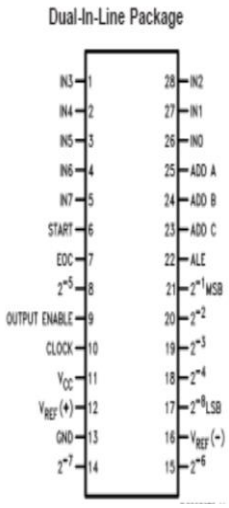


Pin Diagram

Pin Diagram of ADC 0809

The ADC0808, ADC0809 data acquisition component is a monolithic CMOS device with an 8-bit analog-to-digital converter, 8-channel multiplexer and microprocessor compatible control logic

Functional Description



Multiplexer

The device contains an 8-channel single-ended analog signal multiplexer. A particular input channel is selected by using the address decoder. Table 1 shows the input states for the address lines to select any channel. The address is latched into the decoder on the low-to-high transition of the address latch enable signal.

Address line of ADC

The successive approximation register (SAR) performs eight iterations to determine the digital code for the input value. The SAR is reset on the positive edge of START pulse and start the conversion process on the falling edge of START pulse.A conversion process will be interrupted on receipt of the new START pulse.The End-Of-Conversion (EOC) will go low between 0 and 8 clock pulses after the positive edge of START pulse.

The ADC can be used in continuous conversion mode by tying the EOC output to START input. In this mode an external START pulse should be applied whenever power is switched ON The comparator in ADC0809/ADC0808 is a chopper- stabilized comparator. It converts the DC input signal into an AC signal and amplifies the AC sign using high gain AC amplifier. Then it converts AC signal to DC signal. This technique limits the drift component of the amplifier because the drift is a DC component and it is not amplified/passed by the AC amp1ifier. This makes the ADC extremely insensitive to temperature, long-term drift, and input offset errors.

In ADC conversion process the input analog value is quantized and each quantized analog value will have a unique binary equivalent.

Application

ADCs are integral to current music reproduction technology. Since much music production is done on computers, when an analog recording is used, an ADC is needed to create tdata stream that goes onto a compact disc or digital music file.

SOFTWARE ANALYSIS

Compiling with C*x*51:

SELECTED ANALOG CHANNEL	ADDRESS LINE		
	C	B	A
IN0	L	L	L
IN1	L	L	H
IN2	L	H	L
IN3	L	H	H
IN4	H	L	L
IN5	H	L	H
IN6	H	H	L
IN7	H	H	H

This explains how to use **C*x*51** to compile C source files and discusses the control directives you may specify. These directives allow you to perform several functions. For example,

- Direct **C*x*51** to generate a listing file
- Control the information included in the object file
- Specify code optimization and memory models

Running C*x*51 from the Command Prompt

To invoke the C51 or CX51 compiler, enter **C51** or **CX51** at the command prompt. On this command line, you must include the name of the C source file to be compiled, as well as any other necessary control directives required to compile your source file.

The format for the **C*x*51** command line is shown below:

C51 source file _directives…_
CX51 source file _directives…_
or:

C51 @command file
CX51 @command file

where:
the source file is the name of the source program you want to compile.
directives are the directives you want to use to control the function of the compiler.
Command file is the name of a command input file that may contain *source file* and *directives*. A *command file* is used, when the C*x*51 invocation line gets complex and exceeds the limits of the Windows command prompt.

The following command line example invokes C51, specifies the source file **SAMPLE.C**, and uses the controls **DEBUG**, **CODE**, and **PREPRINT**.
C51 SAMPLE.C DEBUG CODE PREPRINT

The **C*x*51** compiler displays the following information upon successful invocation and compilation.

C51 COMPILER V6.10
C51 COMPILATION COMPLETE. 0 WARNING(S), 0 ERROR(S)

5. CONCLUSION

In this paper, we have presented as there is a demand for smart home automation access via virtual reality. The proposed system allows the owner to access via virtual reality and control the home appliances. This is very easy to access. In this paper, we present the design and implementation of a low cost but yet flexible, feasible and secure virtual reality-based home automation system. In our proposed system we will try to control light, motor and 230v supply.This work also demonstrates the use of virtual reality in the context of the appliance control. In this project we have used image processing techniques for image acquisition, preprocessing, image segmentation and feature extraction. The user commands are captured by the camera and transmitted through wireless communication to the receiver end. Thus our project has a huge scope for training and development business using the virtual image and setting up a virtual environment.

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