Design & Implementation of Universal Control System for Automation

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Abstract **- As the world is rapidly developing, we find new technology coming in deeper and deeper into our personal lives even at homes. In our daily life, from the beginning till the end we are accessing many electrical and electronics devices. From switching on/off of a bulb to controlling of a car, everything has become remotely accessible. In ancient times switches were used and nowadays application over phones are used. Today in the digital world, hackers can easily hack anything they need. In order to ascertain safety and better advancement in it, we are creating a device which can be controlled only by single user controller. With this device we can access only our own equipment which are used. A micro device which is easy to wear on hand can control the actions of the receiving devices. A transceiver module has both address of receiver as well as transmitter. A junction box which diverts the selection of equipment depends upon the user. When a device is to be controlled, the micro device is brought in the front of the sensor and creates a path to control the equipment using junction box. Hence by varying the motion of finger switching and other mode of operations, these devices cannot be hacked since it is providing analogy signals as input. In future the prototype board can be replaced with Arduino board and the controller can be programmed for trans-receiver and for the universal automation.**

Keywords: - Transmitter; Receiver; Arduino UNO; Universal Control; Automation; Smart Glove.

I.INTRODUCTION

In this fast growing technology, the advancement in electrical appliances has gone more ahead than we think. It is possible to develop an automatic control of appliances in quite a reasonable cost. This project work can be also implemented to control industrial heavy loads. We are working for the development of our project so that automatic control system can be implemented in every sphere at low cost. This system is moreover cost effective and can give the user, the ability to manage any electronic device without even spending more money for a remote control.

Nowadays, we have remote controls for most of the TV sets and other electronic systems, which have made our lives really simple and easy. Have you ever think about complete automation which would give the facility of controlling devices such as lights, fans and other electrical appliances at home using a remote control? Of-course, Yes! But, are the available options cost-effective? If your answer is No, we have found another solution for it. We have come up with a new system called Arduino based complete automation. This project helps the users to manage all the electronic appliances. Time is a very valuable thing. Everybody wants to save time as much as they can. New technologies are emerging day to day to save our valuable time. To save people's time we are introducing Complete Automation system using Arduino. With the help of this system you can control your home appliances by hand itself. You can turn on/off your home appliances within the range of your hands.

Home automation is the method of managing home appliances automatically for the convenience and easiness of users. A home automation system can involve turning off electrical or electronic appliances like air- conditioners, room heaters or refrigerators when a required temperature has been attained, then turning on again when the temperature has crossed under a certain desired value. This technology makes life more comfort and easier for the users and saves energy by employing devices according to strict requirements. Controls can be as basic as dimming lights with a remote in the home that can be programmed using a main controller.

In the paper "Point-n-Press: An intelligent universal remote-control system for home appliances" the author developed a universal remote control by pointing out the controller to the appliance so that the system will detect the device. In that a user interface (UI) will get displayed on the monitor of the controller. As the world develops quickly, it is quite a challenge to keep our work and home running parallel to each other. Under the pressure to do work on time, and to meet work deadlines, working people often forget to switch off their appliances which could pose as a great danger and would lead to wastage of fuel, electricity, etc. Here we device a universal remote-control system, which will use radio waves to communicate with each appliance installed in the house or in the industry. In the paper "Overview of automation systems and home appliances control using PC and microcontroller" it reveals that the demand for comfort and a better life have a great significance in smart homes. Home automation systems are used to manage home appliances and provide automatic remote control inside or outside homes.

The "Advanced universal remote controller for home automation and security" shares about the fact that remote control render easiness and comfort. A strong and efficient remote controller can be made with taking into account with the following matters of usage of all communication channels and usage of a computer as main server and other one as an emergency controller. In the paper "Low Cost Smart Glove for Universal Control of IR Device" the author developed a low cost, gesture controlled Universal remote-control system. The system is built by the usage of shelf components, available in the market for the simple accomplishment. The main objectives of our proposed project are to sense the existing status of the remote devices, to control the remotely operated devices using control signals, to take corrective action automatically as per requirement and to protect the equipment from unwanted operations.

II. ARCHITECTURE

The automatic machines or appliances in our home has a major role in making a smart lifestyle. And so, it is necessary to have a verity of improved technologies. As the new generation is thinking distinct, there is a chance for great innovations in the field of many technologies. Remote control is one of the widely used symbol in modern technology. It is used in home appliances, DVD players etc... Remote control plays an important role in our day-to-day life. Our project aims at making smart home by using remote controls to automatically control home appliances in the absence of a man. The devices involved in the process include transmitter, receiver, DC motor etc…

The main objectives are protection of appliances, control everything in low cost, carry out different works at the same time operate it by standing anywhere in the home and save time etc., Universal control system is made to automatically control home appliances like bulb, fan, washing machine etc… We can switch it ON or OFF in case, we are busy with our work. This helps in saving electricity. This is done by wearing a glove which has special functions for each finger tips. The controlling process is done by sensing that function. This process can be carried out in a very low cost. Excluding algorithmic automation, devices can be managed by the user to suit personal requirements using direct buttons, cell phones, the internet, or radiofrequency remotes. A web of appliances and sensors can be maked to interact with each other and to take decisions for operation.

This paper contributes with the idea of designing and implementing a cost-effective and a complete automation system which discuss about the general design considerations that should be assessed before beginning, followed by an analysis of the trade-offs among various architectural approaches, and then how to implement the design by smart glove.The type of Interface was the most basic and important requirement in a universal control system and the interface is the primary arrangement for communication and hardware combination used for transmitting and receiving messages between devices and the user uses a smart glove. Designers have too many choices for accomplishing communication between devices,user, and the entire system, depending upon the system, range, size of house, ease of use, etc. If a user wants to control the home appliances via Internet, the designer needs to add an Ethernet/Wi-Fi interface to connect the network to the home network by using an Arduino and Node MCU. If the user wants to manage the network using Bluetooth from a cell phone, the designer needs to add a Bluetooth interface to contact with the device and that all comes under the future expansion of our project.

A. HT12E TRANSMITTER

HT12E is a 212 series encoder IC for remote control applications the pin diagram was shown in fig1 and it is commonly used for radio frequency (RF) applications.It is possible to easily transmit and receive 12 bits of parallel data serially using a paired HT12E encoder and HT12D decoder. The 12-bit parallel data is simply converted to serial output by HT12E which can then be transmitted through a radio frequency transmitter. The 12-bit parallel data is split up into 8 address bits and 4 data bits. We can provide 8-bit security code for data transmission by using these address pins and the same transmitter may be used to address multiple receivers.

HT12E can be operated in a wide voltage range from 2.4 V to 12 V. The transmitter sends a signal over a radio frequency to the receiver in the remote car. The transmitter has a power source, usually a 12-volt battery, that provides the power for the controls and transmission of the signal. The key difference between radio controlled and remote-controlled cars is that remote controlled car have a wire connecting the controller and the car, while radio control is always wireless. Most Radio Controlled toys operate at either 27 MHz or 49 MHz This pair of frequencies has been allocated by the FCC for basic consumer items, such as garage door openers, walkie-talkies and RC toys. Advanced RC models, such as the more experienced RC airplanes, use 72-MHz or 75-MHz frequencies. Most RC toy manufacturers make a kind of each model in both frequency ranges. Some manufacturers provide more important information about the exact portion of the frequency band that the toy car works in. It has a built-in oscillator and we need to connect only a small external resistor. It has a very low power consumption,0.1 micro ampere standby current at 5 V VDD and has a high immunity against noise. It is available in 18 pin DIP which is given below:

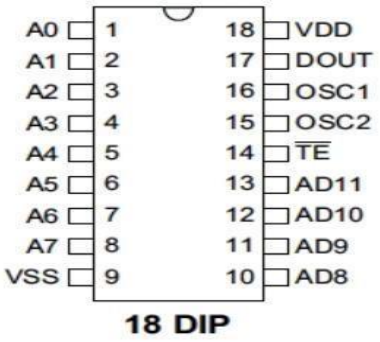

Fig 1. Pin diagram of HT12E

VDD and VCC are power supply pins and it is used to connect positive and negative of the power supply, OSC1 and OSC2 pins are used to connect the external resistances for the oscillator. OSC1 is the input pin and OSC2 is the output pin. TE is an active low input. A0 – A7 are the input address pins. These pins are connected to VSS. D8 –D11 are the input data pins. DOUT is the serial data output and is connected to the RF transmitter.

B. HT12D RECEIVER

HT12D is a 212 series decoder IC for remote control applications and the pin diagram was shown in fig2. It is manufactured by Holtek. It has a common use for radio frequency wireless applications. We can residually transmit 12 bits of parallel data using the paired HT12E encoder and HT12D decoder. The serial data is simply converted to its input, which may be received through a receiver to 12bit parallel data is divided into 8address bits and 4data bits. We can provide 8bit security code for 4bit data using the

8address bits and the same transmitter may be used to address multiple receivers.

HT12D is a CMOS LSI IC and can be operated in a wide range of voltage from 2.4 V to 12 V. It has a low power consumption and has a high immunity against noise. For more accuracy the received data is checked 3 times. It has a built-in oscillator which requires only a small external resistor. Like HT12E, it is also available in 18 pin DIP and 20 pin SOP which is given below:

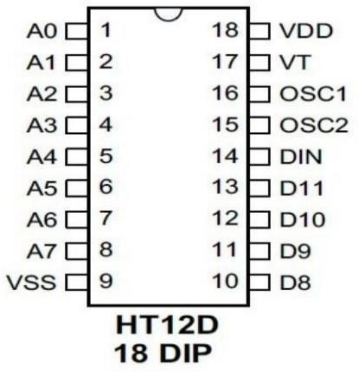

Fig 2. Pin Diagram of HT12D

VSS and VDD are power supply pins which are used to connect positive and negative of the power supply, operating voltage between the range of 2.4 V to 12V. OSC1 and OSC2 is used to connect the external resistors to HT12D, A0 – A7 are the address input pins, DIN is the serial data input pins.

III. IMPLEMENTATION

A. *Prototype of the proposed system*

A simple cost-effective prototype is designed and implemented so as to provide the features of our proposed system. In our prototype we have developed a control system in which it can have all the features. Smart gloves are used in which each of the fingers are having specific function. Input signal is sensed and transmitted through the transmitter HT12E.After the required operations are done it is transmitted to the receiving unit HT12D.The required output is obtained at the last stage. The glove consists of a radio-frequency transmitter module. It is supplied by using a 12 V battery power supply. The prototype is developed in such a way that it uses only low-cost sensors. These sensors are kept on the tip of the fingers. At the tip of each fingers copper wires is wounded and it is connected to the copper wire of thumb. By touching the two contacts, the system identifies the function and does the work properly. Here in the receiving unit we are using a remote-controlled car in which the receiver module setup by applying the signal, the car starts to move in forward or backward motion. When the thumb and the little finger come in contact, the car moves in forward direction. Thereafter, when we are having a contact in thumb and the ring finger, it starts to move in reverse direction. Middle and index finger represents the positive and negative supplies of the motor. Hence by using the system, the movement of the car towards front, back, reverse, and turning to left or right can be attained.

B. *Design of Proposed System*

RC car circuit diagram with remote transmitter is designed in a way to make it as small as possible in a glove for simple automation and was shown in fig 3. Remote uses four button switches (S1, S2, S3, and S4) to control the toy and that was attached to four fingers by inductive coils. Digital data from the switches are encoded by the HT12E encoder IC and are transmitted to the receiver through ASK RF Module. When these switches are pressed, 4 data bits and 8 address bits are encoded serially and output through the pin "DOUT" is given to the 434 MHz Transmitter.Here the circuit becomes so simple due to the simple coupling of ASK module with HT12E and HT12D pair. Remote control is powered through a 3V button cell.

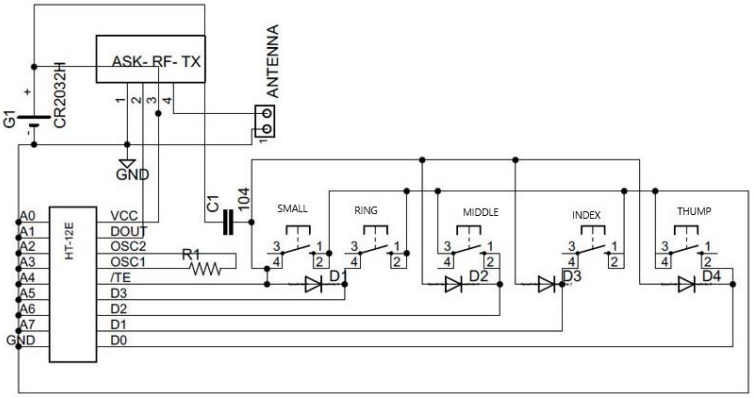

Fig 4. ASK module in the Smart Glove.

From the fig 4,Receiver section will receive the signal with the help of 434 MHz ASK module and gives it to the decoder IC.The "DIN" pin of HT12D receives the data from RF module and checks it three times before decoding.If received address data matches with the encoder address data, then IC will decode the data bits and provides it directly to the device that to be automated. The microcontroller programmed to automate the device according to the received signal. An LED is connected to the valid transmit pin of Decoder IC to indicate a valid transmission.

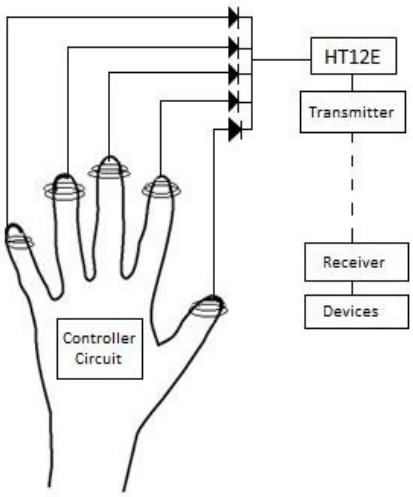

Fig 3. Smart glove circuit

IV.CONCLUSIONS

In our work, we tried to develop an automatic control system which is not dependent on the power rating of the load. Our target is to develop an automatic control system for appliances where the project will be able to decide to turn on/off all the loads. It can also help us to save electricity at our houses. In near future, automation will cover every industries and homes for driving different loads and facilitate the livelihood of human being. With the expertise of the technological manufacturing giants today, enhanced and smart houses will not be a distant dream and the final project is shown in fig 5.

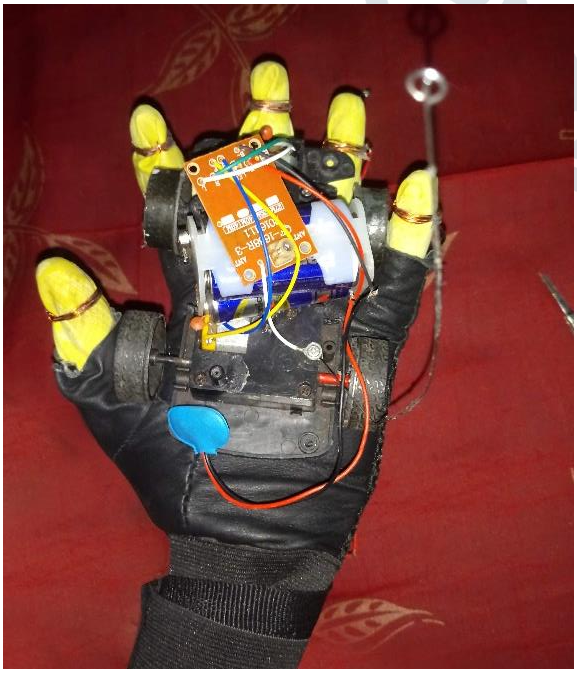

Fig 5. Final automation system

A.Future Expansion

In future we may find some devices that are more reliable, faster and cheaper. We have tried to make a good controlling system. The components that we have used can be changed with the latest device, but it should have the right software and the right driver. In this system, Arduino-Uno board can be replaced as the main controller, a Bluetooth Module or Node MCU can be used as a communication medium, and our smart glove can be used for universal control system for automation. Then the home electrical equipment's like power sockets, home appliances etc., can be controlled. Then also it will more user friendly and cost effective. After the objectives of this project have been successfully met,they can be used to construct a wireless home automation system controlled by a smart glove.We can design and implement cost effective home automation system yet an efficient one.Also we can design a user friendly and a safe system to control home appliances especially aimed to aid the elders and handicapped. Better to use relay modules and connect it to the electrical equipment's to ON and OFF in-home automation.

V.REFERENCES

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