Home Automation using Remote Control System

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Abstract— *This paper provides remote controlling and automation for homes and offices. These are very essential in present life style. Wireless control is primary concern for everyone. This paper describes a design of effective remote control system that can monitor the house. Apart from remote control concern here we also take care of home automation. This paper gives the best solution for electrical power wastage. The home appliances are switched on/off using IR without actually going near to the switch boards or regulators. The water level of the tank can also be monitored and the motor can be controlled through automation.*

Keywords— *Microcontroller, IR unit, Relays, Motor drive, water level sensor.*

I. INTRODUCTION

Electricity became a part of modern life and one cannot think of a world without it. Electricity has many uses in our day to day life. It is used for lighting rooms, working fans and domestic appliances like using electric stoves, A/C and more. All these provide comfort to people. In factories, large machines are worked with the help of electricity. Essential items like food, cloth, paper and many other things are the product of electricity.

Modern means of transportation and communication have been revolutionized by it. Electric trains and battery cars are quick means of travel. Electricity also provides means of amusement, radio, television and cinema, which are the most popular forms of entertainment, are the result of electricity. Modern equipment like computers and robots have also been developed because of electricity. Electricity plays a pivotal role in the fields of medicines and surgery too such as X-ray, ECG. The use of electricity is increasing day by day.

Today we are living in 21st century where automation is playing important role in human life. Home automation allows us to control household appliances like light, door, fan, AC etc. It also provides home security and emergency system to be activated.

Home automation not only refers to reduce human efforts but also energy efficiency and time saving. The main objective of home automation and security is to help handicapped and old aged people which will enable them to control home appliances and alert them in critical situations. The automation of features in one's home helps to promote security, comfort, energy efficiency, and convenience. Another benefit of home automation systems is the amount of labor, time, energy and materials that is saved.

The increasing ubiquity of heterogeneous computing devices such as laptop computers, palms, mobiles etc. shows that users prefer a ubiquitous access of a system rather than to be uncomfortably forced to go physically to the nearest control point. Remote control saves time and everybody is aware of this, it also provides increased security and flexibility. For example, if the user receives a SMS saying that there was an intrusion, he/she can connect to the internet and watch the video cameras inside the house to see what happens, another example could be the possibility to turn on the heaters from the distance using a mobile, laptop or PDA so as soon as the user reaches the house it will be hot already, this could be really useful especially in cold countries. As a matter of fact security will always be a main priority in all families, and prevention is better than cure.

By receiving alerts in a portable device user is informed of all possible issues occurring in the house and it gives the possibility to deal with it using different ways of control like instant messaging, since many users are already familiar with the concepts and user interfaces of instant messaging. Many computers and mobile devices also already have instant messaging clients installed.

The traditional wired electric control is a great system, but it can be difficult to Control the areas of access. Often the range of a wireless network reaches outside the physical boundaries of an organization. The concept of remote controlling is also very

prominently used in home security systems, surveillance systems, intrusion detection mechanisms etc. Also if we have a large organization or building with several electrical appliances are installed.

Every electrical appliance has its own control switch using which a person can turn ON or OFF the appliance. Now, if under circumstances, the user needs to turn ON or OFF thee appliances of all or several rooms which might be located far away from each other, it would be little cumbersome.

This might be aggravated with the fact that the user needs to control i.e. turn ON or OFF the appliances immediately for some necessary, urgent reason or may be, he/she needs to do that every day, routinely, in order to save electricity bills and the money incurred on their bills. If the user could conveniently control several electrical appliances by just sitting at one place, whenever needed, under certain circumstances, it would bring a lot of convenience which would also encourage the users to spend and invest the time saved in other constructive tasks.

As moving in a large building or a large penthouse or a bungalow could be very time consuming, only to turn ON or OFF the electrical appliances, a one stop solution would definitely pave the way for users to save their time and energy spent on just moving around. Plus, in urgent situations, it is highly essential that instead of manually moving around to control the appliances, the user should be able to do that quickly and sitting at one place.

For ex: Suppose, there is a burglar in the premises or some unlawful activity which might be going to happen. If the user has this power to swiftly turn OFF or turn ON all the devices, as the situation might demand, the event could be effectively and proactively avoided by raising an alarm after turning OFF all the appliances. Switching from a traditional to an LED based lighting system can yield significant energy savings. Additional reductions in power consumption can be achieved by intelligent lighting systems that incorporate monitoring, control and communication networks.

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II. EXISTING SYSTEM

In recent years, the home environment has seen a rapid introduction of network enabled digital technology. This technology offers new and exciting opportunities to increase the connectivity of devices within the home for the purpose of home automation. Moreover, with the rapid expansion of the Internet, there is the added potential for the remote control and monitoring of such network enabled devices. However, the adoption of home automation systems has been slow. This project identifies the reasons for this slow adoption and evaluates the potential of Zig-Bee[2] for addressing these problems through the design and implementation of flexible home automation architecture.

Device control is a process that is done in the day to day life of mankind. Usually there are a number of devices associated with home and an efficient control of these systems is a tedious task. The rapidly advancing mobile communication technology and the decrease in costs make it possible to incorporate mobile technology into home automation systems.

In recent years, the home environment has paper focuses on assisting the user to control as well as to know the exact status of electrical appliances in their home at that instant. It is achieved through a prominent wireless communication system called as GSM. The status of the electrical appliances is analyzed using pressure sensor. This system is designed and programmed in such a way that it can listen, reply and execute the commands only from the authorized user mobile number. The possibilities of real time constraints like distance, time and communication error are negligible. This system is quite easy to install, cost effective and zero maintenance.
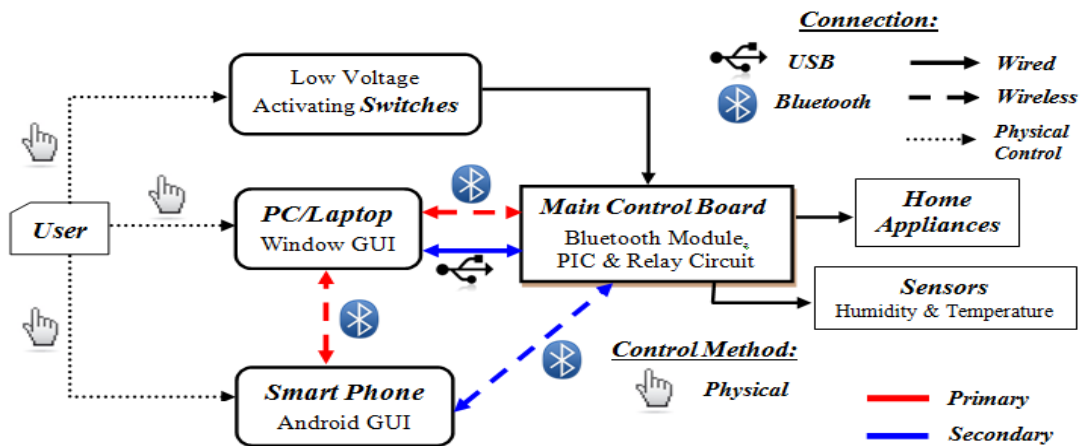
FIG.1 FUNCTIONAL BLOCK DIAGRAM OF THE SYSTEM

The evolution and development in home automation is moving forward toward the future in creating the ideal smart homes environment. Optionally, home automation system design also been developed for certain situation which for those who need a special attention such as elderly person, sick patients, and handicapped person. Thus, providing a suitable control scheme using wireless protocol mode can help them doing their daily routine. Besides, voice control access will be used as command for better purpose. In this paper, we present a smart home automation system using voice recognition.
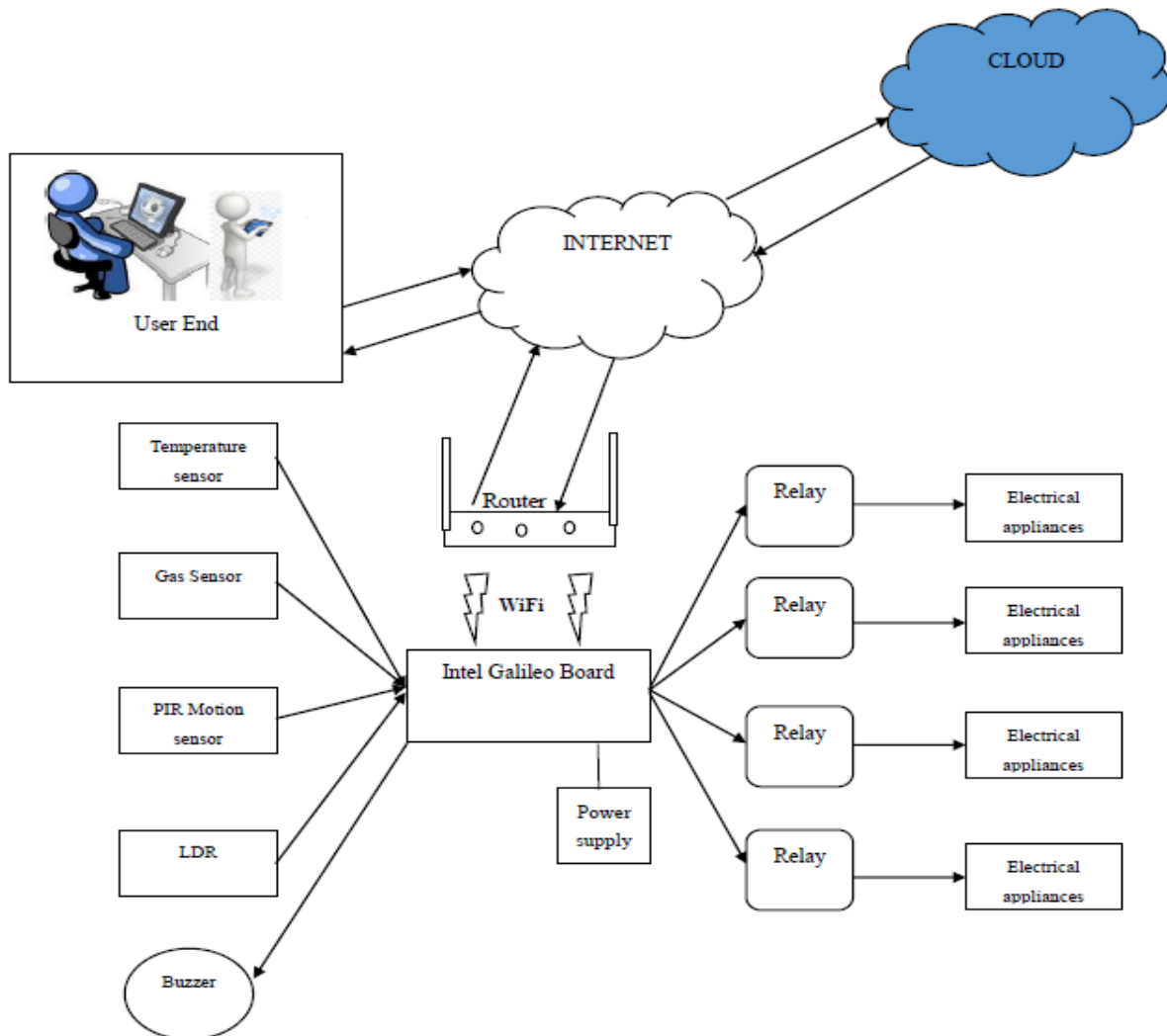

FIG.2 HOME AUTOMATION SYSTEM USING INTERNET

III.   PROPOSED SYSTEM

The scope of this research work will include the control and monitoring system for home appliances from Graphical User Interface (GUI) using Microsoft Visual Basic software that use Microsoft Speech Recognition engine as an input source and being control wirelessly. The research methodology involved is application of knowledge in the field of radio frequency communication, microcontroller and computer programming. Finally, the result will be observed and analyze to obtain better solution in the future.The development of smart home automation system has great potential in today's age of technology. According to the Smart Home Energy, a smart home, or smart house, is a home that incorporates advanced automation systems to provide the inhabitants with sophisticated monitoring and control over the building's functions. Such systems make use of different types of sensors to examine the environment and maintain a control over home appliances using latest communication and networking methods. The purpose of this paper is to provide information about the implementation and design of existing smart home technologies.

This paper also discusses about our wireless, voice control Smart Home System that allow people control their home devices by voice command at home.

Smart Home using MIPv6 is the Integration of Technology and services for better quality of living. This paper provides a review of the recent Developments, Technology, Architecture, Application and future scope for Smart Homes with the tremendous help of MIPv6.The principles of MIPv6 are included for mobility on the design of the architecture for MIPv6 based Smart Homes. Smart Homes based on Mobile IPv6 Consists of various techniques and Home Networking for Interactive services. The crucial Advantages of Smart Home is to support and improve the quality of life for disabled and elderly people.

Home and industrial security today needs to make use of the latest technological components. Many papers going to present the design and implementation of a remote control and home security system based on GSM (Global System for Mobile)[8][9]. This system offers a complete, low cost, powerful and user friendly way of 24 hours of real –time monitoring and remote control of a home and industrial security. The system works as a remote sensing for the electrical appliances at home to check whether it is on or off, at the same time the user can control the electrical appliances at home by sending SMS (Short Messaging Service) message to the system, for example turning on the AC before returning home. In case of fire/security the chip will receive signals from the different sensors in the monitoring place and acts according to the received signal by sending an SMS message to user's Mobile Phone, it also works as automatic and immediate reporting to the user in case of emergency for security, as well as immediate and automatic reporting to the fire brigade and police station according to activated sensor to decrease the time required for tacking action. The design has been described using VHDL (VHSIC Hardware Description Language) and implemented in hardware using FPGA (Field Programmable Gate Array)[10].The proposed system has two main components namely (a) voice recognition system, and (b) wireless system. Lab View software has been used to implement the voice recognition system. On the other hand, ZigBee[7] wireless modules have been used to implement the wireless system. The main goal of this system is to control home appliances by using voice commands. The proposed system can recognize the voice commands, convert them into the required data format, and send the data through the wireless transmitter.

Based on the received data at the wireless receiver associated with the appliances desired switching operations are performed. The proposed system is a low cost and low power system because ZigBee is used. Additionally, the proposed system needs to be trained of voice command only once. Then the system can recognize the voice commands independent of vocabulary size, noise, and speaker characteristics. The Internet of Things idea and the rapid expansion of IPv6[3],[6], moreover after IETF defined 6LowPAN [5] as a technique to apply IPv6 into low-power wireless network standard is added potential of the USN connected to Internet and it made up IPv6-USN as the new architecture. However, if we implement IPv6-USN to home automation, the energy consumption of IPv6-USN node operation is bounded. There is the need to periodically replacing its batteries because it commonly used AA batteries as power source, but the complexity of home building characteristics makes it is not easy.

The proposed system does not require a dedicated server PC with respect to similar systems and offers a novel communication protocol to monitor and control the home environment with more than just the switching functionality. To demonstrate the feasibility and effectiveness of this system, devices such as light switches, power plug, temperature sensor and current sensor have been integrated with the proposed home control system. The main networking technologies used for

connecting devices in home environment: 1) Direct cable connection 2) Bluetooth Connection [1] 3) Phone Line 4) Ethernet 5) Radio (Free) Network 6) AC Network.

3.1   Controlling Home Appliances from Remote Location

The second feature provided by the home automation system is the remote access to devices and their management. E.g. suppose you are going back to your home and it will take 20 minutes to reach your home. Now u Want to On you AC so that when you reach your home you find your home with comfortable temperature. In such a scenario you need to access your home appliances and also to control them from remote location. The typical structure of home automation system for this type of services is given in below

Following are main points to consider about this class of systems:

1.   Authorizer and Receiver is an electronic system capable to receive the control signal. As discussed in Section-II there exist a number of such systems any of them can be used for this purpose. One important thing about this system is that it requires some authorization mechanism to ensure that the request is authorized one. For this purpose, we can use some cryptographic techniques to encode and decode the request so that only authorized user can access the network.

2.   The decision maker system is an AI based agent that can decide what action should be taken in response to received query. E.g. suppose user just put the query that the room temperature should be x0c. Now, this is the Decision Maker that will identify from its experience that the AC will maintain this temperature. And then it will determine setting of AC regulator corresponding to this particular temperature. Of course, the same system can be implemented by some electronics circuitry but that will be more complex, less flexible and less featured as compared to this learning based (case based) AI agent system.

3.   The third component of this system i.e. Actuator is similar to the action implementer in the previous system.

Microcontrollers as the name suggests are small controllers. They are like single chip computers that are often embedded into other systems to function as processing/controlling unit. For example, the remote control you are using probably has microcontrollers inside that do decoding and other controlling functions. They are also used in automobiles, washing machines, microwave ovens, toys etc., where automation is needed.
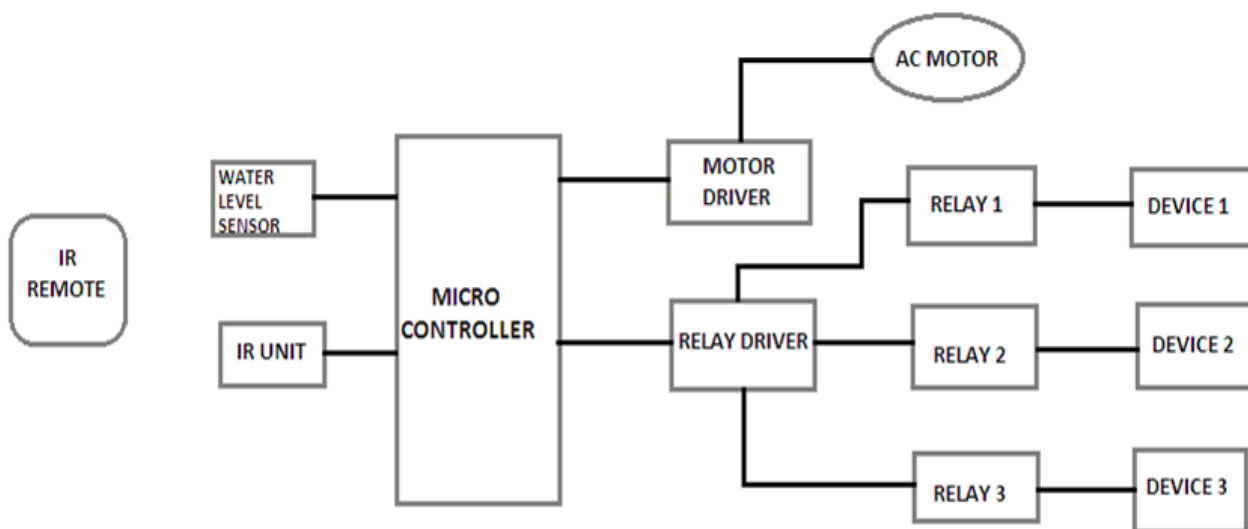

FIG.3 BLOCK DIAGRAM

Micro-controllers are useful to the extent that they communicate with other devices, such as sensors, motors, switches, keypads, displays, memory and even other micro-controllers. Many interface methods have been developed over the years to solve the complex problem of balancing circuit design criteria such as features, cost, size, weight, power consumption, reliability, availability, manufacturability. Many microcontroller designs typically mix multiple interfacing methods. In a very simplistic form, a micro-controller system can be viewed as a system that reads from (monitors) inputs, performs processing and writes to (controls) outputs.

Here we develop an electronic code lock system using 8051 microcontrollers, which provides control to the actuating the load. It is a simple embedded system with input from the keypad and the output being actuated accordingly. This system demonstrates a password based door lock system wherein once the correct code or password is entered, the door is opened and the concerned person is allowed access to the secured area.

3.2 Managing Home Appliances For Comfortability

The first service that a user expects from the home automation system is the comfortable management of devices, e.g. the regulator setting of AC depends upon the temperature of the room. As the temperature increases the AC regulation rating (hence cooling rate) also need to be increased. Such class of services is simplest of all types' services and has the structure as shown in the below Fig. Some features of such systems are: 1) These are closed loop systems 2) Sensors are transducers and other mechanism for sensing the current proximity condition e.g. sensing the room temperature 3) Actuators are simply the mechanism to change the environment according to the control signals received from the knowledge base. 4) Knowledge base (KB) is the centralized part of the system and is the main part to discuss here.

Artificial Intelligence is evolving as a technology for developing automaticsystems that can perceive the environment, learn from environment, and can make decision using case based reasoning. Using Vision capability, knowledge based, learn ability, decision making and reasoning the AI provides a better solution for almost all automatic systems. In this, we will see the types of home automation systems and then see how these system can utilize the AI tools so as to increase the effectiveness, powerfulness etc. Home automation, artificial intelligence, knowledge base systems, secure home.

One definition of an automated and networked home is "An automated and networked home is one in which every appliance can be remotely managed from anywhere on the Internet with a simple Web browser". The general goal of the automatic-home movement is to use networking technology to integrate the devices, appliances and services found in homes so that the entire domestic living space can be controlled remotely.

Home wiring, the advance home developers are installing, typically adds several thousand dollars to the cost of a new home, and it is usually Ethernet or coaxial cable -- or some combination of both -- with other technologies in the mix. The network is being designed to make possible remote operation of appliances connected to the network.
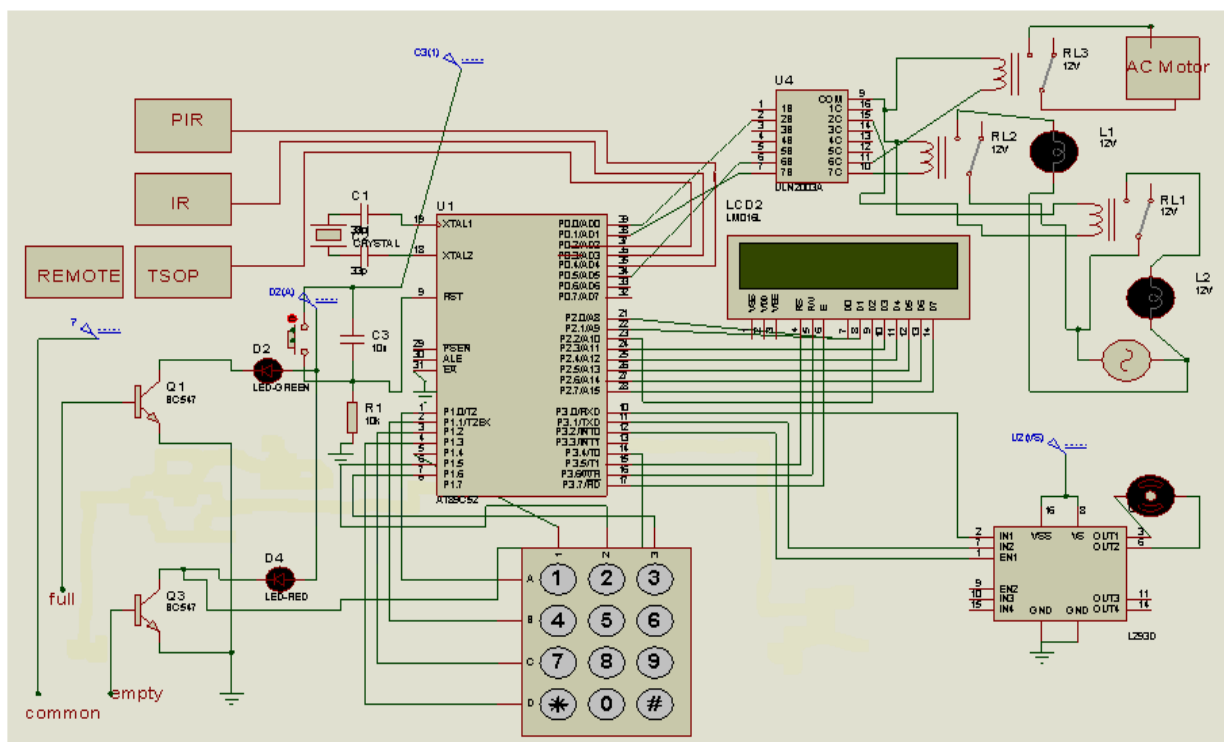
IV.   HARDWARE IMPLEMENTATION

FIG.4 SCHEMATIC DIAGRAM

4.1　PIR Sensor

Compact and complete, easy to use Passive Infrared (PIR) Sensor Module for human body detection. Incorporating a Fresnel lens and motion detection circuit, High sensitivity and low noise. Output is a standard 5V active low output signal. Module provides an optimized circuit that will detect motion up to 6 meters away and can be used in burglar alarms and access control systems. Inexpensive and easy to use, it's ideal for alarm systems, motion-activated lighting, holiday props, and robotics applications. The Output can be connected to microcontroller pin directly to monitor signal or a connected to transistor to drive DC loads like a bell, buzzer, siren, relay, Opto-Coupler (e.g. PC817, MOC3021), etc. The PIR sensor and Fresnel lens are fitted onto the PCB. This enables the board to be mounted inside a case with the detecting lens protruding outwards.

4.1.1　IR Sensor

The passive infrared sensor detects infrared radiation on the basis of the characteristics that the polarization of pyroelectric material changes with temperature. Dual compensated sensing elements are applied to suppress the interference resulting from temperature variation. As a result, the operating stability of the sensor is greatly improved. They can be used in security systems, burglar alarms, visitoracknowledgement, light switch control and intellectualized toy, etc.,

4.1.2　Relay

A relay is electrically operated switch.Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.
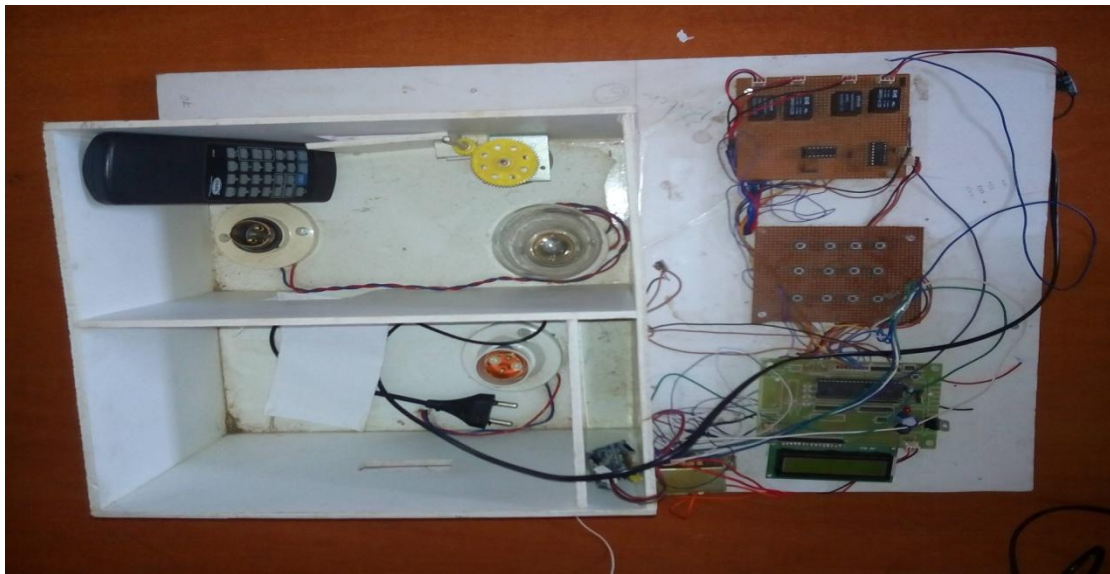

FIG.5 HARDWARE IMPLEMENTATION

4.1.3　Micro Controller

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The AT89S52 provides the following standard features: 8K bytes Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The 16x2 LCD displays are interfaced with the 8051 microcontroller in 8bit or 4-bit mode. This differs in how data is send to LCD. Then the 4x4 key board is also interfaced with the microcontroller. 4-bit mode is generally used although it is not as speed as 8-bit mode but as the LCD's are also slow speed devices generally 4-bit mode is preferred.

For example: Water level sensors detects the level of liquids and other fluids and fluidized solids, including slurries, granular materials, and powders that exhibit an upper free surface. Substances that flow become essentially horizontal in their containers (or other physical boundaries) because of gravity whereas most bulk solids pile at an angle of repose to a peak. The substance to be measured can be inside a container or can be in its natural form (e.g., a river or a lake). The level measurement can be either continuous or point values. Continuous level sensors measure level within a specified range and determine the exact amount of substance in a certain place, while point-level sensors only indicate whether the substance is above or below the sensing point.

Our paper also consists of an automatic water level controller which will automatically START the pump set as soon as the water level falls below the predetermined level (usually 1/2 tank) and shall SWITCH OFF the pump set as soon as tank is full or water level in the lower tank is at below minimum level. The Automatic water level controller ensures no overflows or dry running of pump there by saves electricity and water. It consumes very little energy and ideal for continuous operation.

V.　　CONCLUSION

This Paper "Remote Controlling of Home appliances and automatic water level controller with motor" provided wireless control and automation for homes and offices. These are very essential in present life style. This Paper described a design of effective remote controlling system that can monitor the house. This paper gives the best solution for electrical power wastage. Also the manual operation is completely eliminated. The home appliances can be switched on/off using IR without actually going near the switch boards or regulators. The loads like lights, motors, heaters, power controlling system and also current through the loads can be controlled in this paper. We controlled all loads at a time from one place (control room) without connecting any physical wire between loads and control room. By this paper, we expanding its usability to a great extent. This can create a whole new dimension of remote controlling as it takes the control of as near as to one's palm for always and everywhere. Moreover, by deploying wireless sensors inside the home smart home can be made smarter. Recent works on smart home is governed by the concepts of wireless sensors. Remote systems can be controlled in a more flexible way by integrating wireless sensors to the system.

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