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REAL TIME HOME AUTOMATION WITH ANDROID APPLICATION

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ABSTRACT- The term Home automation refers to the automatic and electronic control of household features, activity and the appliances. These are advancement to the human efforts with the machinery equipment's required to operate various loads in homes manually. This paper describes about the automatic control of the electronic gadgets at the real time based on the sensor values and also with the android application. In this paper, the sensors like PIR sensor, Temperature sensor and LDR sensor are used to monitor the changes in its surrounding and if it detect any changes, then automatically the electronic gadgets are controlled. The sensors play a vital role in detecting the changes in the surroundings. And also, the door model is used to represent the opening and the closing of the door according to the commands given by the Bluetooth. Arduino UNO Microcontroller is used to control and process all these operation because of its vast advantages like open source platform and easy to program it. A Mobile Android Application designed specially to control the gadgets is also deployed. The Bluetooth is also used to control the gadgets via mobile application.

KEYWORDS- PIR Sensor, Temperature Sensor, LDR Sensor, Android Application, Arduino.

INTROUCTION

The home automation or automatic control of devices has become new popular technology in this era. We are in the world of automation in which most of the systems are getting automated, such as industrial automation, homes and other business sectors. Home automation is one of the major growing industries which change the way people live. The process of controlling various operating equipment, machinery, factory operations, etc., automatically and sometimes remotely using control systems can be termed as automation. Home automation systems are advancement to the mechanization processes wherein human efforts are needed with the machinery equipments to operate various loads in homes. Moreover, with the rapid expansion of the Internet, there is a need for the remote control and monitoring of such network enabled devices.

Some of the home automation systems target those seeking luxury and sophisticated home automation platforms; others target those with special needs like the elderly and the disabled. Home automation system makes the operations of various home appliances more convenient and saves energy. With the energy saving concept, home automation makes life very simple nowadays. This Smart home technology usually refers to devices, appliances, or systems that connect to a common network which can be independently and remotely controlled from any place. The home automation systems are used for controlling the indoor & outdoor lights, heat, ventilation, air conditioning in the house, to lock or open the doors & gates, to control electrical & electronic appliances and so on using various control systems with appropriate sensors. The home automation involves automatic controlling of home appliances using different technologies and controllers with the help of desktops, laptops, smart phones or tablets. It involves automatic controlling of all electrical or electronic devices in homes or even remotely through wireless communication. Centralized control of lighting equipment's, air conditioning and heating, audio/video systems, security systems, kitchen appliances and all other equipment's used in home systems is also possible with this system. Smart home automation allows to tap into high-tech functionality and luxury. As technology development continues to expand, so will the possibilities for consumer home automation to make life easier and more enjoyable. This is the best solution even for the elderly and the disabled persons to operate equipment's. Thus, it has lot of benefit in it.

Automation is an efficient method to use in every field because of its advantages like reduced manpower, energy usage, and security and also for improving the quality and efficiency of any system. Home automation systems has proved themselves in the energy efficiency.

In places like schools, labs, colleges, the students move out of the classes without turning OFF the lights and fans. Same scenario happens in the home also. The children may also leave the room with the electronic and electric appliances ON. It may lead to increased usage of the energy sources. So, to ON and OFF the fans and lights and the electronic gadgets, the automation process will be much useful. This paper clearly features the home automation process which can be efficiently implemented.

RELATED WORKS

There are many related works under the topic of home automation. In each paper, they have been using different technologies in which the devices are connected wirelessly or in a wired connection enabling automatic control of devices.

The existing system have made the automatic control of the devices using the 8051 Microcontroller. The existing system uses

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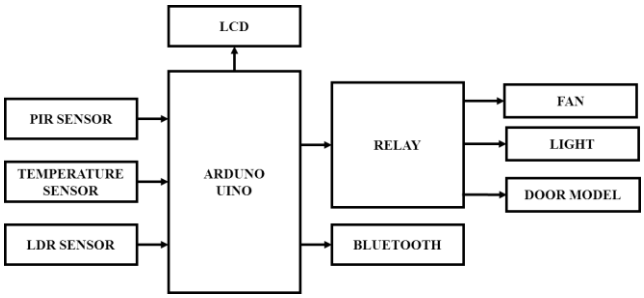
sensors and Zigbee transceiver to control the devices automatically. The 8051 Microcontroller interface the different sensors and the Zigbee transceiver with it. When the sensor detects the changes in the surroundings, then the Zigbee transceiver helps to control the devices.



The 8051 microcontroller has the following disadvantages like, it cannot be interfaced to the high power devices directly, it can perform only limited number of execution simultaneously and the time of execution is more because of the complexity of the circuit board. So, it cannot be used efficiently due to its disadvantages.

The Zigbee is a wireless transceiver. It acts as both transmitter and receiver. The Zigbee has the advantages like low power consumption, can operate in three different frequency bands, easy to install, low cost and setting up the network is easy. Though it has many advantages in it, it has limitation such as low transmission rate, short range, not secured and does not have many end devices. So, it cannot be used efficiently as there is a possibility of controlling the devices by other person.

The PIC Microcontroller is also used in some of the papers. The PIC Microcontroller can be used replacing the 8051 Microcontroller. The PIC Microcontroller is easy to program and simple to interface other devices when compared to the 8051 Microcontroller. It has become an efficient Microcontroller as it is very simple to interface with other peripherals. Though it has huge advantages, it has limitations such as the length of the program is large, because of using RISC and the program memory is not accessible and it can be programmed once. It is difficult to program the microcontroller again and again. It can efficiently interface many sensors and different peripherals with it and can control the devices in a good manner, but due to its limitations, it cannot be implemented efficiently.

PROPOSED WORK

The limitations of the existing system such as unsecured connection due to Zigbee, no mobile application to carry out the home automation process if the sensors fail to work and 8051 microcontroller are overcome in the proposed system.

SYSTEM IMPLEMENTATION

The proposed system uses the Arduino Microcontroller to control all the process and operations. In the proposed work, the sensors like PIR Sensor, Temperature Sensor and LDR Sensor are used. A door model is used to represent the opening and closing of the door. The Bluetooth is also used to control the devices through the commands via the mobile Android application. The block diagram of the proposed system is given below.

Fig: 1 Block Diagram

ARDUINO UNO

The Arduino microcontroller is the most preferred among all other microcontrollers. The reason is that the Arduino UNO is an open source platform and is easy to program and execute the operation. The Arduino can be programmed as many times needed but the 8051 or PIC cannot be programmed many times because the procedure of dumping the program in these microcontroller is difficult. The Arduino Uno is based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button.

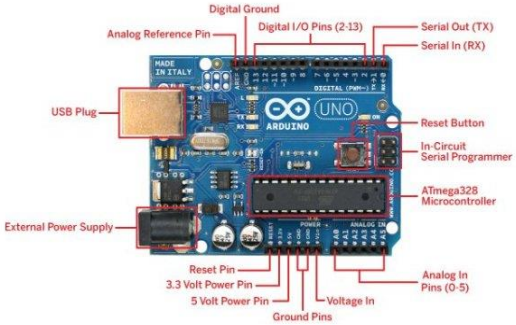


Fig 2: Arduino Uno Microcontroller

SENSORS

The different sensors like Temperature Sensor, LDR (Light dependent Resistor) Sensor and the PIR (Passive Infrared Sensor) are used. The function of these sensors are: Temperature Sensor is a precision integrated-circuit with an output voltage linearly-proportional to the Centigrade temperature. Temperature sensor outputs an analog signal which is proportional to the instantaneous temperature.

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Fig 3: Temperature Sensor

PIR sensors are used to sense the motion, almost used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. The range of the PIR Sensor is around 5m to 12 m.

Fig 4: PIR Sensor

A photoresistor or light-dependent resistor, LDR is a light controlled variable resistor. The resistance of a photoresistor usually decreases with increasing incident light intensity.

Fig 5: LDR Sensor

RELAY

The relay acts as a switch. It is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. It turns ON the loads according to the condition given to it.

BLUETOOTH

Bluetooth is a wireless technology standard used for exchanging data over short distances from fixed and mobile devices, and building personal area networks. The mobile application is specially designed to control the devices when the automatic control of the electronic gadgets is failed in this system. The control over the devices is taken over by the Bluetooth via mobile android application. Thus, the home automation can be done without any interrupt as the Bluetooth controls them by using the mobile application.

Fig 6: Bluetooth

The Bluetooth technology is preferred over Zigbee is due to its advantages like low power consumption, can be operated from distance of 50m, it can pass through the walls and is low cost. Though both the Zigbee transceiver and the Bluetooth are low cost, wireless and easy to install, the Bluetooth technology is used because the Zigbee has no secured communication and it can be operated by any unknown persons also.

LOADS

The loads here taken are Fan and the Light. The input power supply given to theses loads are 12V and are DC type of loads. And also the door model is taken for the implementation of the home automation process.

ANDROID APPLICATION

An android application is specially designed to control the devices with the help of the Bluetooth. It is an android application. This application has the login page where the user can login with the user name and the password. Then the page has different loads with ON and OFF button. The Bluetooth in the android app and the devices can be paired together and then the devices can be controlled through this button. Thus, it is an easy method to control the electronic devices.

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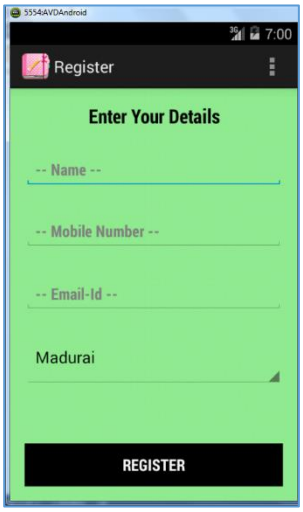

Fig 7: Register Page of Mobile App

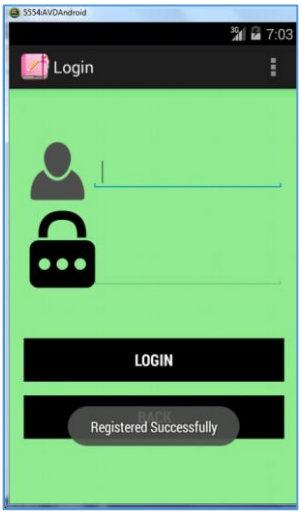

Fig 8: Login Page of Mobile App

Fig 9: Controlling Page of Devices

LIQUID CRYSTAL DISPLAY

The LCD (Liquid Crystal Display) is used to display all the sensor values. The LCD taken is 16*2. LCD screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. The data register stores the data to be displayed on the LCD.

Fig 10: LCD

SOFTWARE USED

Arduino IDE is used to program the arduino board. This open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. This software can be used with any Arduino board. The programming language is so simple and easy to understand the coding.

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The home automation is made simple by programming the device that if the sensors senses the value above the optimum the level, then the relay switches ON to enable the corresponding load ON. And also, by programming, the door model can be opened and closed by the commands given by the Bluetooth via android application.

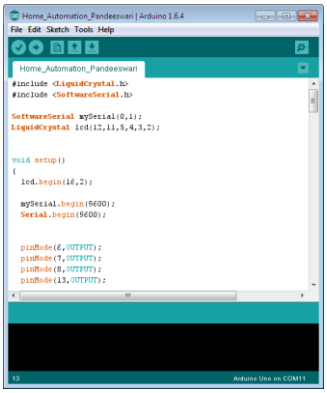

Fig11: Arduino IDE

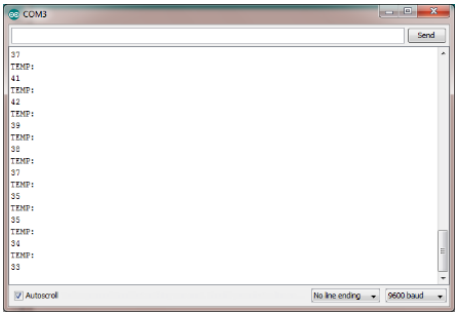

Fig 12: COM port Output

WORKING OF THE SYSTEM

The Arduino UNO Microcontroller is used as the main controller to process the operation. The Arduino has the both the analog pins and the digital pins in it. The PIR Sensor, Temperature Sensor and the LDR Sensor are connected to the analog pins of the arduino. The LCD and the loads such as the Fan and the Light and the Bluetooth are connected to the digital pins. The sensors senses the values when the person crosses the PIR sensor, when the light intensity varies and when there is a temperature changes in the environment respectively. The relay acts a switch and it operate according to the condition given to it.

If the PIR Sensor sense the movement of the person near to it (i.e) if the PIR values go above 0 and also the temperature Sensor senses the increase in the temperature in that surrounding (i.e) the temperature increases above 35, then the relay is switched ON to turn ON the Fan automatically. It implies that the if both the human is detected and the temperature of the room increases due to the presence of the person in that room, then the fan is turned ON.

If the PIR Sensor senses the value above 0 and the LDR Sensor senses low value, then the relay is switched ON to turn ON the Light automatically. The low value of the LDR Sensor is due to the less intensity of the light which falls on it. The resistance of the LDR Sensor increases when the intensity of the light which falls on it, is high. It implies that if the human is detected and also the room is dark due to the less brightness in the room due to the less intensity of the light, then the Light is turned ON.

The Bluetooth can also be used to control the electronic gadgets through the commands given via mobile android application. This is an efficient method of controlling the devices as it has a secured communication. The Bluetooth in the Android app and the devices are paired together.

The Fan and the Light can be automatically ON and OFF by pressing the ON or OFF button in the app. The door model can also be open and closed automatically by pressing the button in the app whose Bluetooth is paired with the Bluetooth in the devices.

Thus, the efficient method of home automation was built by using the sensors and the Bluetooth technology is built and implemented.

CONCLUSION

Thus, this Home Automation process using the Mobile Android Application is built and implemented. The sensors such as PIR sensor, Temperature sensor and LDR sensor correctly senses the values when the human crosses, when the temperature raises and the light intensity varies respectively. These sensor value changes helps to ON and OFF the loads such as Fan and the Light. And also, the Door Model is used and the opening and closing of it, is done through the Mobile App whose Bluetooth is paired with the Bluetooth of the devices. The Bluetooth also efficiently control the loads through the commands like ON or OFF given to it using the mobile application. This process demonstrates the fully automated system in an efficient manner.

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