

IoT Based Home Automation System Using Arduino

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Abstract

In past years we have seen significant advancement in the field of consumer electronics. Various “intelligent” or “smart” devices such as cellular phone, home security devices, home theaters, etc., are set to evolve the concept of a smart home rapidly. They have given rise to a network where all these devices are internally connected and monitored through a controller. Home automation involves introducing a degree of computerized or automatic control to certain electrical and electronic systems in a building. These include lighting, temperature control, etc. This project aims to a simple home automation system which contains a remote mobile host controller and several client modules (home appliances). The client modules communicate with the host controller through a wireless device such as a Bluetooth enabled mobile phone, in this case, an android based Smart phone.

Keywords: Internet of Things, Arduino, Sensors, Home Automation.

1. Introduction

Home automation is not a new thing but today’s home automation systems require a huge and costly change in infrastructure. This means that it often is not feasible to install a home automation system in an existing building a home automation system is a platform which allows users to control electric appliances of varying kind in a network. Home automation is important and security to help handicapped and aged people that will control home appliances and in critical situations it can alert them. Remote home automation systems improve energy efficiency, security, convenience. Home automation can be reduces the human efforts and time.

Many people are always on the move from place to place due to business demands. Some people can spend a couple of days away from their home leaving all their household appliances without any kind of monitoring and control. Some devices are left plugged into power sockets whereas others are supposed to be plugged into and out of power sockets at different intervals depending on the time of the day. All this requires an individual to manually attend to each of the devices independently from time to time. All such monitoring and control can be done without necessarily being around or inside the home. Some devices if not controlled properly consume a lot of energy which leads to extra expenditure on electricity.

Therefore we propose to design an online home automation system which will work through internet and also enable one to remotely manage his/her appliances from anywhere, anytime. . Home automation can be reduces the human efforts and time. Home automation is helpful in helping handicapped and aged people that controls home appliances and in critical situations it can alert them.

2. LITERATURE SURVEY

i. Arantxa Villanueva, Rafael Cabeza, Sonia Port a “Eye Tracking System Model with Easy Calibration”, IEEE 2011

The aim of this work is to build up a mathematical model totally based in realistic variables describing elements taking part in an eye tracking system employing the well-known bright pupil technique i.e. user, camera, illumination and screen. The model is said to be defined when the expression relating the point the user is looking at with the extracted features of the image (glint position and center of the pupil) is found. The desired model would have to be simple, realistic, accurate and easy to calibrate.

ii. M.mangaiyarkarasi and a.Geetha, “Cursor control system using facial expressions for human-computer interaction”,(IJETCSE), April 2014.

A vision based human-computer interface is presented in this paper. The interface detects eye movements and interprets them as cursor control commands. The employed image processing methods include webcam for detecting the face, and template matching method based eye region detection. The Haar feature technique is used for eye feature extraction. SVM classification method is used for classifying the eye movements. The classification of eye movements such as eye open, eye close, eyeball left, and eyeball right movements are used for cursor top, bottom, left and right movement respectively.



Fig 1: If necessary, the images can be extended both columns

We have divided this project implementation in two way.

- In-House Automation
- Out of the House Automation

3. Methodologies

3.1 IN-HOUSE:

3.1.1 Remote operated light-

Android application is used to control lights. An application consists of remote to instruct the module, which controls relays accordingly. We are also use PIR motion detection sensor for detecting motion, by using that if motion senses then the light will turn on in that particular room.

3.1.2 Humidity controlled fan

Sometimes, after rains, the air feels moist. The water seems to have suspended in the air. However, in certain AC's you click some buttons and the atmosphere brightens up. How and why does it all happen? Moisture forms up in the air, resulting in humidity. However, the humidity sensor in your AC picks it up and cleans it up for you. Isn't that wonderful? A humidity sensor senses, measures and reports both moisture and air temperature. The

ratio of moisture in the air to the highest amount of moisture at a particular air temperature is called relative humidity.

3.1.3 Fire detection in home

Flame detectors, also known as optical flame detector sensors, report when fire is present within a specific area. These fire flames transmit invisible infrared light and ultraviolet radiation. Our UV or UVIR flame detector sensors use these invisible radiations to distinguish between a real flame and other sources of radiation that are visible to the detector. The fire detector is connected to a fire alarm control unit, or can function as a separate system to alert everyone or to shut down system in case of a emergency.

3.2 OUTHOUSE AUTOMATION:

3.2.1 Garden water automation

This soil moisture sensor is used to sense the present of water in soil and gives some output voltage to the processor to execute according to the instruction given by the user.

3.2.2 Water level detection in tank

A water level detection sensor module is an electronic device which is designed to detect the presence of water and level of water in tank and alerts user when water level is low.

3.2.3 Motion detected Light

We use PIR motion detection sensor for detecting motion, by using that, if motion senses then the light will turn on in that particular passage.

3.2.4 Parking Automation

By using IR sensor we are going to atomize the Parking. If motion is detected parking light will turn on using IR and PIR motion sensors.

4.1 SENSORS

4.1.1 Ultrasonic sensor-

This sensor has a capacity to detect distance of about 2 cm to 450 cm also has accuracy of 15 degrees and 2mm

Connection of sensors, VCC and GND pins to 5V power supply, Trigger pin (Trig) pin to a digital output and the Echo pin to a digital input on your microcontroller. Pulse the trigger pin high for at least 10us and then wait for a high level on the Echo pin. The amount of time it takes to receive the echo corresponds to the distance that the ultrasonic sound has travelled. The quicker the response, the closer your robot is to an obstacle.

4.1.2 LPG gas MQ2 sensor-

This sensor is used to detect gas leakage and is also helpful during fire emergency which helps to know gas leakage during other emergency.

This RM0703 is a 6 pin IC, 4 pins are used to receive signals and 2 for power supply. These sensors must have high sensitivity also alarm point is necessary to set

4.1.3 Motion Detection Sensor-

Motion Sensor is used to detect motion in a room and is helpful in providing security. It detects motion by detecting change in IR levels of sensor. It can be used for motion detection in security systems or robotics. It works on DC and gives TTL output is directly transmitted to microcontroller or to relay through a transistor.

4.1.4 Light Sensor (LDR)-

The sensor has a capacity to detect intensity of light using radiant energy that exists in a very low range of frequencies called light, and which ranges between frequency of Infrared to Ultraviolet light spectrum.

4.1.5 Soil Moisture Sensor-

This soil moisture sensor is used to sense the present of water in soil and gives some output voltage to the processor to execute according to the instruction given by the user.

4.1.6 Water level Sensor-

A water level sensor is used to detect water level in water tank and transmit data to user. Water level sensor works with the help of level detector which senses water level and sends instruction to motor to on and off when water level in tank is low or high.

4.1.7 Flame Sensor-

Flame Sensor is used to detect flames of fires. The sensors sensitivity must be high to transmit signals immediately I case of emergency. The most sensitive sensor also responds to ordinary light and is used for alarm purposes. Sensor must be kept at certain distance, to avoid the damage of high temperature sensors.

4.1.8 Sound Sensor-

This Sound Sensor is a simple microphone transducer based sensor based on the Transistor Amplification which converts from sound energy into electrical energy, and it can be used to detect the sound strength of the environment. The value of output can be adjusted by the potentiometer.

4.1.9 HC-06 Bluetooth Module-

The HC06 is a Bluetooth module having fully qualified Bluetooth V2.0also having data rate of 3Mbps Modulation at frequency of 2.4GHz radio transceiver. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).

4.1.10 IR sensor-

IR Sensor is useful for security purpose. Sensor has invisible rays of light when interrupted sounds alarm. Also it is used for parking to know parking status.

4.2 ADVANTAGES

In Smart home all household equipment's are examined by installed hardware and software and instructed to user to control these equipment's remotely through communicating to automation module. Proposed system is based on Arduino microcontroller. Also we can develop this system in many different ways with various other controllers. Arduino microcontroller is open source and used in system development. it can be used to develop objects that are supported by computing system. This process starts with sensors by performing their operations and send signals to Arduino microcontroller which will process received signal through program code and transmit data to user for further instructions to be received from user.

- **Savings**

You use your appliances and devices when needed can obviously optimize utility bills. No unnecessary wastage of money and when doors are not locked you have to run back to

home will be prevented and your time will also not be wasted. Less efforts and efficient also convenient to control all devices.

- **Safety**

You can control lights by just tapping and so not get scared of some shadows. By some other devices like automatic door locking system, IR sensors, etc. you can increase security. When you are not at home you are worried that if kids didn't lock door before going to play. By automatic door locking system you can lock it remotely.

- **Convenience**

With home automation convenient control of your home is at your fingertips. You don't have to trust someone else with your most valuable and precious things.

- **Energy efficiency**

Controlling appliances can increase energy efficiency of your home. If any device remains on you can off it through your device and save energy as well as save environmental pollution.

5.1 EVALUATION AND RESULT

In the research work we have successfully integrate arduino with various different sensors. Responses to arduino from all sensors are very effectuated. During testing of Bluetooth module, when control signals are sent were immediately received by arduino through Bluetooth module and works according to instructions.

Soil moisture sensor is a digital sensor which returns response as 0 when soil has no moisture and 1 when soil has moisture.

Water level is monitored through analog signals received to arduino and informs when level is below minimum specified level.

Motion is detected when IR levels are changed and informs arduino about motion. In response Arduino sends signals to LDR to turn on and off lights in specific area.

Gas sensor is a digital sensor returning 0 when gas is absent and 1 when gas is present.

Flame sensor detects heat level an immediate change in temperature and informs user about it through Arduino.

IR sensor is used for security purpose which transmits digital signals and when anybody cuts the signal alarm turns on.

5.2 Conclusion

People can control their electrical devices automatically and set up the control over appliances remotely. At the moment the components are a bit too high to be able to produce these devices for an interesting price. This project work is complete on its own in remotely and automatically switching on and of any electrical appliance not limited to household appliances, and sends a feedback message indicating the new present state of the appliance. It does not implement control of multiple appliances or automatic detection of faults in the controlled appliance.

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