Smart Home Automation and Home Security System Using Arduino

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Abstract--- The home automation is a rapidly increasing phenomenon in very current days because of higher rate of affordability and simplicity. The capability of controlling our houses, and for having the aspect to respond to events automatically, it has become very popular because of the security purposes and reasons of price. We have proposed a model to introduce a complete automation of house with a security system for our household. Main aim of this project is to establish a solution which is of low cost. We have used off shelf components because of which the economic value reduced. An Arudino board has a control of sensors and few actuators that help in monitoring a predefined location mentioned. The system also sends alert messages or signals if an abnormality is detected. The voice recognition part of project is implemented here permits user to control the house with the application voice commands.

Keywords--- Home Automation, Arduino Kit, Speech Recognition, Graphical User Interface, Java.

I.   Introduction

The new system of automation in houses is one among the emerging technology and is very popular nowadays across the globe. Mainly the end users and the people benefited are especially the physically challenged and old age people. But due to the increase in complications in the domain and because of high cost the system is not always favored. Population ageing is a common aspect that is taking place in all the places across the globe. Ageing results primarily from decline of mortality, and decline of fertility. This ends up in reduce of children in a proportion and to an raise in the ratio of people in working ages and of elder people in the population.

The global share of elder people (age of 60 & above) increased from 9.2 per cent in 1990 to 11.7 per cent in 2013 and will rapidly increase as the world population increases day by day, at last reaching 21.1 per cent by 2050. [1] With rapid growth in economy, living standard of people is also rising day by day. The modern society expects safe, economic, comfortable and convenient life. "Home automation is extremely emerging significantly promising and a beneficial area. The main benefits are increased comfort, greater safety and security, to a more rational use of energy and other resources, allowing for significant savings. It offers a powerful means for helping and supporting the special needs of people with certain disabilities and, specifically, the elderly. This technological application in all the domains is specific and may steadily improve in the upcoming years [2]."Home automation is defined as the automation of the house also the activity in the house. Automation of home is a popularly known term in society and has been around for a significant time. Home automation contains the overall management of lights, temperature, components installed in house, to provide sophisticated life.

II.   Existing Models

Sheperd[3] has implemented the model by using a Bluetooth wireless module as a cable replacement and connected it by means of the wireless connectivity that could be achieved using the approach of radio system of home automation. Sriskanthan et al. [4] also explained a system working on module that is wireless called bluetooth that allows the user for overall facilitation of systems that are provided with Bluetooth connection over network acting on a host mobile. MaqsodJ. [5] installed some procedures and provided a valid solution for realization of a system which incorporates a Bluetooth control via Android app.

Cubukcu.A. et al [6] has achieved recognition of voice which is designed on the wireless control of most of devices in home. Adrainshyak, A. et al [7] implemented a home automation module that is capable of overall control of all the intensity of lights in the house, temperature present inside the area and the house, alarms and also the household appliances.

III.   Objectives

The objectives of proposed solution are

1. To provide houses with economical smart systems by decreasing the complexity with the components used.
2. To decrease the cost and a open sourced software is implemented to avoid the licensing problems for the access of the software.
3. The sensors used will work by the controlling mechanism of Arduino, and certain voice commands has been used on java, both are a Free software that is Open sourced and the GUI for safety purpose is worked with MATLAB 2013.
4. Arduino is an real time applications open sourced prototyping platform that provides easy of use of hardware and programming environment for the developers.
5. **It creates an energy efficient system in a economic way.**

IV.   Proposed Model Block Diagram
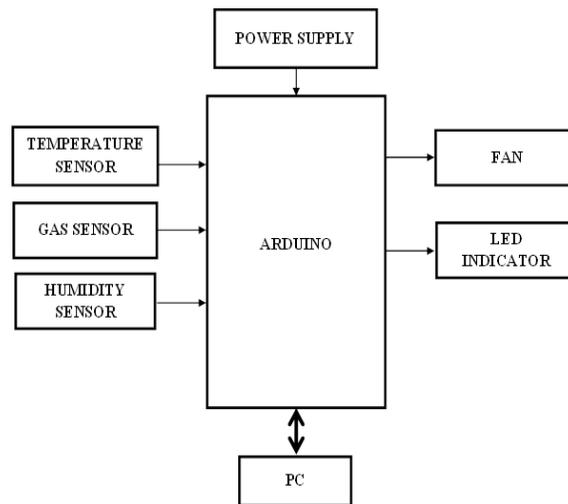
Fig. 1: Automation of Home Using Arduino

V.   Experimental Procedure

Monitoring and Sensor Reading

Arduino provides the monitoring of sensors and some action sensing in real time applications. The ports on the Arduino[8] board(analog and digital) acts as pins that serve for input and output(GPIO). The ATmega328[9] is a controller embedded on the board contains the analog -to-digital converter , which changes the signal that is analog to a number which is in the range of 0 and 1023. The number obtained is in proportion to the voltage that is set as input. Any sensor that operates on the value of 5 volts is given to the board. For the function of monitoring the readings from the sensor using arduino, by establishing a model for the connection to the board by an analog sensor.

Fig. 2: Arduino Board

Controlling Actuators

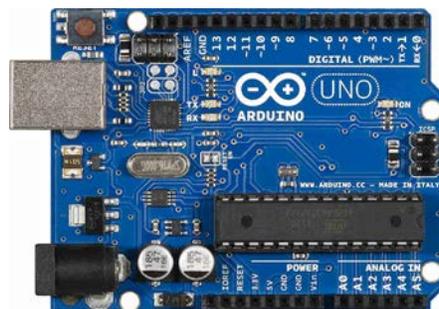The Arduino is capable of triggering actions (i.e., pushing notifications and switching on/off switches) during monitoring of sensors in current time. While reading the data provided by sensors in the real-time, the Arduino performs actions like controlling the speed of the fan, switching the LED, and turning ON/OFF the alarm accordingly. In this proposal, two operating modes are framed. The initial part is a manually–automated mode where the appliance such as bulbs is made to work using voice command. The selected household articles may be turned ON/OFF based on correct decision .The alternate way is a self-automation mode. The user can only overview the actions. The installed Matlab GUI [10] platform will control the entire system and turned on /turned off the system accordingly. It also sends the significant message to the owner.

Smart Home Temperature Sensing System

We will control the home temperature automatically by using a certain temperature sensor LM35. The output temperature directly alters with the temperature marked in Celsius. It has a low self-heating capability, which is apt for remote applications. It is less in the cost wise due to trimming of water level, operating from 5 to 30v, decrease in impedance output .We have used this control [11] to sensing of area's temperature. The controller differentiates temperature that is measured as hot, cold or normal. The room temperature value can increase or decrease by changing the fan.

Fig. 3: Temperature Sensor [LM35]

Smart House Lighting System

The user can access the light by LDR sensor automatically. In this light control process, the LDR is used for the process of detecting bright/medium/dim/dark conditions. [12] The working of LED is managed with Arduino. It depends upon the intensity of light condition of the area and it is reciprocally varies with the intensity of brightness in the area. This is an efficient way in saving of energy.

Fig. 4: LDR

Gas Detecting System

The smoke sensor used is the MQ-2 for detection of gas. It is a cheap sensor that is sensitive to smoke and the other flammable vapours. This sensor produces the result with the smoke content in parameters of voltage as an output. If there is more smoke, the more will be the voltage output. The sensor includes built-in potentiometer to adjust the sensitivity to smoke. By potentiometer variation, values can be alternated as it is sensitive to smoke. [13] We have connection of the sensor with board so that arduino will have the access of sensing range denoted in the buzzer will be blown and a message "House on fire" on the screen of the computer if the output of sensor is a voltage above a certain level. This way, we can find the danger and alert the user.

Humidity Sensing System

The humidity in the room is measured by using a DHT11 humidity sensor. The DHT11 is a less complicated, provides humidity values and temperature values and is a digital. It implements a sensing technique which is follows value of humidity .It also contains a thermistor which measures the environmental air and gives out on the digital pin as a output. [14] The readings obtained at the arduino then the output readings are obtained on the LCD screen.

Fig. 5: Humidity Sensor [DHT11]

Smart House Security System

The safety for the system is designed using the MATLAB GUI platform. This security system contains of a portative panel of pushbuttons, a LCD screen and a camera. On start-up it needs a four digit password which was pre-set by the user. If the entered password matches with the recorded password then a message is passed to the Arduino via USB cable and the door opens and the entire house turns ON. If password doesn't match with the pre-set, then the image of intruder is captured and the image is saved in the system and e-mails the picture of intruder to the owner.

VI.   Outcome

For demonstrating the product developed, here the snapshots of the controlling mechanism taking place using Arduino has been published.
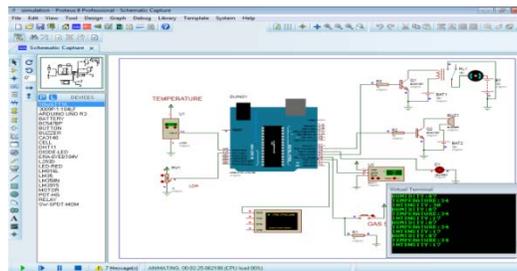
Fig. 6: LDR Output
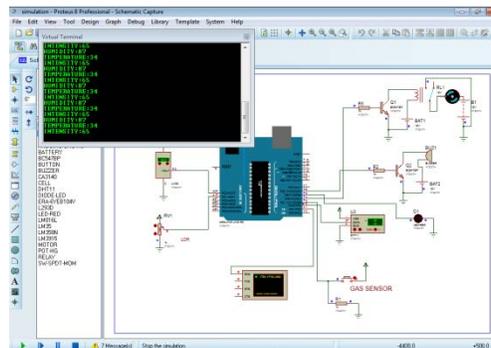
Fig. 7: Sensor Reading
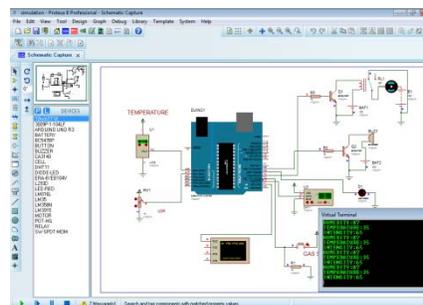
Fig. 8: Temperature Output

VII.   Future Scope

For further work, changes can be made like adding motion sensors for automatic turning ON/OFF of lights, fans based on the position of user, wireless connectivity can be added to system, and schedulers can be added for the control of household appliances. The whole system can be constructed as economic commercial hardware package. This project of home automation can be suitable for automation of grid in smart grids in power systems.

VIII.   Conclusion

A basic skeleton for an economic artificially intelligent system is proposed and achieved by means of this paper. This paper gives an exposure of controlling various home appliances and to provide a security using Arduino Uno and Matlab GUI. This project affords a cost efficient system, and is based on Visual Basic and Arduino platform which both are FOSS (Free Open Source Software). So the overall implementation cost of the items is very inexpensive and is affordable by a common person. This low cost system is designed for the improvement of the living standards in home. The voice control system helps the old age people and people with disabilities in a productive way. The system is designed in Matlab-GUI also assure the safety of home and also provides safeguard from threats. The entire system can be constructed as economic commercial hardware package. This approach of home automation can also be used for automation of grids in smart grids in power systems.

Acknowledgement

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