

Wi-Fi Based Remotely Operated Smart Home Automated System using the Concept of Internet of Things

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Abstract—With the help of Arduino Uno microcontroller the design and execution concepts for a wireless real-time home automation system is presenting in this paper. Most widely there are two operational modes. The first one is denoted as a manually–automated mode here the user using the cellular phone through Wi-Fi communication technology can monitor and control the home appliances from anywhere over the world. Another mode familiar as a self- automated mode which are portable for monitoring and controlling home appliances based on related sensors .The main theme of internet of things is to control electrical appliances and also for security purpose. This also helps specially challenged people and old age people.

Keywords—Home automation, Arduino microcontroller, Internet of things (IoT), Transport Control Protocol (TCP), Wi-Fi

I.INTRODUCTION:

Involvement of technology is becoming greater in reducing the cost of living as it is raising high. Hence by viewing these things the sense of the Smart Home project became friendlier for the users in building and maintaining their houses which are smart and also for keeping the energy levels down while providing more automated applications. A smart home has the advantage of its environment and allows control irrespective of the presence of the user. For its great advantages Home automation is becoming very popular now days. Actually Home automation is meant as the controlling of home appliances and domestic features by local networking or by remote control. The framework is provided by the Artificial intelligence to go real-time decision and automation for Internet of Things (IoT).

Kevin Ashton (1999) was the first one who applied the idea of “Internet of Things”. The Internet of Things (IoT) is the network which is very useful for exchanging and controlling the data between the networks and systems etc. IOT is becoming like the part of human life and brought the great revolution in communication for both people and machines. Bluetooth, Wi-MAX and Wireless LAN (Wi-Fi), ZigBee, and Global System for Mobile Communication (GSM) are the most widely used communication technologies in home automation. Here we are trending to the Wi-Fi module which offers the user a complete access control of the appliances through a remote interface.

Features of Home Automation System:

1. Less installation cost.
2. User authentication.
3. Highly Secured.

Applications of Home automation and security

The applications of Home Automation and Security System are listed below:

1. Smoke detectors can detect a fire or smoke condition, and blinks all lights in the house for alerting the people in the house to go for any possible emergency.
2. In emergency cases

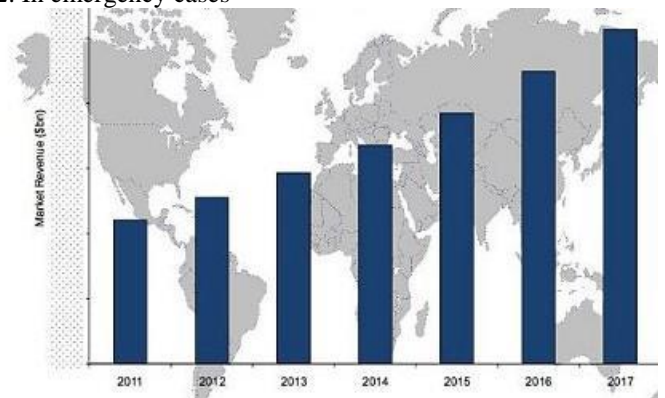


Figure1: Popularity of Smart home in market

providing Medical alert or give some tele assistance is possible.

3. Precise and safe blind control.
4. Detection of fire, gas and water leakage can be done by using the respective sensors.
5. This also provides an emergency alerts to the home owner and fire department by making a call.
6. By auto on/off lighting system it is possible to save energy in both residential and commercial areas especially at night times in all major city office buildings, say after 10pm.
7. Provides an automatic door locking system with controllable system of security .And also there is a

possibility of controlling the security cameras by the user, so that he can know about what is actually happening around a house or a business right from a monitor or touch panel.

8. If there is any kind of unauthorized movement the motion sensors that include in the Security systems will detect and notify the user through the security system or through cell phone.

9. An intercom system allows communication via a microphone and loud speaker between multiple rooms.

Description of proposed System:

In this work we will design a system which is based on Home automated system using internet of things concept. Here for communication point of view we are using Wi-Fi module Esp8266 which is worked on AT command set. Basically we are using TCP protocols for communicating with telnet.

The system mainly and simply involves the following three components:

1. Aurdino Uno
2. Web server, and
3. Android device

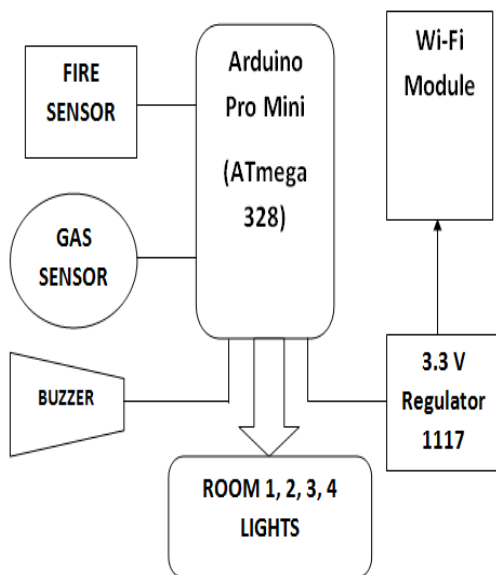


Figure 2: Home automated system block diagram

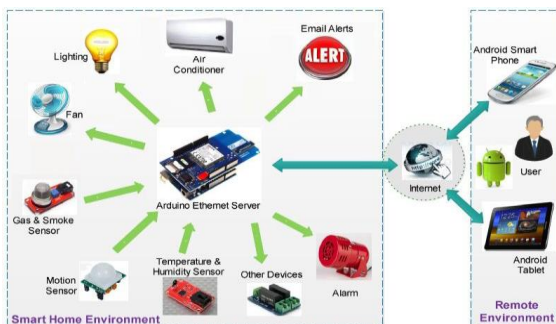


Figure 3: Detailed Design

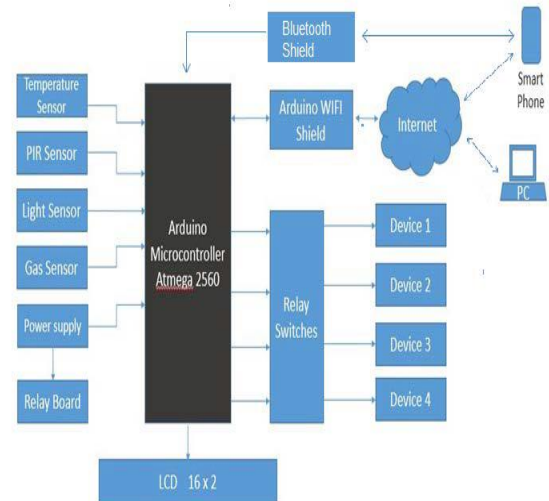


Figure 4: Detailed Block Design

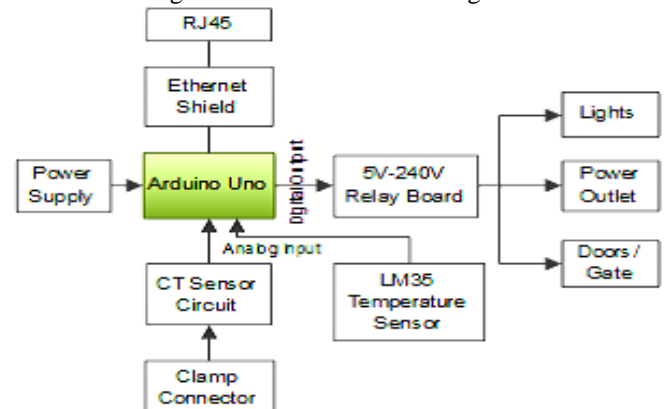


Fig.5 Hardware implementation

Description of components:

Arduino Uno Board: Arduino Uno is a single board microcontroller, which uses Arduino IDE Software for Programming. Official Arduino had used the Atmel megaAVR series of chips, specifically the ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega2560. Microcontroller used in the proposed project.



Fig6: Arduino Compatible Freeduino (ATmega328)

Wi-Fi Module: Wi-Fi Module is used to enable connectivity with the Internet.



Fig7: Wi-Fi module Esp8266

Relay: Relay is a switch which performs controlling action over power or voltage. Only reason to prefer Relays in Arduino is that they can't withstand higher powers/voltage.



Fig8: Relays

SOCKET PROGRAMMING:

The system implemented here uses client-server communication which makes use of the services provided by the TCP/IP (Transport Control Protocol/Internet Protocol).Transport layer consists of two protocols: TCP (Transport Control Protocol) and UDP (User Datagram Protocol).

Algorithm for Server Program:

1. Open the Server Socket
2. Wait for the Client Request
3. Enable I/O ports
4. Communicate with client
5. Close socket

Algorithm for Client Program:

1. Create a Socket Object
2. Enable I/O ports
3. Communicate with server
4. Close the socket when done

Operating Modes of Smart Home

1. Scheduling Mode: The user can set the timings for the individual devices to turn ON or OFF.

2. Manual Mode: The user can turn ON or OFF the device depending on the status of the device by using android app or by using the manual switch.
3. Dimming Mode: The user can change the intensity of the light or speed of the fan
4. Auto Mode: This mode is used for fans and lights. LDR sensors and LM35 sensor are used to control lights and fans respectively.

Manually-automated system:

Manual implementation to control and access the android device such systems are known as Manually-automated systems.

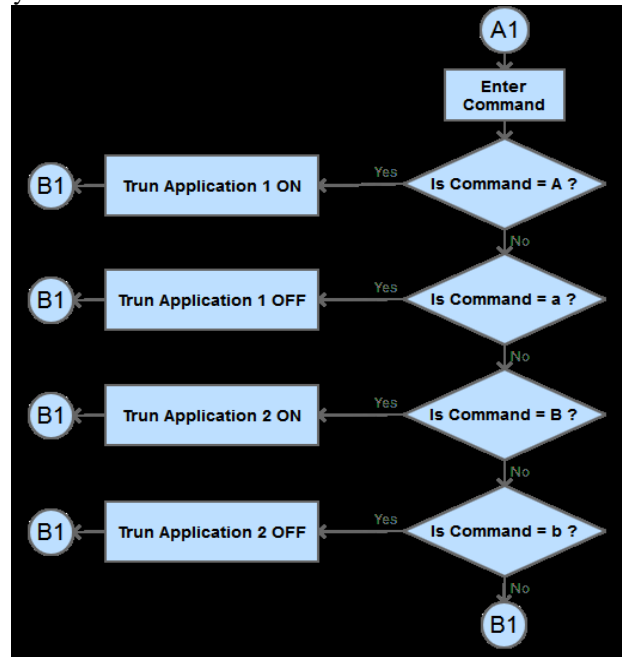


Fig 9: Self automated system flowchart

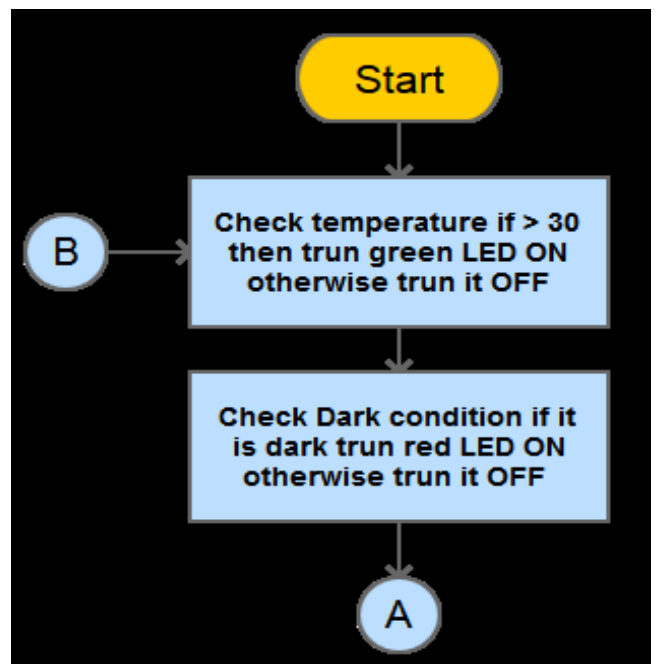
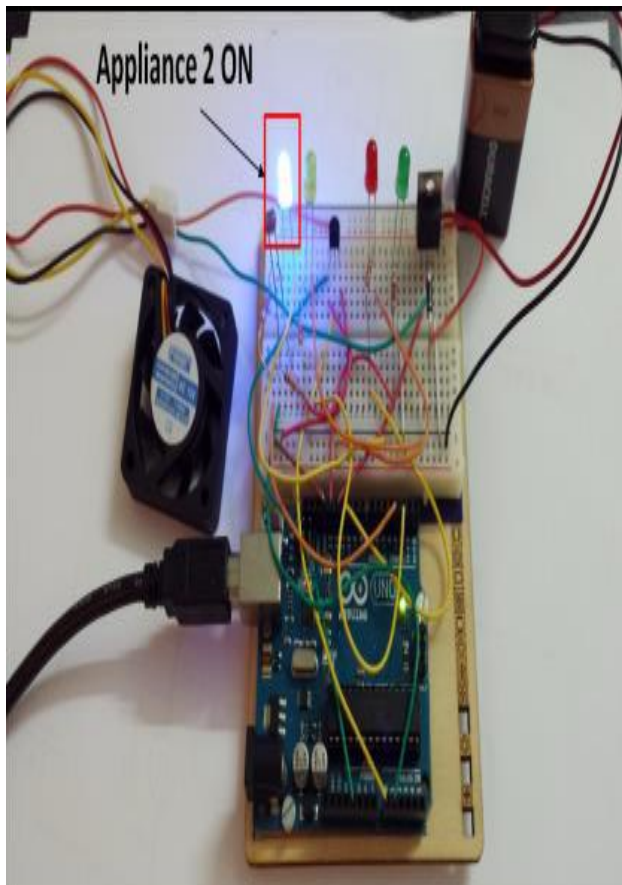
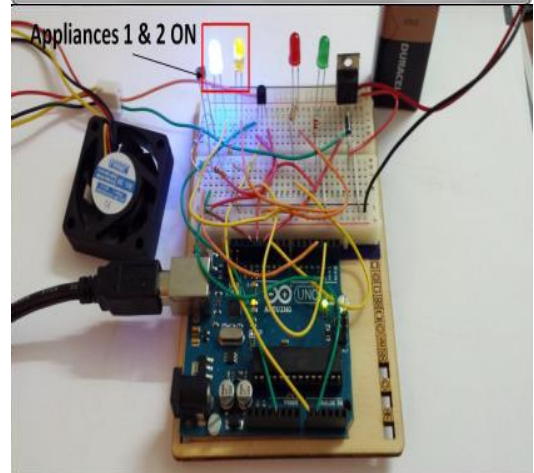
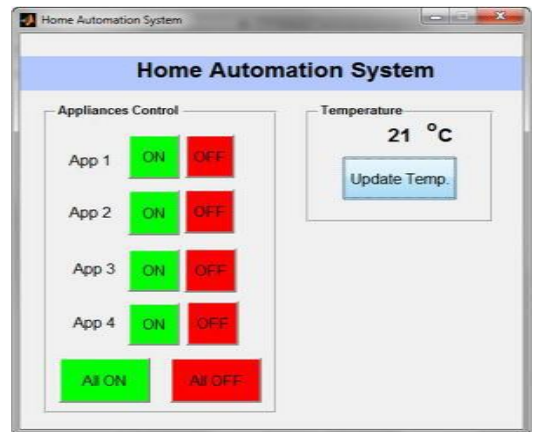
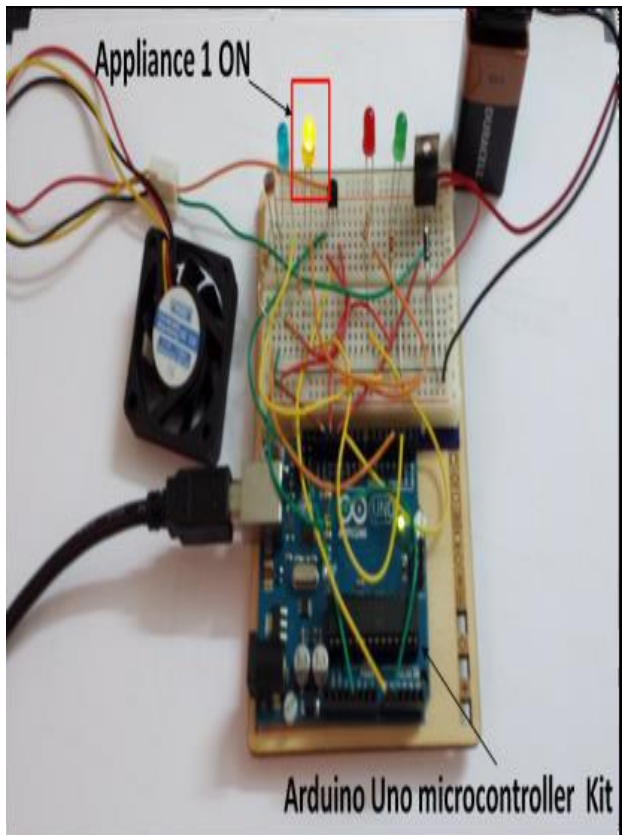
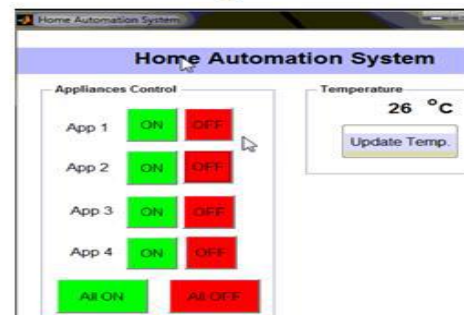


Figure 10: Proposed Manually Automated Systems



Self-automated system:
 In case of the self-automated mode, the appliances are automatically controlled. Two systems are implemented for this case one is temperature control and monitoring system and the other is the light/dark sensing system.



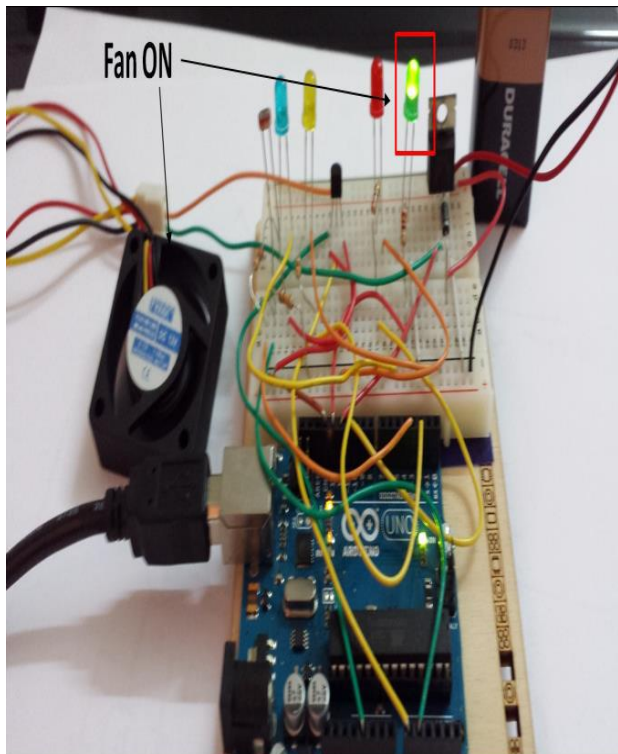
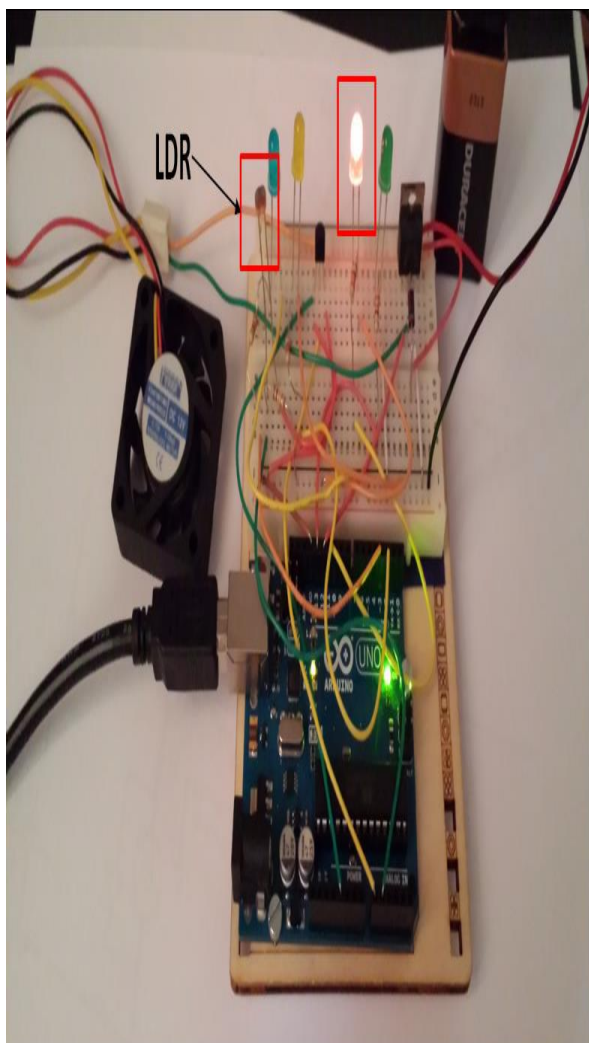


Fig11: Temperature self-automated system.



Fig: LDR self automated system



RESULTS AND DISCUSSION

Functionality of proposed app designed:

- Automatic control of home appliances over internet using user authentication (Remote device monitoring and control)
- Setting time option, Alert notification.
- Password change option
- Supports voice activation for switching functions.



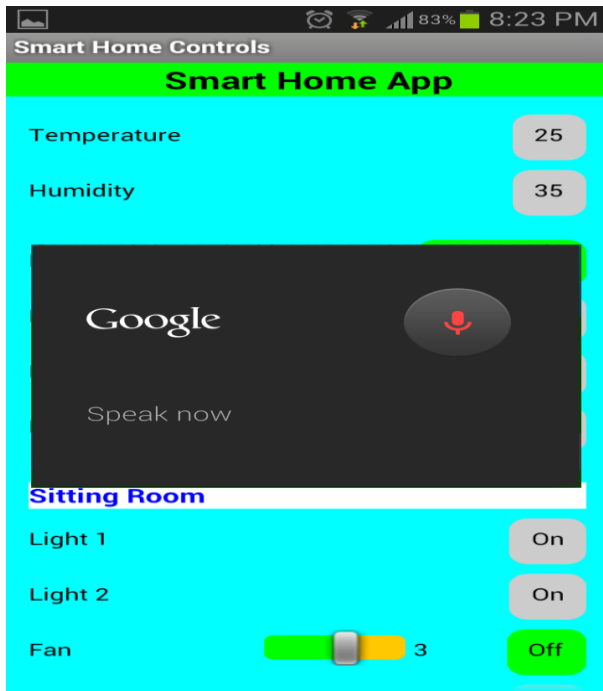
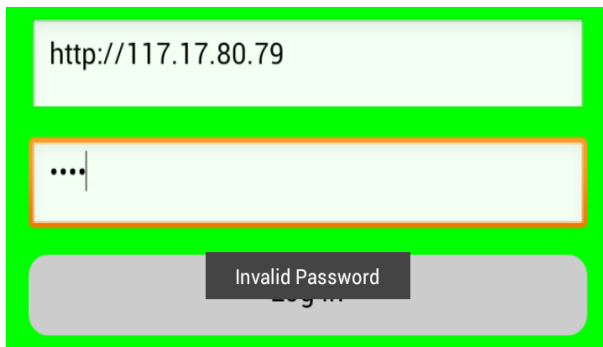
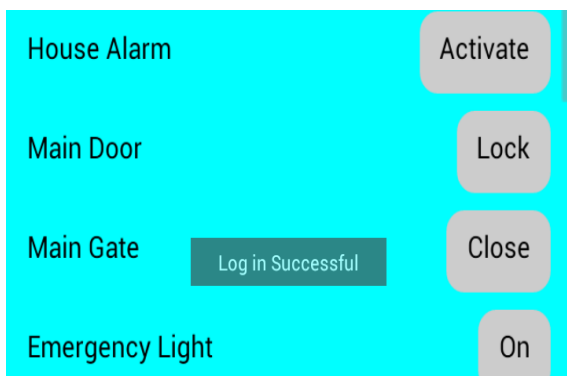


Figure12: Screenshots of the proposed smart home app

For successful web server application implementation we need to enter correct IP address and valid password. After entering valid data for web server get access to proposed app and it grant us a response code 200, or else 404 to indicate error.



(a)



(b)



(c)

Figure 13: Proposed app Screenshots (a) invalid password is entered (b) login is successful (c) no voice command is detected.

FUTURE WORK:

This project scope can be further extended to any area not only restricted to home even different technologies can be preferred in both wired and wireless configuration. Our future aspect: we can build a CCTV which while capturing pictures found anything suspicious during recording automatically ON buzzer immediately buzzer can control room.

CONCLUSIONS

In this project we control home appliances remotely with low cost, user authentication, provides alert notification and automatically controls home appliances connected to the relay terminal work efficiently with very low response time.

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