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Remote Controlled Home Automation Using Android Application via WiFi Connectivity

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Abstract:- Today is a world of advanced ubiquitous mobile applications which are used exhaustively to save time and energy. These applications ease day-to-day life of a common man. Based on these technologies and applications we designed a Home Automation System. In this paper, we propose design and prototype implementation of home automation system that uses Wi-Fi technology and Android operating system. An attractive market for Home Automation System is for busy families and individuals with physical limitations. Users can control electrical appliances in home or office via smart phone. Application will also provide secure notifications and alarm for Burglary, fire hazards and LPG leakage.This project aims at controlling every happening at home or office on your fingers**.**

Keywords- *Wi-Fi, Android, Fire Sensor, LPG Sensor, IR Sensors, VB.NET, Microcontroller, Relays, ucFlash+.*

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I. INTRODUCTION

The current scenario is such that people have to manually operate various kinds of appliances which at times is not feasible for busy families and individuals with physical limitations. Also there is no effective means of controlling various accidents due to gas leakage, blaze and burglary.

Our system will provide proper notifications to users for such incidences and alert them via sending messages on their mobile phone.

Smart home is a very promising area, which has various benefits such as providing increased comfort, safety and security to people. It is rational use of energy and other resources thus contributing to a significant savings in terms of time and more secure. Such system will be affordable, portable and scalable so that new devices can be easily integrated in to systems. The technology is easy to use and targeted for people without technical background.

II. THEORY

The main objective of this project is to design and implement a cheap and open source home automation system that is capable of controlling and automating most of the house appliances.This application is an easy and manageable web interface for user to run Home Automation System.

In this project we have integrated technologies like Android with Wi-Fi to execute Home Automation System. We designed user Interfaces using Android because Android operating systems are capturing most of the mobile market.It has technical advantages of scalability, flexibility, availability, security and its ease of use for users.

The aim to take Android as platform is because people are familiar as many applications are launched in Android. Android provides interactive graphical user interface which makes an application easy to use for users.

In this application, we used fans, bulbs etc depicted graphically for better understanding of the users. Users can switch ON/OFF any appliances like fan, tube lights etc as per their convenience through mobile application. They can also check the status of appliances even when they are not at home. This application is scalable to add or delete appliances as per user's requirement.

In this application we embedded features like gas leakage alerts to user by sending simple text message on user's phone. If there is a gas leakage, our system will sense it and send the signals immediately to server. Server will send message to user mobile application connected with server through Wi-Fi. User can take immediate action on receiving SMS from server by automatically turning off the cylinder valve and opening windows through Android application as per user's command. In addition, feature like fire alarm is embedded to sense increase of temperature above threshold value. Server will take appropriate action by sending message via Android application to user. To keep home safe from burglary this project behaves in same fashion.

We have selected Wi-Fi technology to be used in this project because it will keep Home Automation System active and user can interact with server even if user is not present at home.

Wi-Fi is available with multiple ranges, ranging from 150 feet (46m) for indoor and 300 feet (92m) for outdoor. The

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system maintains log information as well regarding the units consumed by various appliances which can help the user acquire knowledge about individual device power consumption.

III. PROPOSED SYSTEM

A. *FEATURES*

The Entire project consists of two main phases i.e. Hardware and Software. User has the central control over home appliances by using Android phone application. User commands through Android application whose signal is given to PC via Wi-Fi. PC has the sever program deployed on it. Server is configured to handle both hardware and software modules. Microcontroller using serial communication port interacts with server.

As per user's command particular appliance is operated (ON/OFF). Server keeps record of log information which is provided to user on demand and temperature readings regularly updated on user's application. In case if gas leak or fire hazard occurs, it will send notifications to user about it, so necessary actions could be taken and hazards can be avoided. Through Wi-Fi, server and user application is connected. Wi-Fi is chosen to improve system security (by using secure Wi-Fi connection), and to increase system mobility and scalability. In case when no one is present in the room, the appliances will automatically get switch OFF, thus saving electricity.

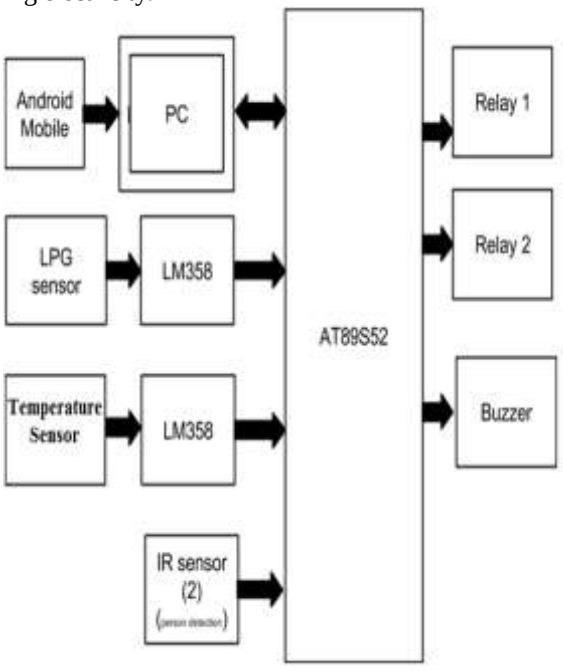

Figure1: Block Diagram

B. *SYSTEM DESIGN*

- *Hardware Design*

The hardware circuit consists of Atmel AT89S52 powerful microcontroller, temperature sensor (LM35), LPG sensor (MQ6), Relays and IR sensors.

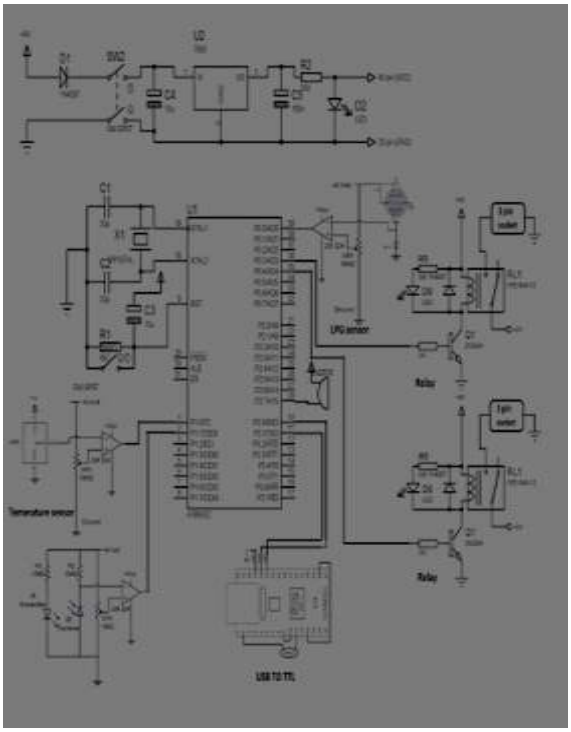

Figure2. Hardware Circuit

This microcontroller is a 40 pin IC having four ports namely P0, P1, P2 and P3 each with 8 I/O pins (P X.0-P X.7). The LPG sensor is connected to pin P0.0, Two Relays to pin P0.3 and P0.4, Temperature sensor to pin P1.0, IR sensors to pin P1.1, Buzzer to pin P2.7 and USB-TTL to pin P3.0 and P3.1.

On AC power supply of 230V, the Bridge rectifier (D1) converts it into DC. To get a constant output voltage of 9V DC, voltage regulator 7809 is used since relay circuitry requires 9V supply whereas 7805 regulator is used for microcontroller working. Capacitors, (electrolytic or ceramic) and resistors with their specific values are mounted as per the requirements. Crystal Oscillator provides frequency of 11.0592 MHz for microcontroller working. LED's mounted on the circuit indicates whether the circuit is working properly.

- *Software Design*

The software design is nothing but designing of graphical user interface on Android application. Using this GUI, user interacts with the system to control devices. For interaction, user initially has to establish connection between Android application and deployed Wi-Fi network. On successful establishment of connection, user can either operate devices (ON/OFF) or acquire log information (energy consumed by each device) about devices. Further, temperature reading will be constantly notified to user via Android application. In case of emergency situations like gas leakage or fire hazards, user will be given immediate notification in the form of simple text message. When IR sensors will detect that no one is present in the room, it will automatically turn OFF appliances, and this information will be sent to Android Application.

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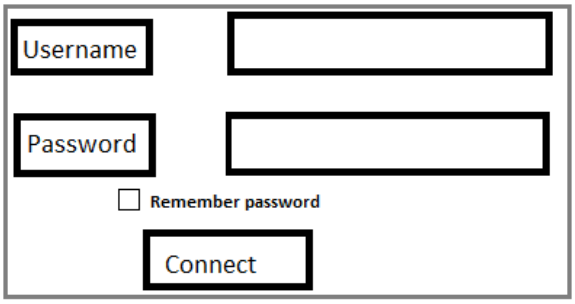

Figure3. Login Screen

This is the first screen that will be displayed to the user wherein the user has to establish connection with Wi-Fi network for remotely accessing appliances.

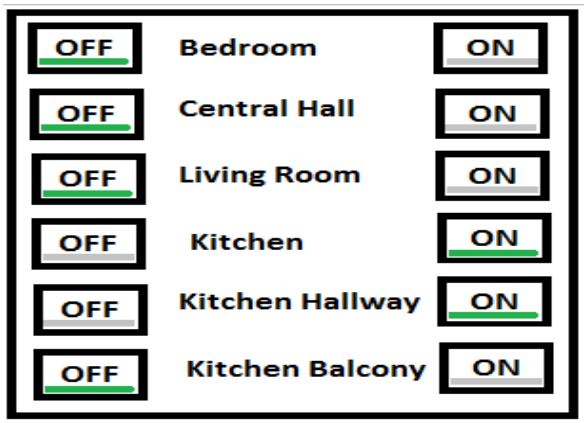

Figure4. Central control

This allows user to have central control over all the appliances present in a particular area without the need of individually turning ON/OFF.

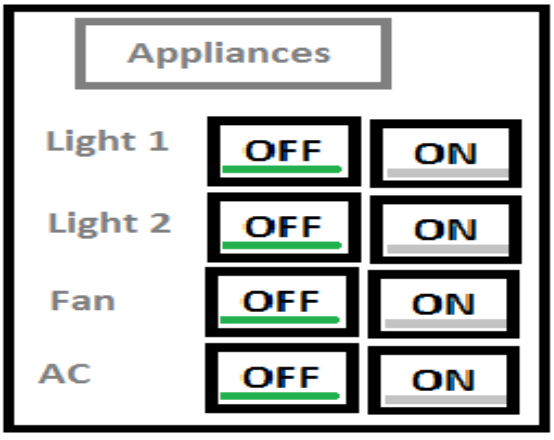

Figure5. Appliances Status

Using this screen, user can control each of the appliances present in the room as per the users' requirement.

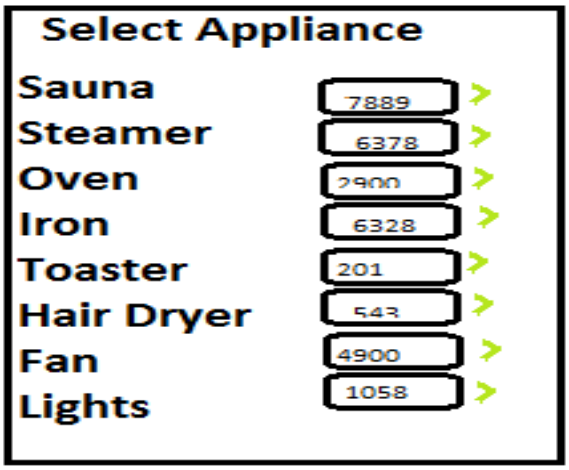

Figure6. Energy Consumption Screen

Log information specifying the energy consumed by various devices will be displayed on Android application upon users' request.

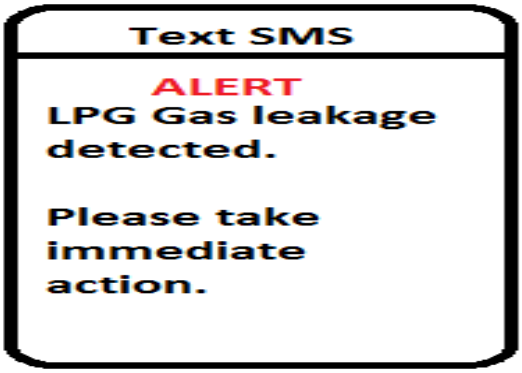

Figure7. Alert Message

This shows an alert message which is sent to the users' Android application when LPG leakage occurs. Similar alert message is sent in case of fire hazards.

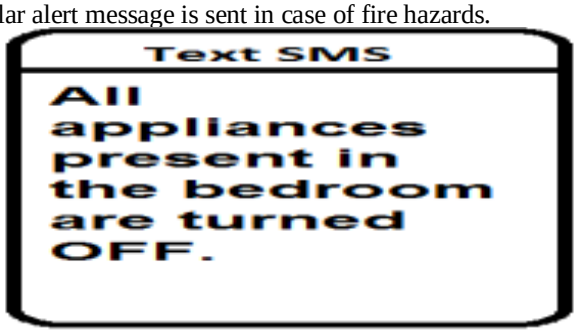

Figure8. Message Screen

When IR sensor detects that no one is present in the bedroom, all appliances present there will automatically be turned OFF and this is notified on Android application. User will receive similar notifications for other rooms as well.

C. WORKING

The user can access this system using Android handset. User sends command through Android phone whose signal is given to PC via Wi-Fi.

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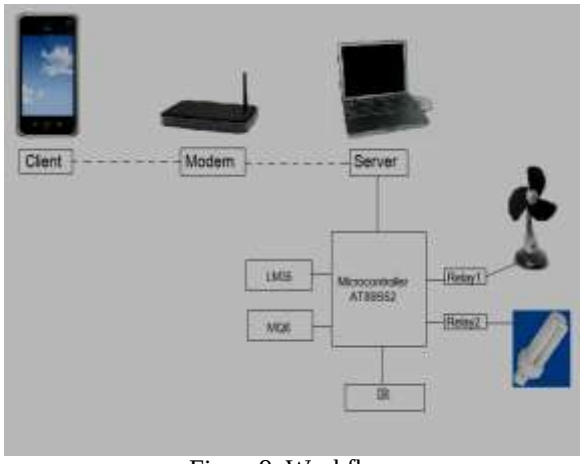

Figure9. Workflow

Server machine transmits this command to microcontroller circuit through USB to TTL which converts the digital signal to analog. The microcontroller circuit consists of temperature sensor (LM35), LPG sensor (MQ6), Relays and IR sensors. Microcontroller circuit in turn will perform the required operation as per the command received. In case if temperature exceeds the threshold limit or on gas leakage immediate notification will be received by the user on his handset. .The system also has IR sensors which keeps a count of people in the room, so when the person enters or leaves the room it will increase or decrease the count respectively. Thus on the count of zero the appliances will be switched off automatically.

The server machine will also maintain the log information regarding the consumption of energy by each device and this information will be displayed on their mobile phone as and when required.

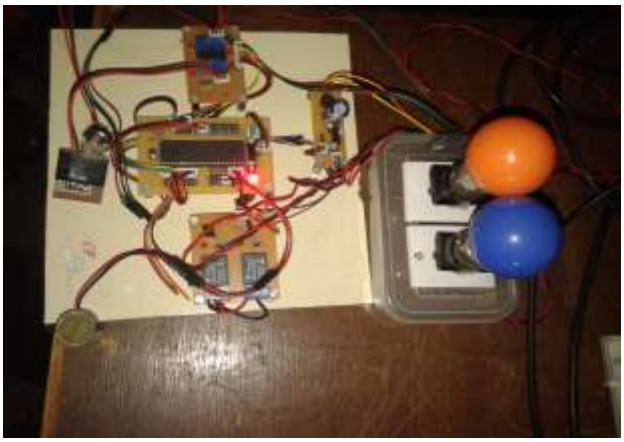
Figure10 .Hardware Circuit

IV. FUTURE WORK

We can build cross platform system that can be deployed on various platforms like iOS, Windows etc. Home Automation can be extended to all other home appliances. Security cameras can be controlled, allowing the user to observe activity around a house. Security systems can include motion sensors that will detect any kind of unauthorized movement and notify the user. Scope of this project can be expanded to Industries, Hospitals etc and thus not restricted to home.

V. CONCLUSION

This paper proposes a low cost, secure, ubiquitously accessible, remotely controlled solution for home automation. The approach discussed in the paper is novel and has achieved the target to control home appliances remotely using the Wi-Fi technology to connect system parts, satisfying user needs and requirements. Looking at the current scenario we have chosen Android platform so that most of the people can get the benefit.

The technology is easy to use and targeted for people without technical background. This technology also provides great assistance to handicapped and aged old people.Theproposed system is better from the scalability and flexibility point of view than the commercially available home automation systems.

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