Android based Smart Home: Remotely Controlling and Monitoring Home Appliances

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Abstract— Internet of Things (IoT) platforms allowed us to gather huge amounts of perceiving data. The idea of remotely concerning and monitoring real world objects through the Internet. When it comes to our house, this concept can be rightly incorporated to make it smarter, safer and automated. This project focuses on erection a smart home security system which sends alerts on android app by using Internet in case of any invade and rears an alarm optionally. Mobile-device-based activity quicker and estimate the app for participants living in smart homes. The practical goal of this paper, to create a virtual, but practically usable, android home automation system. The android mobile is used to direct the commands to the arduino to switch all the home appliances. The main feature of this system is to control the energy levels of home usage like speed of fan based on temperature, intensity of light and another feature that get the prestige of our home appliances from our android mobile phone.

Key words: Arduino, Android, Wi-Fi, Home Automation, SMS, Bluetooth, GSM, Automatic Switching

I. INTRODUCTION

Wireless Home security and Home automation are the dual aspects of this project. Home automation aims the orchestration of digital devices to provide users with real comfort together with security and ability to monitor multiple dwellings [1]. Traditional home automation systems involve the control of digital devices which provide the functions such as heating, lighting and shading. The provision for sending alert messages to concerned security personnel in case of critical situation is also built into the system. The Smart home, the use of new technology, to make the domestic activities more convenient, comfortable, secure. This system does not require the user to manually activate an alarm but still it provides the user with the advantage of analyzing the situation and then triggering the security alarm remotely from his phone.

The home automation system includes constituents which are:

A. User interface

As an observer, computer, or Phone, for example, that can give orders to control System.

B. Mode of transmission

Wired connections (example Ethernet) or Wireless (Wi-Fi, Bluetooth, GSM) etc.

C. Central Controller

It is hardware interface that communicates with user interface by controlling domestic services .Electronic devices, a lamp, an AC or a heater, which is compatible with the transmission mode, and connected to the Central control system.

D. Internet Connectivity

Control devices from anywhere in the world with use mobile phones to control smart home.

E. Expandable

Certainly add devices to create an integrated smart home system and built-in security make sure reliability of smart home.

II. PROBLEM STATEMENT

The population is promptly increasing and lack of economical and suitable smart home technologies inspired us to develop smart home technologies in Android platform. Many old person face different problems in their daily life. These problems are mostly occurring when they are in home lonely. Therefore, a smart home system is personalized to the different needs of old person can make their natural life more relaxed, joyful and help put up with their good health and good fortune.

By identifying these requirements for elderly smart home the objectives of paper is as follows:

1) To design a home automation system that is capable to helps old person in individual daily actions.
2) To design systems that moderate consumption of electricity, improve class of older life.
3) To design a home automation system i.e. accomplished of learning and executing daily routine at a low cost.

III. LITERATURE REVIEW

Many Authors designed smart home systems by using different technologies. By using GSM based home automation System we need to send message (Alert) to control home appliances [4]. It has extra time delay and compound system.

By using Bluetooth home automation system also we can control all the home appliances. But the main disadvantage is Range [9, 12].

Some authors designed home automation using Wi-Fi. But in those designs they implemented only ON/OFF functionalities.

In our design we realized ON/OFF functionality alongside with the voltage variations and all the home-based appliances are controlled by using android application.

IV. METHODOLOGY

Methodology is divided into five phases.

A. Problem credentials and circumstantial

In this stage, the intentions of the research and the problem statement are framed and defined. Both practical and non-practical requirements are recognized and labelled.

B. Literature review and assessment

In this stage in more detail literature review is carried out. Related papers are examined, and the approaches and ideas used in smart home.

C. Design proposed model

In this stage, GUI and databank is planned based on the requirements recognized in stage 1 and 2.

D. Develop prototype and replication

In this stage, the prototype is developed and replications are performed.

E. Testing and Assessment

Here, the developed system is tested to ensure the system objectives requirements are met.

V. ALGORITHM

Here, the Observe, Learn, and Adapt (OLA) algorithm is applied in our smart home system. The OLA algorithm uses the results of the combination of wireless sensors and artificial intelligence concepts towards improving energy management in the smart home.

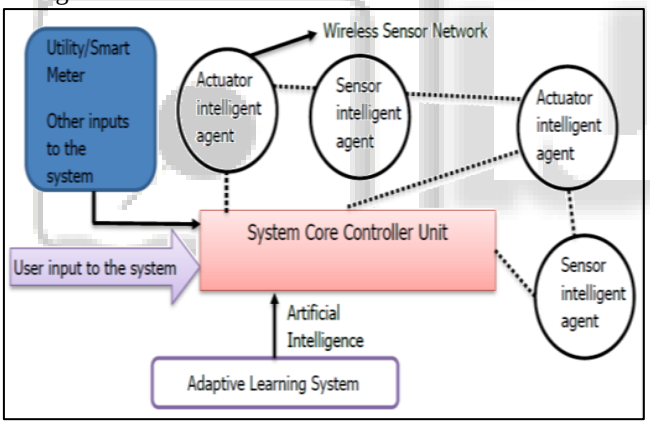

Fig. 1: Research Algorithm

VI. SYSTEM ARCHITECTURE

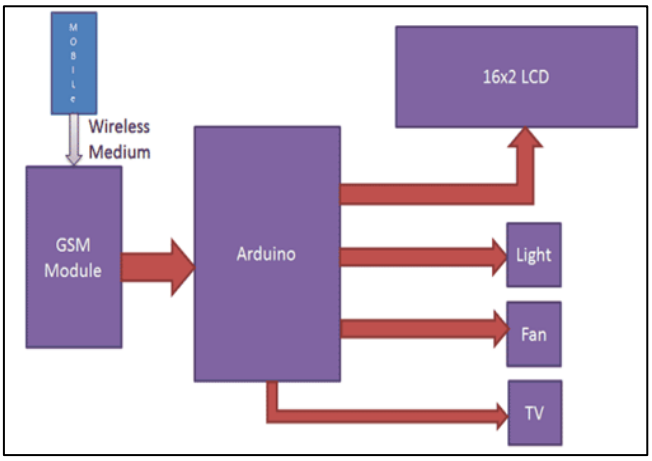

Fig. 2: Home Based System Architecture

VII. DESIGN AND IMPLEMENTATION

This paper presents the overall design of Home Appliance System (HAS) with low cost and wireless remote control. This system is designed to help and provide provision in order to fulfill the needs in home. This system implements wireless Android technology to provide remote access from smart mobile. The design replaces the existing electrical switches and provides more safety control on the switches with low voltage activation method.

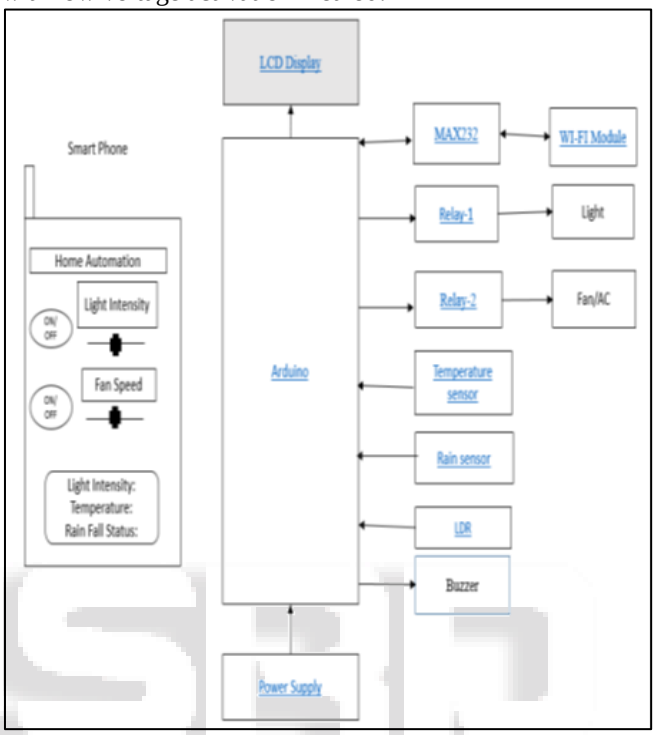

Fig. 3: Proposed System of Home Automation

A. Required Sensors

1) LM35:

The LM35 temperature sensor is used to detect the temperature levels in our home. The advantage of LM35 sensor is its low cost and highest sensitivity between +2 C and +250

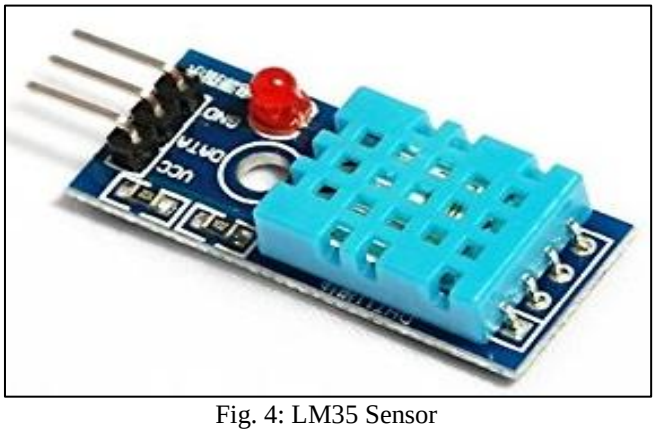

Fig. 4: LM35 Sensor

2) Rain Sensor:

The Rain sensor is a simple tool to detect rain. This sensor can be used in measuring rainfall and it works a switch when raindrops fall on the sensor board.

Fig. 5: Rain Sensor

3) Motion Sensor:

A motion sensor is a device that detects moving objects. Such a device is often unified as a component of a system that automatically performs a task or alerts a user of motion in a region. They form a fervent component of security, automated lighting control, home control, yields energy proficiency, and other systems.

Fig. 6: Motion Sensor

4) Smoke Sensor:

MQ-2 Sensor detects H2, LPG, CH4, CO, Alcohol, Smoke, Propane and other flammable gases. Output can be used to trigger relay, read by a microcontroller or arduino.

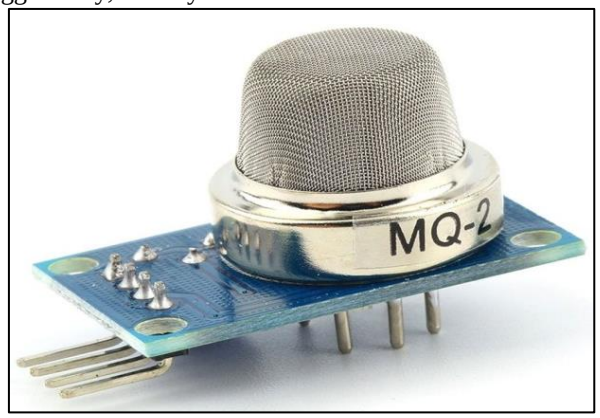

Fig. 7: Smoke Sensors

5) LDR:

A light dependent resistor works on the principle of photo conductivity. When light fall on the LDR, the resistance decrease. Resistance is inversely proportional to the light.

This section describes the skills used for developing the Android based mobile application for Home Appliance Control in GSM Set-up environment which are: Arduino and GSM. Android is a platform developing and deploying android based applications on mobile devices supporting it.

B. Arduino IDE

The open-source Arduino makes it easy to write code and upload it to the I/O board. It runs on different OS and other open source software. The arduino improvement environs contain text editor for writing code, message area, text console, and toolbar with buttons for common functions, and a series of menus.

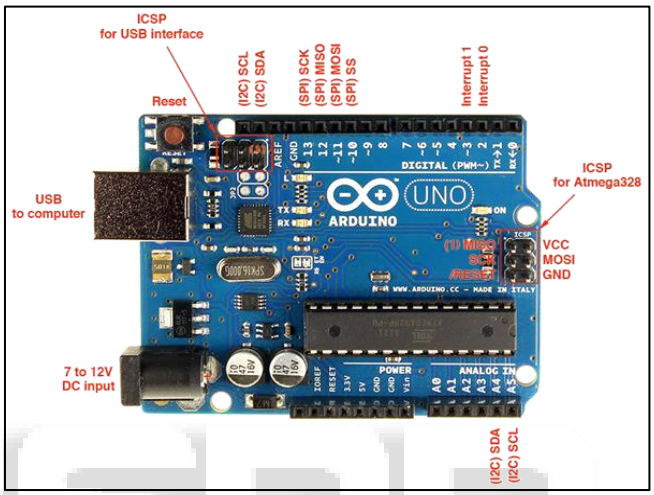

Fig. 8: Arduino Block Diagram

C. GSM

GSM (Global System for Mobile Communications, originally Group Special Mobile), is a standard developed by the European Telecommunications Standards Institute (ETSI). GSM has its own standard as a wireless communiqué technology for permanent and nomadic devices. Combining the power of SMS service, the best known and used wireless technology for mobile communiqué provide a facility to create Android based mobile applications using the GSM Wireless Technology.

VIII. APPLICATION

1) Lighting Control: Leaving the Dark Ages and Stepping Into the Light
2) HVAC Regulation: No Longer Burned by Your Heating Bill
3) To help Handicapped people
4) Where less energy consumption is major factor

IX. ADVANTAGES

1) Adds Security through Usage and Lighting Control
2) Secure Home Through web control Increases Convenience through Temperature Adjustment
3) Save time
4) Save money and increase convenience
5) Allow to appliances control when out of town
6) Automation
7) Multifunctionality

8) Efficiency
9) Adaptability
10) Interactivity

X. RESULT

Design and implementation of the GSM Home Appliance System (GHAS) using the App for Android mobile phone has been discussed. The purpose of the GHAS is to use mobile's inbuilt SMS facility and GSM Modem for automation of Home Usages.

The GHAS application program is tested on various Android mobile's which are quite adequate and responses received from the civic in all-purpose are inspiring. The GHAS delivers a good premise for any Automation System based on Android Mobile Phone and GSM.

XI. CONCLUSION & FUTURE SCOPE

This paper contributes simple idea how we can control home usages by computer expertise. The main objective of this project is to help handicapped people. It provides security and saves energy. We can access it even if we are far away from home where the Wi-Fi is available.

We can implement other related units like fire sensor etc. The system can be extended with further security measures and app can be used as a monitoring system with enhanced sensitivity.

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