Smart Home Appliances

Dr.R. Sasi kumar[1], K. Surya Phanindra[2], M. Siva Sai Kumar[3], M. Revanth[4]

[1]Professor/ Department of CSE, R.M.D Engineering College, Tamilnadu 601206
[2,3,4]UG Student/ Department of CSE, R.M.D Engineering College, Tamilnadu 601206

***Abstract*—**Advanced metering system is used to measure, collect, store, analyze and use power consumption information. At present, there is no official version standard released at home and abroad. Advanced metering system is used to measure, collect, store, analyse and use power consumption information. At present, there is no official version standard released at home and abroad. The rapid development of smart grid puts forward higher requirements to its standardization. At last, it put forward proposals for the standardization of smart bidirectional interaction, smart energy consumption service and information security protection system to regulate and guide the construction and application of advanced metering infrastructure. It provides technical support for perception of smart grid, intelligent control, flexible and interactive, friendly and open, economic and efficient application of advanced metering infrastructure. It launched the research of standard for smart metering equipment and power consumption information collection device. It proposed the standardization construction scheme of network communication technology and business data management and application system. This system will avoids the heavy power usages in the homes. The system will also provide security in kitchen and electrical lines. Gas sensor is used at kitchens to sense the LPG leakage and electrical voltage sensor is used to find any short circuit occurrence in the transmission lines. Whenever any problem occurs these sensors senses the condition and sent alert via sms.

Keywords—Energy Management System(EMS), Internet of Things(IoT), Internet Protocol (IP), gas detection, leakage, alert.

I. INTRODUCTION

In the Internet of Things (IoT) model, many of the living and non-living things that encompass us will be on the internet in one form or another. Driven by the popularity of gadgets empowered by wire-less technological innovation such as Wireless Bluetooth, Radio Frequency Identification, Wireless-Fidelity, embedded sensor, IoT has moved out from its beginning stage and it is actually on the edge of changing the present fixed inter-net into a well featured upcoming Internet. Currently there are almost nine billion inter-connected gadgets and it is estimated to touch almost fifty billion gadgets by 2020. There is incorporation of mobile technology into home automation system due to the rapidly advancing mobile communication technology and the decrease in costs. We propose a system that monitors the LPG gas level and electricity voltage level from residential send it directly to the home user. AMR system can be divided into wire AMR system and wireless AMR system according to communication medium used. Man made mistakes can be countless. Human resources wasted and many other problems do occur. We finally thought of building a system that will do the above process automatically. Sensor is attached with our electricity main board that will scan the input voltage reading after particular period. Likewise for LPG cylinders also a sensor is attached for reading gas level.These sensors are controlled by a microcontrollerand records will be transmitted to the centralized server and shown in the application. If any problem occurs a sms alert will be send to the user and the nearby rescue station.

The heart of the system is a Microcontroller. A microcontroller is a small computer on a single integrated circuit. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes[3]. There are different microcontrollers like Altera, Fujitsu, Holtek, Infineon etc., Atmel ATmega328P based Arduino is used in this paper because Arduino is made to help to use the microcontroller easily. Raspberry pi is also used in this paper. Raspberry Pi is neither a microprocessor or microcontroller, it is a single board computer which contains a SOC (System on Chip - Has multicore processor, GPU, ROM, I/O Peripherals inside it.), DDR RAM memory, Ethernet port, USB host, micro HDMI on it. Neither.

II. EASE OF USE

[1] In this paper Energy control framework as a part of Residence was created utilizing remote installed equipment, home gateway, UI and Internet of Things (IoT). Smart socket has inbuilt Zigbee correspondence module used to speak with home portal. Smart socket will quantify the associated gadget parameters and send to home portal. Home portal will send the control message to socket utilizing cloud server arranged remotely. This framework works in four control modes, named as peak time control, energy control, automatic control and user control. Control modes are worked utilizing smart sockets.

In [2] Smart home apparatus control framework was produced in the IoT condition. Smart controller is the

fundamental piece of this framework. Modules are associated through Zigbee interface to the controller utilizing the Radio frequency of 433MHz. Controller is associated with the Server, Personal PC or cell phone through web and remote switch by means of Wi-Fi interface. Utilizing this framework can ready to control and screen the usage of energy by the appliances in the home.
In reference [3], This system is put together for monitoring leakage of gas and preventing any leakage. The system can be divided into three modules or steps. Firstly, the MQ6 gas senor senses any leaked gas. Secondly, the gas sensor sends a signal to the ARM controller. After this, an activation signal is sent by the microcontroller to the devices attached to it externally. Lastly, various functions by devices like buzzer, exhaust fan, sprinkler are performed and the GSM module is activated which then sends SMS to the already specified mobile numbers. This system makes use of GSM module and an ARM based microcontroller LPC2148.

In reference [4] In this system, a home automation system is proposed using Arduino, which is a low cost microcontroller and an Android mobile phone. The programming of Arduino can be done in such a way that it can receive keyboard input or sensor data for controlling a number of electrical appliances which are connected to output peripherals. With mobile phone being a wireless communication device, the Arduino and smart phone are connected using Bluetooth which is a short range wireless communication technology for indoor environment. Wireless connectivity is established using an external HC-05 Bluetooth module as there is no in-built Bluetooth radio in an Arduino micro-controller unit. On the connection of the home appliances to the Arduino board, they can be easily controlled inside a smart home using any Bluetooth enabled smart phone.

In [6] explains now a day's system security is a noteworthy in the field of media transmission while transmitting or accepting of any information. In this paper they have depicted about the system security vulnerabilities in Supervisory Control and Data Acquisition (SCADA) framework and Energy Management System (EMS). They have broke down many issues identified with security and gave answer for making a skilled data security to SCADA and EMS utilized as a part of industry.

[10] This paper explains the checking and controlling of energy in both system and customers point. Usage of the framework based on their SCADA and hardware system for estimation of utilization and load control. Energy checking and control was done utilizing Programmable Logic Controller (PLC). Advanced mobile phone or a modern PC is utilized to actualize the correspondence with clients. Utilizing this framework they have executed energy administration on household customer progressively.

III. METHODOLOGY

A. Scope

The main goal of our project is to develop a system such that it will be capable to assure a safetyfor each and every electric appliance and LPG cylinder in the home and the user will be able to acquire an alert if any problem occurs. Along with this, the sms will be sent to the nearby rescue center. The user can monitor the electricity level of each individual load and LPG cylinder leakage using a web application which will also work as a data setter to set various user programmable parameters like high/low cut-off voltage, etc.

B. Objective

The main objective of the project is to develop smart home security system. The arduino takes the pulse from the gas and voltage sensor, calculate the threshold level and displays the reading on the application. The sensor reading is store in the database. The reading of the energy level and gas level is also sent to the cell phone of the user by a message.

C. EXISTING SYSTEM

In existing method there is no advanced technology for monitoring the gas leakage and voltage fluctuation. Due to this electric voltage fluctuations are not maintained properly and human need is required here. The increasing trend there are lot of problems should be handled. Along with this fact, LPG leakage makes a lot of destruction in recent years. There is no proper system for monitoring this facts automatically.

DISADVANTAGES:

- Human need is required.
- Electric fluctuations are not maintained properly.
- This may lead to a large disaster.
- Appliances may destroy due to voltage fluctuation.

D. PROPOSED SYSTEM

This method properly monitors the LPG and electricity problems. User will intimated with the problem. Voltage and Current sensor is placed for measuring the input voltage and current this will identify the power input in home. So we can avoid the damage to the appliances if any power fluctuations occurs. No man power is needed for checking in homes. A Web server facility is provided for monitoring and control using PC. The system will also provide whenever any fluctuation or leakage occurs it Sent alert through via sms.

ADVANTAGES:

- No man power need for taking current readings.
- Avoid high usage of electricity.
- Can identify the high electricity used industries easily

IV. SYSTEM DESIGN

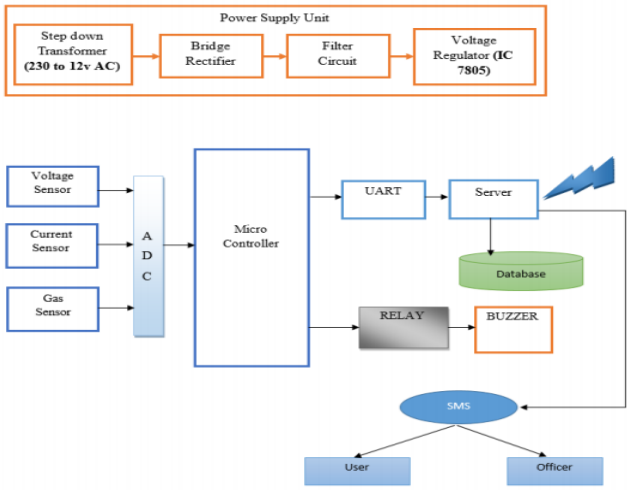

Fig 1: Block Diagram for Proposed Approach

A. *Arduino UNO*

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by arduino. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under Common Creative Attribution Share-Alike 2.5 license and is available on the arduino website. Layout and production files for some versions of the hardware are also available. "UNO" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0.The UNO board and version 1.0 of arduino Software (IDE) were the reference versions of arduino, now evolved to newer releases. The UNO board is the first in a series of USB arduino boards, and the reference model for the arduino platform. The ATmega328P on the arduino UNO comes pre programmed with a boot loader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. The UNO also differs from all preceding boards in that it does not use the FTDI USB-toserial driver chip. Instead, it uses the Atmega16U(Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Fig -2: Arduino Board

B. *GAS SENSOR*

The MQ6 is an easy-to-use LPG (Liquefied Petroleum Gas) sensor which is highly suitable for sensing LPG, which is mainly composed of butane and propane, concentrations in the air. Gas concentrations of anywhere from 200 to 10000ppm can be detected by MQ6 sensor. The sensor comes with a very high sensitivity and a fast response time. The output of this sensor is an analog resistance. You only have to power the heater coil with 5V, add a load resistance and connect the output to an ADC, which makes the drive circuit very easy. • Gas sensor is used to find the LPG gas is present in surrounding. Mainly the sensor is working based on the resistor value, if the gas value is low then the resistor value is low.

C. *VOLTAGE SENSOR*

AC voltage measurement can be carried out by converting AC voltage into proportional DC Voltage using rectifier and filter circuits. For low AC voltage (mili volts) measurement precision rectifier is used as diode knee voltage is 0.7 Volt. Similar to DC voltage measurement Voltage divider is constructed using 47K Ohm variable resistor R1. 5v zener diode is used to protect Arduino from accidental excess voltages. Adjust the resistor R1 (47K) to calibrate the voltage. Here the AC voltage that we can give to transformer is from 50V to 230V depending on its ratings. Rectified DC is fed to the voltage divider circuit. Connect Arduino as per circuit shown in Fig.5[15], make ground common for Arduino and circuit shown in figure. Adjust the resistor R1 to get proper reading. When AC Voltage is 250V we get 5V output.

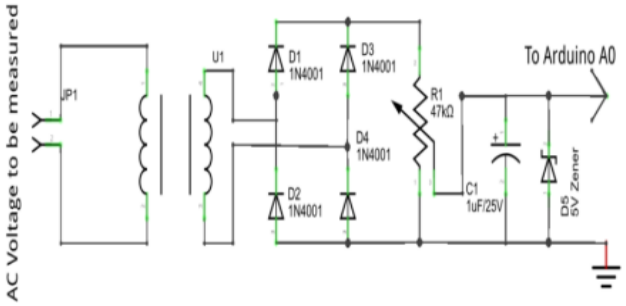

Fig.3.Voltage sensing circuit

D. Current Sensor

In this project current sensor ACS712[14] is used to measure the current, voltage and it is shown in Fig.4. It gives accurate current measurement for both AC and DC signals. These are good sensors for metering and measuring overall power consumption of systems. This sensor produces an output voltage which is directly proportional to sensed current. It works on the principle of Hall Effect. 5V should be supplied to Vcc of ACS712 breakout board and the GND should be the negative of 0v of supply. Once it is powered, the Vout should produce output voltage which represent current going through the sensing pads. When the load is in OFF state then the sensor produces Vcc/2 voltage (no load voltage).ACS712 is able to measure current in two directions. Output voltage more than 2.5V (VCC/2) indicates current in one direction and voltage less than 2.5V indicates current in another direction.

Fig.4.ACS712 Hall Effect Current sensor

V. IMPLEMENTATION

Gas sensor is used to find the LPG gas is present in surrounding. • Mainly the sensor is working based on the resistor value, if the gas value is low then the resistor value is low. If the value of gas is high then the resistor value is high. Here we have to use this equipment for finding the abnormal gas is present or not in vehicle. Once it measure as high means the buzzer will automatically alert and the update is we can monitor in web page.

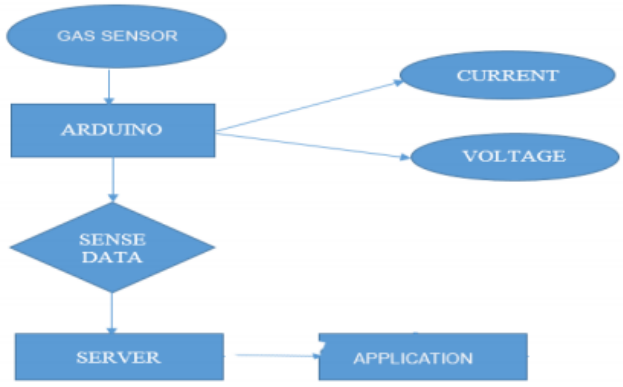

Fig 5: Flow Chart for Level 1

• The Voltage Sensor block represents an ideal voltage sensor, that is, a device that converts voltage measured between two points of an electrical circuit into a physical signal proportional to the voltage. Connections + and – are electrical conserving ports through which the sensor is connected to the circuit.

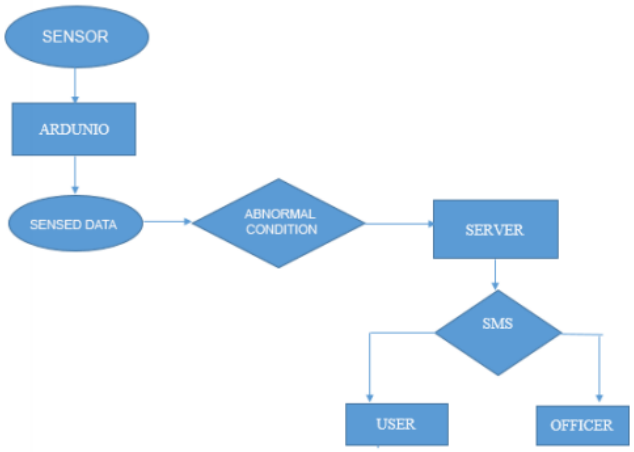

Fig 6: Flow Chart for Level 2

To convert the analog values to digital values for displaying the values in html page. The values obtained from the sensors are passed to the microcontroller Arduino UNO. Arduino consists of both a physical programmable circuit board and a piece of software or IDE. It used to write and upload computer code to the physical board. USB cable is used to load a new code onto the board. Pin 1 serves a power source.

The Serial Peripheral Interface (SPI) bus is a synchronous serial communication interface specification used for short distance communication, primarily in embedded systems. An Arduino is actually a microcontroller based kit which is basically used in communications and in controlling or operating many devices. The Arduino Ethernet Shield R3 (assembled) allows an Arduino board to connect to the internet. It is based on the Wiz net W5100 Ethernet chip (datasheet).The processed data is sent to SERVER via Ethernet Accordingly, real-time data can be stored and monitored at Cloud servers.

In this module, we are going start the connection between the arduino to server by clicking the button event, once we start the server all the data will be received by the computer from the Arduino.

Concisely, a web server is run at the gateway for hosting a web-page which is userfriendly and able to represent both raw and processed data in text and graphical forms. The web-page provides functions such as a log-in form with a username and a password, or a searching tool.

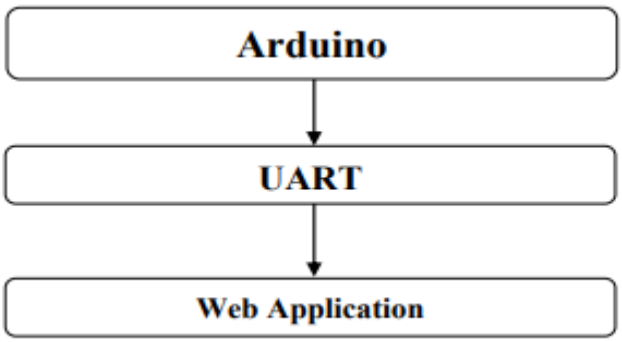

Fig 7:Web Interfacing

VI. RESULTS

The Hardware part of the project is shown in Fig.7. The arduino takes the pulse from the gas and voltage sensor, calculate the threshold level and displays the reading on the application. The sensor reading is store in the database. The reading of the energy level and gas level is also sent to the cell phone of the user by a message.

Fig 8: Hardware Setup

VII. CONCLUSION

Thus we have presented internet connected energy monitoring and controlling system that increases awareness of energy consumption amongst devices and users. Energy awareness enables the user to control the power state of the devices as per there needs which minimizes the energy use. In the coming future, each individual devices will have their own identity that can share and communicate the information over the IP network. The proposed system makes the gas detection and its prevention easier for kind of user, whether technically sound or not. This system wirelessly transfers alert notification to the user and the user can easily connect the devices through a smartphone from any location. This easy control over the devices like exhaust fan makes the surroundings less accidentprone. Using the Arduino microcontroller also makes the system cheaper. Easy access and control makes the system very useful.

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