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IOT BASED SMART KITCHEN AUTOMATION AND MONITORING SYSTEM

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ABSTRACT

In this project, We Implemented IoT based smart kitchen with Automation & Monitoring system using Node MCU. The different technologies such as RFID, WSN, Cloud Computing, Networking Technology and Nanotechnology that support the IoT, and their applications in various fields i.e Smart home, Smart City, Smart Grid, Smart Health and Smart Farming have been covered. In addition to this a special coverage has been made with regard to Smart Kitchen. The description of various appliances and their application in the smart kitchen has been enumerated. In recent days kitchen based accident has been increased in both commercial kitchens and domestic kitchens. People regularly go in kitchen for cooking the food. But it will become a dangerous situation if there is leakage in gas cylinder. Our aim is to reduce the risks in Kitchen using Internet of Things. These accidents can be avoided using IoT technologies like monitoring the entire kitchen from remote areas. In order to implement this research both hardware and software will be utilized. From the hardware side gas sensor, temperature sensor, humidity sensor, Servo motor, Arduino UNO, load cell Node MCU has been used. From the software side integrated Node MCU and mobile application has been used. Our system provides results in the form of SMS. The system enables monitoring of gas leakages in kitchen and thereby leads to a faster response time in the events of a leakage condition and during night condition if gas leakage happens all of a sudden the person may switch on the light which may leads to blast to avoid that, the main power supply will be automatically off . Monitoring the kitchen appliances like Cylinder and notify the user.

Keywords: Node MCU(ESP8266), Arduino Uno, MQ2 Gas Sensor, DHT11 Sensor, Load Cell And Web App(Blynk App).

I. INTRODUCTION

IoT has changed the life of human beings. Enormous increase in users of Internet and modifications on the internetworking technologies enable networking of everyday objects . Each things is uniquely identifiable through its embedded computing system within the internet infrastructure. If the settings of the environment can be made to respond to human behaviour automatically, then there are several advantages. Ambient intelligence responds to the behaviour of inhabitants in home and provides them with various facilities. Internet of Things is all about physical items talking to each other, machine-to-machine communications and person-to-computer communications will be extended to things. The ultimate goal is to create a better world for human beings||, where objects around us know what we like,

what we want, and what we need, and hence act accordingly without explicit instructions. Natural gas is an energy source that is commonly used in homes for cooking, and heating. Financial loss as well as human injuries are happened due to accident cause by gas leakage. To detects gas leakage and alerts the subscriber through alerts and status stored in database and display on android device is the work aims of the designing a system. The system is an intelligent system, as it does not create a noise nuisance by continuously sounding alarm but gives the alerts to the users. Explosions due to gas leakages are avoided by this technology and improve safety of life and property while using domestic cooking gas. We proposed the design and construction of an SMS based Gas Leakage Alert System. Gas sensors were used to detect gas leakages in a kitchen; its outputs are then interfaced with an microcontroller programmed in assembly language. The GSM phone is configured to send gas leakage alerts in the form of a short message service (SMS). We can get this and much more safety feature that can be integrated with the automation system includes temperature sensor, weight

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sensor. Continues monitoring of gas leakages in kitchen is performed by this system. Although much of the work has been done until today to realize the Internet of Things (IoT) into practice, The Internet of things (IoTs) is a network of physical objects or things embedded with electronic, software, sensors and connectivity to enable objects to exchange data with manufacturer, operators and connected devices. Our project is based on IoT that is Smart Kitchen using IoT. The project entitled " IoT Based Smart Kitchen Automation and Monitoring System" will be a great help to the people in their day to day life in terms of preventing any danger caused by gas and fire leakage. The purpose of this project is to detect gas as a part of the safety system. If there is LPG detection an alert (mail) will inform the authorized user about the gas leakage in order to prevent any harmful effects due to gas leakage. We used gas sensor to monitor and detect the gas If due to LPG leakage, short circuit happens and causes fire, a alert Notification to user through mobile phone and automatically The window will open which is connected through servo motor. Also we will continuously analyze and examine the humidity and temperature of the surrounding. For this we used DHT11 humidity and temperature sensor to monitor humidity and temperature.

II. LITERATURE SURVEY

In the year 2009, Kiritsis proposed a new definition ofintelligent product based on what happened with us as human being. It suggests closed loop product life cycle management to develop more enhanced product data technologies, which can be used in future to develop smart or intelligent product and also to deal not only with static but of dynamic product data as well. In the year 2009 Eisenhauer et. Al., was published which proposed a platform to create an intelligent application for wireless devices and sensors. This will work asa middleware for the developer to create intelligent application for the embedded systems. It used unique combination of Service-oriented Architecture (SoA) and a semantic-based Model Driven Architecture to build this platform.

In 2010 HONG et. al, it proposed wireless sensor network technologies on the basis of various standard protocols, internet protocols to facilitate internet of things. It focuses on how to adapt the IP to the space of things. This article introduces the Sensor Networks for an All-IP World (SNAIL) approach to the IoT. It also includes four significant network protocols: mobility, web enablement, time synchronization,and security.

In 2014 Bello and Zeadally, focuses on how two devices inany IOT should communicate intelligently because the qualityof the information gathered depends on how smart the devicesare. In IoT, different devices work on different network standard, so this can lead to several networks challenges & this cannot be solved by traditional routing protocols. So this paper proposed state-of-the-art routing algorithms, which can help to achieve an intelligent D2D communication in the IoT.

In the year 2016 Sun et. Al proposed that one can use IoTto make a network of various connected devise and smart sensors, so that this network can able to remember the past & plan for the future. They also argued that to use big dataanalytics to get the desired SCC. It suggested that one can use mobile crowd sensing and cloud computing to build SCC and suggested that SCC will help to improve livability, preservation and attainability.

RELATED WORK

Home automation or smart homes (also known as domotics) can be described as introduction of technology within the home environment to provide convenience, comfort, security and energy efficiency to its occupants. With the introduction of IoT, the research and implementation of home automation are getting more popular. Various wireless technologies that can support some form of remote data transfer, sensing and control such as Bluetooth, wifi, Rfid and cellular network have been utilised to embed various levels of intelligence in the home. The studies have presented Bluetooth based home automation system using android smart phones without the internet controllability. The devices are physically connected to Bluetooth sub controller which is then accessed and controlled by smart phone using built in Bluetooth connectivity. Researchers have also attempted to provide a network interoperability and remote access to control devices and appliances at home using home gateways. Lately few researchers have also presented the use of Web services , simple object access protocol (SOAP) and representational state transfer as an interoperable application layer to remotely access home automation system.

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III. THE HARDWARE

ARDUINO UNO

The Arduino UNO SMD is frequently used microcontroller board in the family of an Arduino. This is the latest third version of an Arduino board and released in the year 2011. The main advantage of this board is if we make a mistake, we can change the microcontroller on the board. The main features of this board mainly include, it is available in DIP (dual-inline-package), detachable and ATmega328 microcontroller. The programming of this board can easily be loaded by using an Arduino computer program. This board has huge support from the Arduino community, which will make a very simple way to start working in embedded electronics, and many more applications

Fig 1: Arduino UNO

NODE MCU(ESP8266)

The Node MCU ESP8266 development board comes with the ESP-12E module containing the ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. Node MCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects. NodeMCU can be powered using a Micro USB jack and VIN pin (External Supply Pin). It supports UART, SPI, and I2C interface.

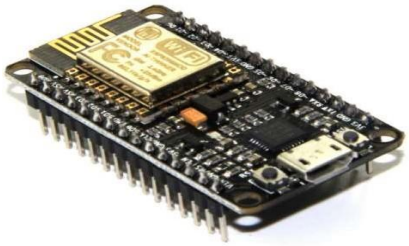

Fig 2: Node MCU(ESP8266)

MQ2 GAS SENSOR

MQ2 gas sensor can be used to detect the presence of LPG, Propane and Hydrogen, also could be used to detect Methane and other combustible steam, it is low cost and suitable for different application. Sensor is sensitive to flammable gas and smoke. Smoke sensor is given 5 volt to power it. Smoke sensor indicate smoke by the voltage that it outputs .More smoke more output. A potentiometer is provided to adjust the sensitivity. Sn02 is the sensor used which is oflow conductivity when the air is clean. But when smoke exist sensor provides an analog resistive output based on concentration of smoke. The circuit has a heater. Power is given to heater by VCC and GND from power supply. The circuit has a variable resistor. The resistance across the pin depends on the smoke in air in the sensor. The resistance will be lowered if the content is more. And voltage is increased between the sensor and load resistor.

Fig 3: MQ2 Gas Sensor

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DHT11 SENSOR

This sensor is basically a cost efficient digital humidity & temperature sensor. This sensor supplies digital output and therefore can be directly connected to data pins of microcontroller in spite of using ADC. It also consists of eight bit microcontroller to provide values of temperature & humidity in the form of data that is serial. It has 4 pins they are VCC, GND, DATA and NC. It operates from 3.3-5 volts power supply. This sensor has exceptional quality,anti-interference capability, economical performance and fast reaction benefits. Humidity is calculated by means of measuring the conductivity of liquid substrate that alters with exchangein humidity and temperature is calculated by the usage of a thermistor.

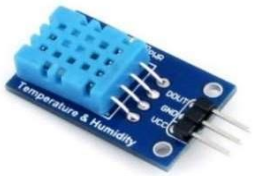

Fig 4: DHT11 Sensor

SERVO MOTOR

SG90 servo motor is the cheapest servo motor available on the market. If you have an SG90 servo motor and you don't know what to do, this article is for you. In this article we will introduce sg90 servo motor. We'll share the sg90 pinout scheme. At the end of our article, we will share best 10 sg90 servo motor projects.

Fig 5: Servo Motor

RELAY MODULE

A Relay is a device that opens or closes an auxiliary circuit under some pre-determined condition in the Main circuit. The object of a Relay is generally to act as a sort of electric magnifier, that is to say, it enables a comparatively week current to bring in to operation on a much stronger current. It also provides complete electrical isolation between the controlling circuit and the controlled circuit. Relays are the switches which aim at closing and opening the circuits electromechanically.

Fig 6: Relay Module

1KG LOAD CELL

The load cell which is also known as a transducer converts mechanical energy (weight) to an electrical output. The magnitude of the electrical output is directly proportioned to applied force. The strain gauge in the Load cells deforms when pressure is applied on it. Strain gauge generates electrical signal during deformation because its effective resistance changes during deformation. This Weighing Load Cell Sensor 1kg With Wires is straight bar load cell (sometimes called a strain gauge) can translate up to 5 kg of pressure (force) into an electrical signal. Each load cell can measure the electrical resistance that changes in response to, and proportional of, thestrain (e.g., pressure or force) applied to the bar, With this gauge, you will be able to tell just how heavy an object is, if an object's weight changes over time, or if you simply need to sense the presence of an object by measuring strain or load applied to a surface.

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Fig 7: 1kg Load Cell

TONE DECODER IC

The LM567 is general purpose tone decoders designed to provide a saturated transistor switch to ground when an input signal is present within the pass band. The circuit consists of an I and Q detector driven by a voltage controlled oscillator which determines the center frequency of the decoder. External components are used to independently set center frequency, bandwidth and output delay.In simpler terms the IC LM567 IC is a tone decoder chip which is designed basically for recognizing a specified frequency band, and activating the output in response to the detection.Needless to say this chip can be used for a number of different applications, the most common being in the field of remote controls, and security systems.

Fig 8: Tone decoder IC

BLOCK DIAGRAM

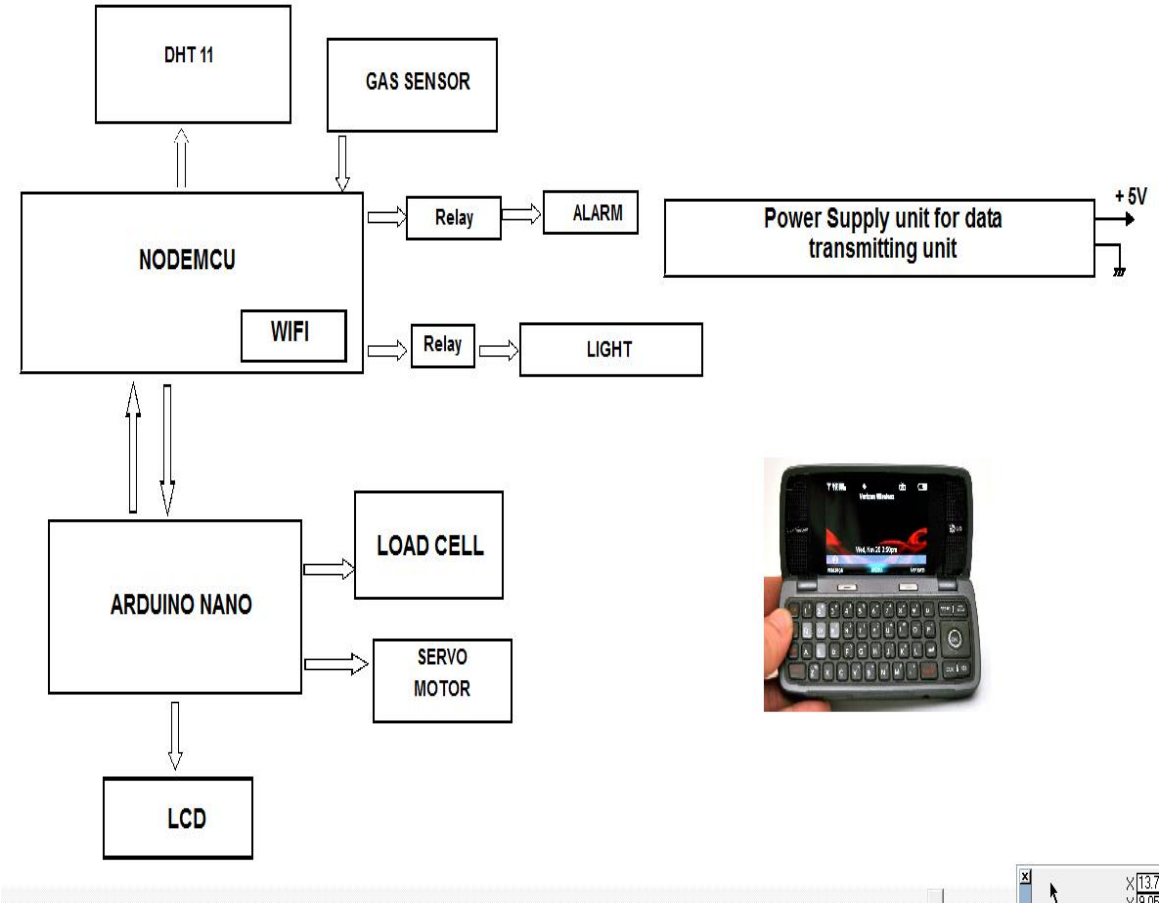

Fig 9: Block Diagram

IV. WORKING

when power supply is given to Node MCU and Arduino UNO , all the sensors get activated Wi-Fi module in the Node MCU connected to the blynk app and servo motor, load cell to Arduino whenever the gas or smoke

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leakage happens in the kitchen automatically the sensors collects the data through node MCU and kitchen window will be open through servo motor and also automatically power supply will be off .sensors display the data of room temperature and sends the alert notification to the user through blynk app in android application, detects cylinder weight and notify the user through load cell connected to Arduino. The user can immediately take the action and responds about the incident.

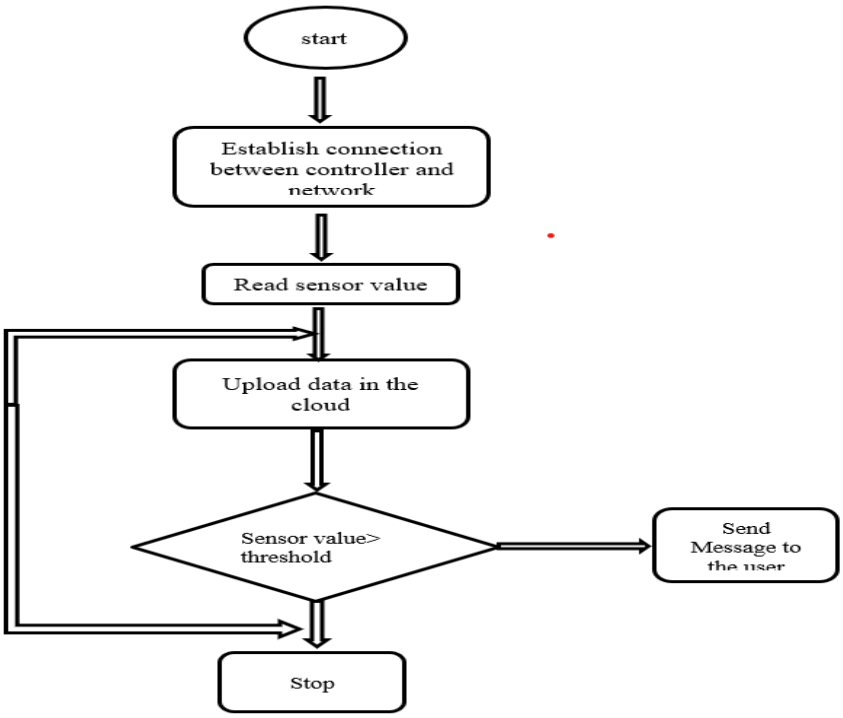

Fig 10: Flow chart

V. SOFTWARE

ARDUINO IDE SOFTWARE

It's free software that allows us to develop and upload code to Arduino devices. This software can be run on many operating systems or platforms such as windows, Linux, and Mac OS. C and C++ have supported programming languages. This software combines standard inventor tools into a single user interface for creating apps for several operating systems. It is very similar to C Language and it is based on a hardware programming language named processing. An Arduino IDE is required for uploading the sketch on the board.

SOFTWARE SERIAL

The Arduino hardware has built-in support for serial communication on pins 0 and 1 (which also goes to the computer via the USB connection). The native serial support happens via a piece of hardware (built into the chip) called a UART. This hardware allows the Atmega chip to receive serial communication even while working on other tasks, as long as there room in the 64 byte serial buffer.

The SoftwareSerial library has been developed to allow serial communication on other digital pins of the Arduino, using software to replicate the functionality (hence the name "SoftwareSerial"). It is possible to have multiple software serial ports with speeds up to 115200 bps. A parameter enables inverted signaling for devices which require that protocol.

VI. RESULTS AND DISCUSSION

In this IOT based working model, all the sensors are connected to node MCU wifi module and a blynk app which is specially designed for IoT projects should be installed in user mobile for notifications and monitoring the appliances like temperature and humidity. Whenever any existence of gas leakage, uncontrolled fire and excessive temperature are occurred in the kitchen area immediately the user will receive notification about the incident and also can monitor the humidity and temperature in the blynk app. Blynk app will continuously

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receive notification about the incident in kitchen. Monitor the cylinder weight and notify the user through Blynk app which is connected to load cell

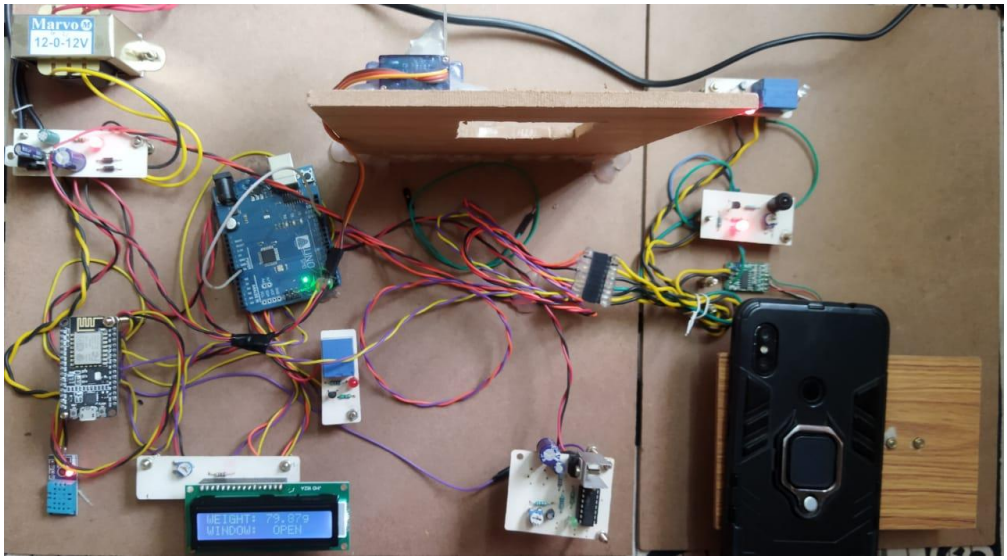

Fig 11: Image of IoT Based Smart Kitchen Automation and Monitoring System

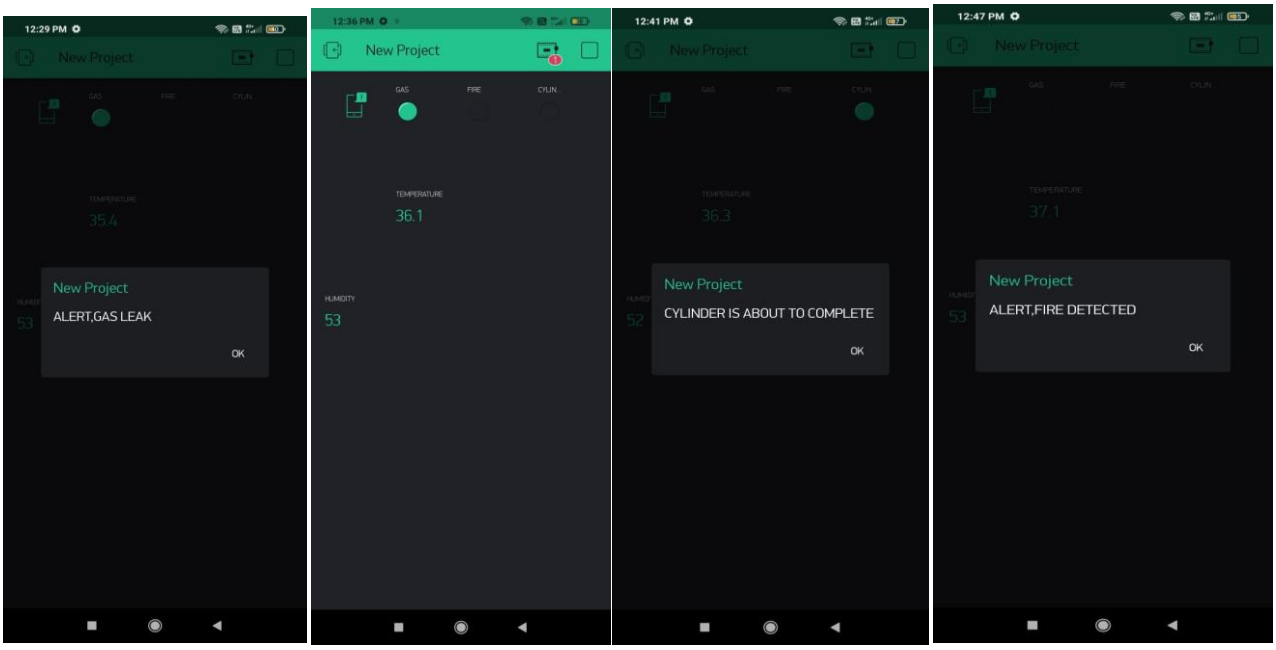

Fig 12: Readings of the Sensors on the Blynk App

VII. CONCLUSION

Our Smart Kitchen using IOT system with multiregionalsensors has been designed, constructed and tested. The result obtained from the tests carried out shows that thesystem is capable of sending SMS alerts whenever there is gas concentration at the inputs of the gas sensors. Hence this system can be used in homes and public buildings such as hotels and restaurants. Smart kitchen provides you all the automation features that includes safety features over gas leakage detection system. For this we are using a gas sensors, temperature sensor and automatic opening the kitchen window through servomotor. Gas sensors are used to detect the leakage of a gas in the system and Temperature sensors are used to detect the current room temperature. Server stores information and related data are stored in it, it also stores the information about the hardware, sensors, and also maintain the logs and status of system,also stores the room temperature and information aboutthe users. Threshold values are set into the room, when itcrosses that values it will send a notification to the user,about the leakage of a gas cylinder and leakage of a gas. Server can communicate with the user through android device. Through email and SMS server can sends a notification to the user which will display on the android devices. It

can prevent the accident and hazards. The only way to access the information is if the user is far from the home. It is a cost effective and time consuming solution. We can use this in various applications like home automation, Hospital management, Militarymanagement, industrial applications.

VIII. FUTURE SCOPE

One of the modifications is to provide the system with a dual power supply i.e. include a battery power supply source in addition to the utility power supply**.** Design thesensors that can be used for more kitchen parameters. Apply various techniques to make the system more secure and automatic cylinder weight checking and gas booking , Also we can increase some sensors.

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