Kitchen Automation Using Internet of Things (IOT)

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Abstract- *The kitchen is one of the important places in a house. Safety factor is the main aspect that must be taken into account during the activity in the kitchen. The existence of gas leakage, uncontrolled fire and excessive temperatures must be quickly identified and addressed. The purpose of this research is to make prototype of kitchen security system using Internet of Things. The system is designed using 4 types of sensors and Arduino UNO. DHT 11 sensor is used to monitor temperature and humidity, IR Flames sensor is used to detect fire, MQ-135 sensors are used to detect gas leakage, and PIR sensors are used to detect human activities in the kitchen. The sensors output are then connected to the Arduino which will control the relay. The relay acts as a fan switch in the event of a gas leak, uncontrolled fire and excessive temperature increase. Under these conditions, Arduino will also turn on the alarm and the led, and send information to the server. The results show that the system can work according to the desired specifications.*

I. INTRODUCTION

1.1 Kitchen System:

The project is to automate certain processes done in a kitchen, nowadays it is a basic need for all people and everyone in the world is looking for a change in the way things are done. Sensor technology and internet of things are the basic concepts behind the project, this is where the entire kitchen is connected in a network and the elements can communicate the data between one and another. Currently everything is turning into automated processes and the management of the kitchen in a home is something very essential for the future.Appropriate sensors are needed to measure the different elements and an Arduino board is used to connect the elements and to present the data. The data will be presented to the user in an android application format and the software should prove to be appealing to the user.

One of the most important aspects in a home is the management of the kitchen. Presently the kitchen is managed by a person and he/she must take all decisions including whether to fill a container which is finishing, what items are needed for the kitchen and to monitor the gas level in the kitchen. In addition to this he must check whether the income that is earned is enough to purchase the things needed. The use of sensors to measure the kitchen items and recording them in a database to present them in an android application to the users is the main aim behind the project that is planned to be implemented.

The programming of the Arduino board is used by the team to sense the items' level in the container and send the data to the database and it will be presented to the user as an android application. The android application is one end of the system which is the users' end and will display the data in a creative and appealing fashion. The user will be able to view the number of products in the kitchen even if the user is outside the house and he will know what is needed to be bought for the kitchen.

The amount of gas in the cylinder in a kitchen will be able to be known through the android application by using load cell to measure the gas level. If the level is below a certain threshold value, the user will be notified through the application and the gas supplier will be contacted as well.

1.2Review of related literature:

When people think about home automation, most of them may imagine living in a smart home: One remote controller for every household appliance, cooking the rice automatically, starting air conditioner automatically, heating water for bath automatically and shading the window automatically when night coming. To some extent home automation equals to smart home. They both bring out smart living condition and make our life more convenient and faster.

Vinay sagar K N, Kusuma S M proposed a system[1] which uses Intel Galileo. This system uses wireless communication, internetworking of cloud networks. It operates various lights, fans and simple appliances. The data from the sensors will be collected automatically. This data will be stored in the cloud. The proposed system is built to reduce cost and allows expandability using wide range of devices. This system can be operated from anywhere of the world using internet connection.

Deepali Javale, Mohd Mohsin, Shreerang Nandanwar proposed a system[2] to provide control over various home devices and provide safety using android devices. This design is an integration of android phone and Arduino Mega. The main objective of this system is to provide more convenience to the user. The Arduino ADK controls the embedded devices with the help of android phone. The android device sends the signal to Arduino ADK.

This design is capable of building automation system in offices, schools and other places. The paper ends with the idea of employing the technology in larger and comprehensive form.Mohamed Abd El-Latif Mowad, Ahmed Fathy, Ahmed Hafezpresents the execution of a multiplatform controlled system[4] that is a combination of both hardware and software technologies. It is an interface to enable remote control with integration of mobile devices. In this paper, the use of a microcontroller, Arduino and few sensors is specifiedfor controlling the home devices like fan, light etc. This paper gives the detailed view of connectivity between a microcontroller and smart phone via Bluetooth.

ChristianReinisch,MarioJ.Kofler,Wolfgang Kastner has put forth the idea of minimizing energy consumption as well as guarantee user comfort. The main aim is to build a smart home as digital ecosystem[5]. It uses the concept off applying artificial intelligence in controlling the home devices.In their paper, Tan, Lee and Soh (2002) proposed the development of an Internet-based system[6] to allow monitoring of important process variables from a distributed control system (DCS). This paper proposes hardware and software design considerations which enable the user to access the process variables on the DCS, remotely and effectively Potamitis, Georgila, Fakotakis, and Kokkinakis, G. (2003) suggested the use of speech to interact remotely with the home appliances to perform a particular action on behalf of the user. The approach is inclined for people with disability to perform real-life operations at home by directing appliances through speech. Voice separation strategy is selected to take appropriate decision by speech recognition

In the year 2006, S. M. Anamul Haque, S. M. Kamruzzaman and Md. Ashraful Islam proposed a system entitled "A System for Smart-Home Control of Appliances Based on Time and Speech Interaction[7]" that controls the home appliances using the personal computer. This system is developed by using the Visual Basic 6.0 as programming language and Microsoft voice engine tools for speech recognition purpose. Appliances can be either controlled by timer or by voice command.Ciubotaru-Petrescu, Chiciudean, Cioarga, and Stanescu (2006) present a design and implementation of SMS based control for monitoring systems[8]. The paper has three modules involving sensing unit for monitoring the complex applications. A processing unit, that is microcontroller and a communication module that uses GPRS modem or cell phone via serial port RS-232. The SMS is used for status reporting such as power failure.

Jawarkar, Ahmed, Ladhake, and Thakare (2008) propose remote monitoring[9] through mobile phone involving the use of spoken commands. The spoken commands are generated and sentin the form of text SMS to the control system and then the microcontroller on the basis of SMS takes a decision of a particular task.Prof. EraJohri Dept. Of Information and Technology K.J.Somaiya College of Engineering VIDYAVIHAR,MUMBAI "Remote Controlled Home Automation Using Android Application via Wi-Fi Connectivity.

1.3 Existing System

1.3.1 Kitchen automation system by using Bluetooth:

The design and implementation of Bluetooth based home automation system. They use a host controller implemented on a pc, which is connected to a microcontroller-based sensor and device controllers. The researches even built a new protocol on top of the Bluetooth software stack, called home automation protocol to make the communication between devices possible. The device controller is connected to electronic devices through the I2C bus. The system allows more than one device controller to be connected to the host controller.

Home automation system using Bluetooth that can be accessed remotely through GPRS. The researches use a cell phone equipped with Bluetooth connectivity as a GSM modem and host controller that provides internet connectivity access. Home appliances are fit with Bluetooth communication adapters can communicate with host controller means mobile phone via Bluetooth connectivity. So that it can control the devices with short distances only that means it can operate up to 10meters long. This system will control the appliances with limited devices only.

Bluetooth communication should only be used on occasion where there is a need for short lived network communication with less concern for security. Bluetooth looks like an attractive communication for creating smart homes. It is very cheap, easy and quick to set up. People are already familiar with technology. The hardware required for establishing Bluetooth communication is readily available. And the technology also provides the necessary bandwidth for the operation in a home. But they also have serious flaws.

It is a Bluetooth stack 2.0 compatible devices which has built-in 2.4 GHz antenna. It is low power consumption, cost effective and high-performance wireless transceiver device that provides two-way communication and supports both USB and SPI protocols. Bluetooth communication should only be used on occasion where there is a need for short lived network communication with less concern for security. Bluetooth looks like an attractive communication for creating smart homes. It is very cheap, easy and quick to set up. People are already familiar with technology. The hardware required for establishing Bluetooth communication is readily available. And the technology also provides the necessary bandwidth for the operation in a home. But they also have serious flaws. The paper discusses remotely controlling and updates the home appliances along with detection and the error diagnostics. The work also talks about providing an electronic user manual on the phone using Bluetooth and internet.

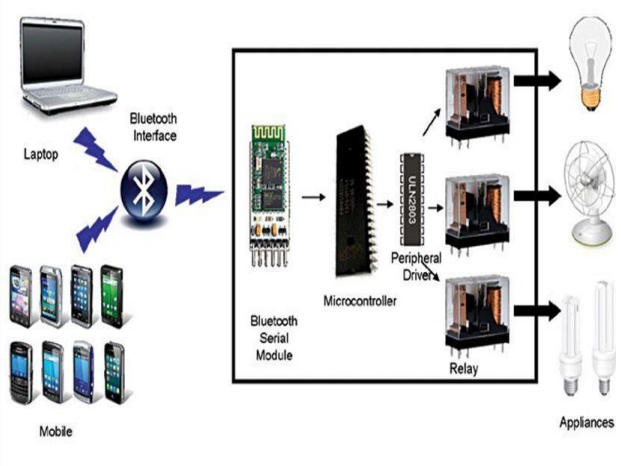

Figure1.1: Bluetooth kitchen automation

Disadvantages:

- Higher power consumption.
- It occurs eavesdropping
- It also has serious flaws.
- It cannot operate from a long distance.
- It cannot applicable for huge devices.

1.3.2 Kitchen automation by using ZigBee:

ZigBee is aradio recurrence(RF) correspondences standard. The ZigBee organizer is incharge of making and keeping up the system. Each electronic gadget (i.e.Clothes washer, Television, Lampand so on) in the framework is a ZigBee gadget oversaw by the facilitator.

Figure 1.2: ZigBee kitchen automation

All correspondence between gadgets proliferates through the facilitator to the goal gadget. The remote idea of ZigBee defeats the meddling establishment issue with the current home mechanization frameworks recognized before. ZigBee networks can be established by a coordinator only. Upon correct PAN parameters settings, other devices may join the network, forming one of the following topologies.

II. PROPOSED SYSTEM

In order to address the mentioned issues of functionality and flexibility in the literature survey, we have designed and implemented a novel, flexible, standalone, and low cost home monitoring and control system. The system consists of an Arduino Mega 2560 with ETHERNET shield, hardware interface modules and the Android supportable Smart phone application.

2.1 Block diagram:

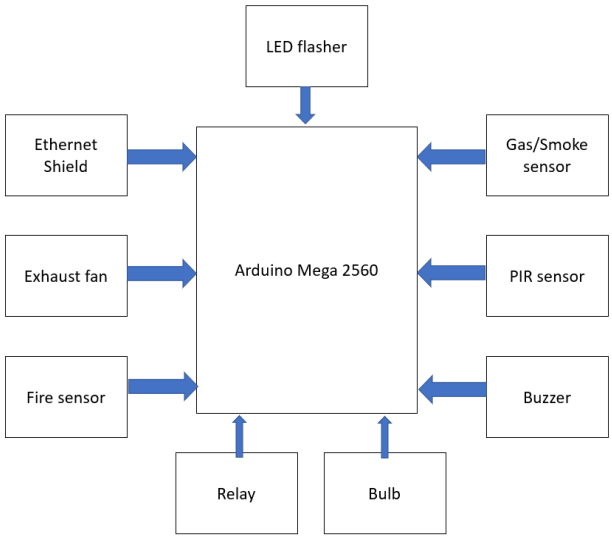

Figure 2.1: Block diagram of kitchen automation

2.2 Working:

The architecture presented in this project can be customized in several ways in order to support different application scenarios with minimum modification in design and coding i.e. each time when a new device is added to board, a new thread has to be added in the smart phone application.

The power supply is connected directly to Arduino Mega 2560. The sensors powered from pin 5v (VCC) Arduino Mega 2560.The sensor used in this system are Mq-135 to detect LPG gas leak/ smoke, IR flame sensor to detect fire, PIR sensor to detect human activity in the kitchen. Data received by the sensor will be sent directly to the device via digital or analog pins. Arduino Mega 2560 serves as the controlling center in this system, all data sent by the sensor will be processed to become a reference in the next action. Data received by Arduino Mega 2560 will also be sent to the Blink server.

Fan Relay functions as a fan controller and light bulb. This relay will work according to the command. The device will command the Fan to turn on when the smoke sensor detects smoke greater than our requirement, MQ-135 sensor detects LPG gas leakage, IR flame sensors detects a fire, and when a command from a mobile device passes through the Blink server. Alarm works when there is a gas leak, or a fire occurs.

The indicator lights consist of three different lamps, each light indicator having different functions. A red light indicates a fire, yellow lights indicate a gas leak, green lights indicate the kitchen safely. Blink serves as a web server that will accommodate various information transmitted by Arduino via Wi-Fi connection. Blink will process the information and will be displayed on the dashboard. The dashboard is a view of the page or application that shows the information received by the Blink server.

In the dashboard, there is also a section that can control the components connected to the Blink server. In this system, which can be controlled by the Blink is fan relay. Blink also has a trigger function. Trigger function will send notifications in the form of SMS and Email based on sensor readings that have been determined. The mobile device serves as the receiver and information viewer of the smart kitchen system through the Blink server.

2.3 Advantages:

- Time saving and power saving.
- We can control device from a long distance, thus it gives increased comfort.
- Quickly to operation and more efficient.
- No need to carry separate remote or any other controlling unit.
- Smart kitchen has various benefits such as increased comfort, safety and security.
- Easy and manageable web interface for user to run kitchen automation system.
- Device monitoring.

IV. SOFTWARE REQUIREMENTS

4.2.1 Arduino IDE:

The Arduino Integrated development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.The source code for the IDE is released under the GNU General Public License, version. The Arduino IDE supports the languages C and C++ using special rules of code structuring.

4.2.2.3 The blynk app steps:

Create a Blynk Account:

After you download the Blynk App, you'll need to create a New Blynk account using Email address. This account is separate from the accounts used for the BlynkForums.An account is needed to save your projects and have access to them from multiple devices from anywhere. It's also a security measure. You can always set up your own Private Blynk Server and have full control.

It is responsible for all the communications between the smart phone and hardware. You can use our Blynk Cloud or run your private Blynk server locally. It's open-source, could easily handle thousands of devices and can even be launched on a Raspberry Pi.This is a convenient method of checking the status of your sensors as well as being more mobile than a laptop or desktop.

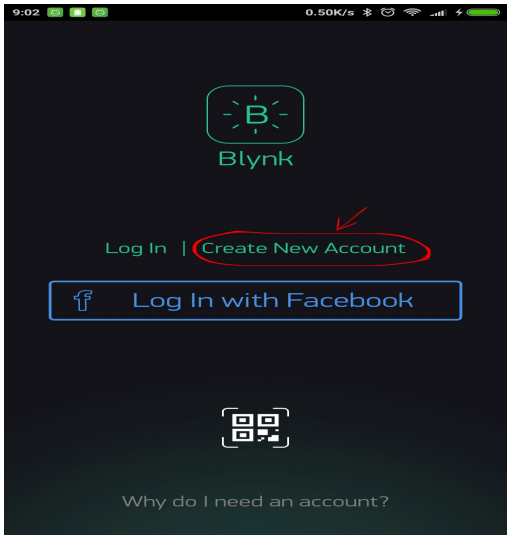

Figure 4.24: Blynk account

1. *Create a New Project*

After you've successfully logged into your account, start by creating a new project.

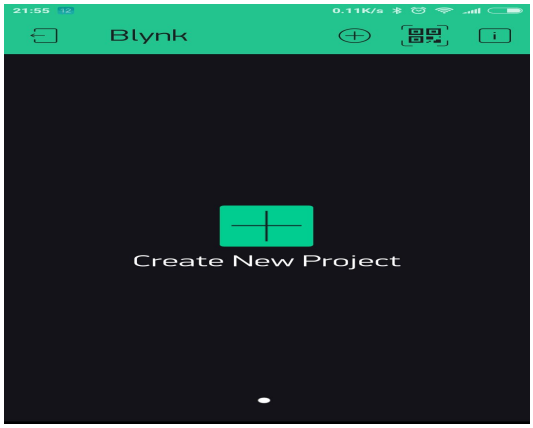

Figure 4.25: Create new project

2. *Choose Your Hardware:*

Select the hardware model you will use. Check out the list of supported hardware!

3. *Add a Widget:*

Your project canvas is empty, let's add a button to control our motor. Tap anywhere on the canvas to open the widget box. All the available widgets are located here. Now pick a button.

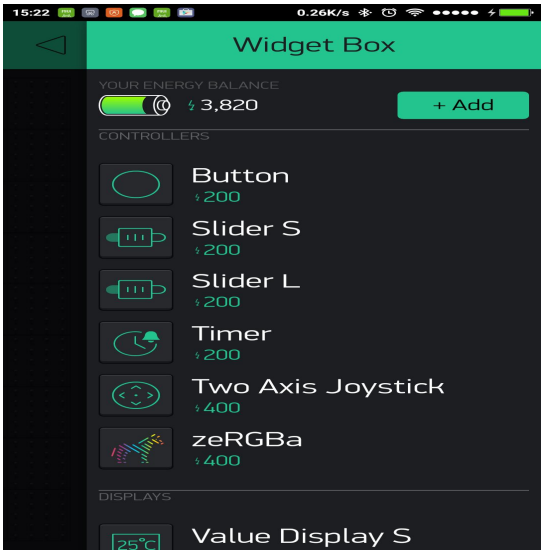

Figure 4.26: Widget Box

Drag-n-Drop - Tap and hold the Widget to drag it to the new position.

Widget Settings - Each Widget has its own settings. Tap on the widget to get to them.

4. *Run The Project:*

igure 4.27: Run the project

When you are done with the Settings - press the PLAY button. This will switch you from EDIT mode to PLAY mode where you can interact with the hardware.

V. RESULTS

To determine the performance of this system, the smart kitchen prototype that will be placed in aminiature kitchen, as shown in figure. The layout of each indicator and sensor is adjusted to the actual system condition. Prior to use in this system, the sensor was independently tested to determine its eligibility. The test results show that the system can work properly. Each sensor can work correctly. All data sent by the sensor can be accepted by Arduino to determine an action for the output device. Data displayed on the dashboard can be seen in figure

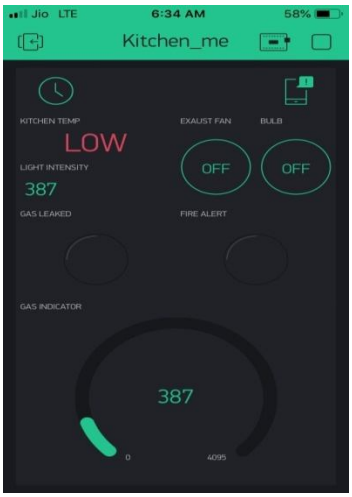

Figure 5.1: Dashboard of Kitchen Automation App

1234567890‘’“”International Symposium on Materials and Electrical Engineering (ISMEE) 2017 IOP Publishing IOP Conf. Series: Materials Science and Engineering 384 (2018) 012007 doi:10.1088/1757-899X/384/1/012007The dashboard displayed can be customized. The data that received by Blynkis also displayed on the dashboard in the Blynkapp on a mobile device. The in-app dashboard display can be seen in figure. Blynk application Display

The dashboard displayed in the app can be customized but simpler than WebBlynkdashboard display. The warnings notification in the event of a fire and gas leak also works correctly, as shown in figure

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IOP Conf. Series: Materials Science and Engineering 384 (2018) 012007 doi:10.1088/1757-899X/384/1/012007

Figure 5.2:Gas Leakage alert by blynk app

The system will send warning notification directly to mobile devices via Wi-Fi.

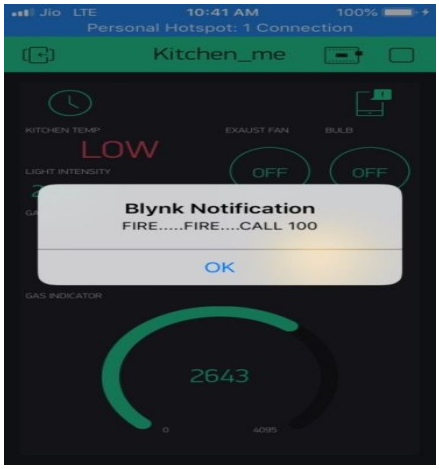

Figure 5.3:Fire Alert notification by blynk app

VI. APPLICATIONS

Kitchen automation is not only measuring for temperature, smoke levels, lightings, etc., in kitchen room but also used for variant aspects. Like mentioned below, Tech advancements are taking the entire world by a storm.

Figure 6.3: Kitchen automation by Wi-Fi

Especially, when it comes to revolutionizing the service-oriented sectors, there’s no denying the significance of tech innovations. Automated solutions are what the leading industries and enterprises are adopting and embracing. From banks to supermarkets, every single destination is adopting automated technologies like never!

1. Place your orders
2. Benefits for the restaurateur

3. Uncovering the benefits
4. Parting thought

VII. CONCLUSION AND FUTURE SCOPE

Conclusion:

Rapidly increasing population, urbanization, and industrialization have made Kitchen management a global challenge. The Smart Kitchen system provided comprehensive solutions to the people those who are in the urban area. This system could read and transmit the weight data to the server. Finally, the project successfully achieved to fulfill all the objectives of this system and hope this research would be of benefit.

1. Based on the test, each of sensors contained in this system works well. After installing, calibration should be done so that the results can be in accordance with the expected.
2. All collected data can be displayed on the web and apps. In the delivery of such information, is strongly influenced by the quality of Wi-Fi networks used.
3. In simulated fires and gas leaks, the fan can function properly. A warning system can work. Email and SMS can be received directly by the mobile device.

Future scope:

The addition of variant sensors to measure various information about the kitchen is needed. The addition of security systems also needs to be improved. One of the security systems that can be embedded in this system is a fire extinguisher or automatic gas lock.

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