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Safety in Kitchen Using IOT

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***Abstract*—** Gas stoves are one of the most important assets in the kitchen. All the cooking activities are carried out with the help of this apparatus. Through our project, we are trying to bring into focus those areas which can cause danger in the kitchen. Through our project, we are taking some important factors into consideration that will help the user to avoid those harmful situations. We have observed that most of the accidents in the kitchen take place due to the less careful behaviour of the user. Our project focuses on the idea to provide safety to the user hence avoiding accidents due to flame, gas leakage, or spillage of the flame. Project is the real-time application of the embedded system to turn off the gas stove knob in case of an emergency situation using a reverse gear mechanism. There are three cases in which the automatic turning off the gas stove will take place.

1) In the absence of a user for a set amount of time
2) When smoke or gas leakage is detected.
3) When flame blows off accidently.

***Keywords*—** Safety, Automation, Motion sensor, Smoke detection, Flame detection.

I. INTRODUCTION

The kitchen is the place in the house that requires a huge mechanism and all the work should be carried out with full care. An important factor that comes into the picture is handling all the stuff with care. With the imaginative improvements and our technical abilities, the project is more focused on the automation of the stove knob. The system basically works on the development of the automatic knob in the stove. Project is a real-time implementation in the society in order to make homes safer and better place to live. The project is centred on thinking of all the children, young and old people in the house. The maximum chance of accidents in the kitchen is due to gas leakage. In our project, if the gas leakage is detected by the gas sensor, the Gas sensor sends an alert message to the registered mobile number and hence then the knob of the stove will automatically turn off. In order to make our day-to-day life easier, a combination of technical and imagination skills makes things easier. The structure of the system is more efficient and compact which can be made suitable for all the families to purchase this at an efficient price. This system is affordable for every person but it requires Android or IOS support with the user. The system is completely wireless and has obliged machines. This device can also keep the data of time, temperature and alert messages. Our system can identify ease and accessibility for the development of compact system. Due to technical enhancements the complete system can be controlled by the mobile phone. The system is inbuilt with the GSM module which helps an user to get the alert message as well as it helps to trace the location of the system which is one of the most safety factor and advantages to the user. There are three important sensors used in this system which is Ultrasonic sensor, which is used to detect the motion of the person in the kitchen. Another sensor used is a flame sensor, this sensor will detect the flame on the burner. One of the most important sensors is the gas sensor, this sensor will check the leakage of the gas .If leak is detected then the knob will perform its default function and will turn off the stove knob automatically if the system receives no response from the user. The sensor will send data to the AtMega and as indicated by the program the controller will act accordingly. When the smoke or flame spillage is identified in the presence of the person then the system is programmed in such a way that control is given to the user. The turning off mechanism uses a 12V DC motor to turn off the knob. When the controller is controlling the signal given to the motor then voltage generation is observed in the motor and then the controller will reset.

Figure 1

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Block Diagram of Implemented System

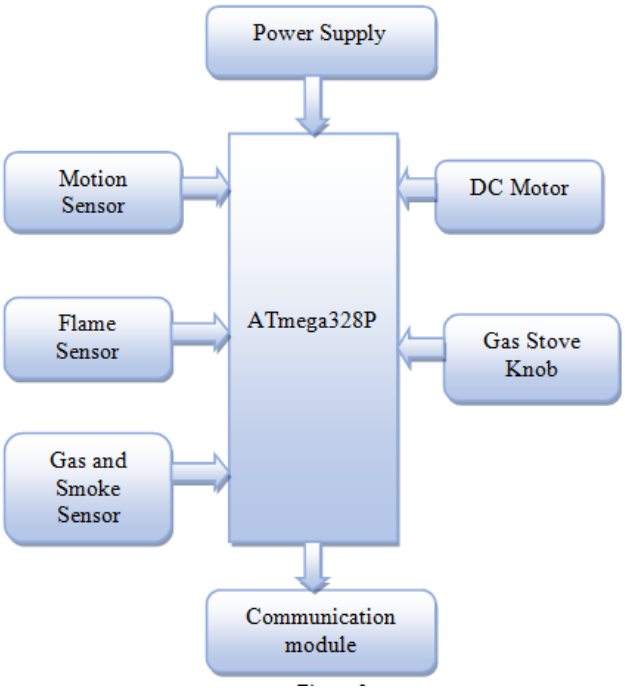

Figure 2

II. RELATED WORK

1) IOT in the Kitchen: Monitoring stovetop for fire safety--This paper deals with safety considering the flame sensor at the burner side and it mostly looks for the spillage of flame. And if the PIR sensor detects no motion then an alert message is sent to the user. This system requires internet connectivity. The drawback of the system is that if there is no internet all the devices remain disconnected and hence in such a case there the chance of accident increases. Through our Project, we have tried to overcome this issue by using the GSM module as the communication media between the system and the user device.

2) IOT-based Smart Kitchen--This system is fairly applicable to overcome all challenges. It uses SMS to send the alert message to the user but its major drawback is the cost. The cost of the system is high and hence proves to be inefficient due to the user. Our system works on the same principle but the several cost of the project makes the difference. The system implemented by us costs around 4500 Rupee which is 42% less than the earlier system available in the market.

3) Automation and Monitoring Smart Kitchen based on IOT--This system deals with all the automation activities carried out in the kitchen. It uses an IR sensor to detect the flame, a PIR sensor to detect the motion, a DHT11 sensor to find the temperature, and MQ235 to detect the gas leakage. This system is App bases and requires continuous internet connection. Continuous internet connection is not possible in rural areas and hence the chances of accident increases. Other than this the system implemented by us is more efficient in terms of cost, reliability, and network issues.

III. METHODOLOGY

The main objective behind this idea of home automation is the concern about safety in the kitchen. So we successfully built the Kitchen gas security framework with an automatically functioning gas knob. We had referred a number of IEEE papers and examined our theme. We made our decisions based on the research carried out and our objective to achieve automation with utmost safety. We chose sensors and other materials based on our requirement and their availability in the market. We especially looked into the online market for the least cost. We prepared the final circuit by studying the specifications of every sensor. Setting an outline for the final circuit to meet all the requirements and assumptions. We planned to build a board that incorporated a microcontroller in it along with reset hardware, ports, supply crystal, power, etc. We did a code for all sensor establishments. The main objective of our project is to turn off the knob automatically. The last step was to check perceptions. Here is the list of the components used:

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1. **ATmega328P:** The control system of the project. To carry out the controlling operations and takes decisions based on an algorithm
2. **Motion sensor:** To detect the motion in the kitchen and report to the controller.
3. **Gas/Smoke detector:** To Sense the gas concentration in the kitchen. Especially for the LPG gas. And report the same to the controller continuously.
4. **Flame sensor:** To detect the flame on the stove, To sense the flame on the stove to detect whether the stove is on or off. And to report continuously to the controller.
5. **DC motor**: DC motor helps to rotate in reversing applications.
6. **Load Cell**: Sense the weight of the cylinder and detect the level of the gas in the cylinder.
7. **GSM Module**: To communicate with the owner or the user via SMS informing the condition or the situation.

Implemented System

Figure 2

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Flow Chart

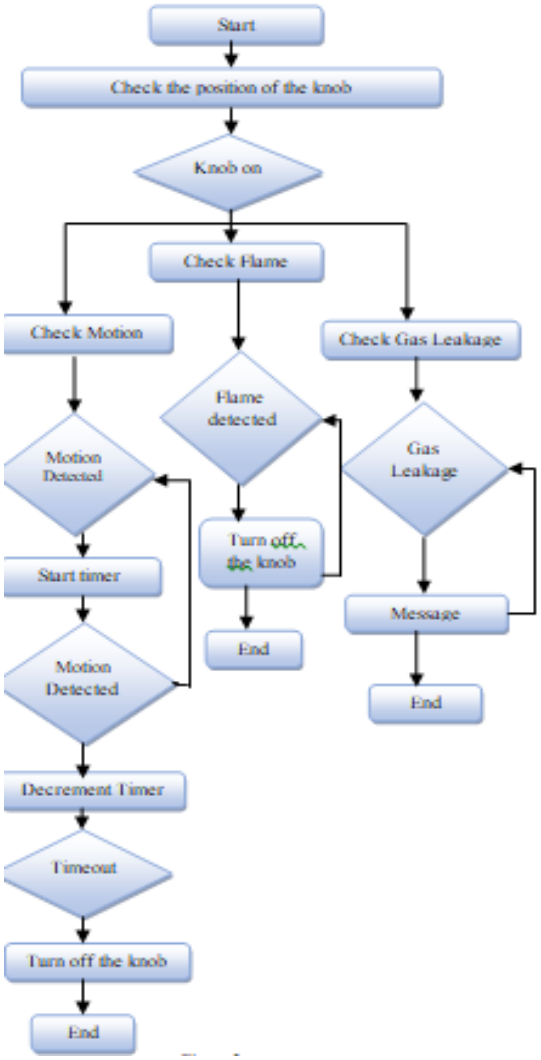

Figure 3

IV. RESULTS AND DISCUSSION

After implementing the system and calculating the results for different test conditions we have tabulated the following test

1)When the flame is on and gas leakage is detected: It detects LPG, Propene, Methane, etc concentrations from 200 to 10000ppm.

Table 1

Sr.No.	1	2	3	4
Input Voltage	4V	4V	5V	5V
Current(microampere) (Flame Sensor)	8.01	8.96	10.56	11.94
Output Voltage(Volts)	17.01	17.95	19.35	18.94
Threshold Voltage(Volts)	16.004	16.004	16.004	16.004
Message sent to a user	YES	YES	YES	YES
Response from User	No response	Turn off	Keep it on	Turn off
Position of Knob	Off	Off	On	Off

From the above table we can find that for different voltage range there is different result obtained for the switching off mechanism. The threshold voltage for the system above which the knob will turn to off position is set as 16.004V.

2) When the flame is on and there is no gas leakage :

Table 2

Sr.No.	1	2	3	4
Input Voltage	4V	4V	5V	5V
Current(micro Ampere) (Flame Sensor)	8.01	8.96	10.56	11.94
Output Voltage(Volts)	14.91	15.955	15.34	14.67
Threshold Voltage(Volts)	16.004	16.004	16.004	6.004
Message sent to a user	NO	NO	NO	NO

The corresponding table shows the result when an alert message is not sent to the user. This is the safe condition in the kitchen when the system works according to the programmed architecture.

3) When the Knob is on and there is no flame detected: The DC motor will turn in a clockwise direction and the knob will turn off.

Table 3

Sr.No.	1	2
Input Voltage	4.5V	5V
Output Current(microampere)	0.00	0.00
Threshold Current (microampere)	0.00	0.00
Position of a knob after 10 second	off	off

4) When the Knob of the stove is on and the flame is detected:

i] After every movement in the kitchen it will reset the timer.

ii] If there is no movement detected after 10 minutes it will send a response to the user to keep it on if GSM receives a response from the user the timer will restart or else the DC motor will rotate in clockwise direction and the knob will be off.

V. DRAWBACK OF THE SYSTEM

1) The drawback of the system is it only cuts off the supply from the stove knob.

2) Ultrasonic sensor senses the motion of very small movement and hence then the system will go into the detect mode.

VI. CONCLUSION AND FUTURE SCOPE

Our system works on detect , react and defend mechanism. It identifies the dangerous circumstance which may be caused because of incidental gas spillage, fire or smoke in the kitchen and furthermore if the gas oven is kept on

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without observation. The react mechanism of our system incorporates automatically turning off the gas knob when there is no movement detected in the kitchen, if the knob is on and the flame is extinguished and in cases of smoke and gas spillage. It acts smartly by informing the client about the gas spillage, handle position, gas level of the chamber. In the event that if the handle is on, the client will get a warning and the client can return in the event that he needs to keep the handle on/off. This framework is an IOT based system and can be a piece of the shield for home framework ecological system. The correspondence part can be accomplished by utilizing either GSM or android application or Wi-Fi. It is an affordable framework will be simple for establishment. This framework will actually protect the kitchens from hazards. Future scope for the system is that it can be in case of gas leakage the gas supply will be cutoff from the cylinder rather than from the stove knob.

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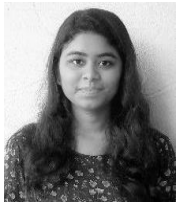

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