SMART GAS SAFETY SYSTEM WITH AUTOMATIC KNOB

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ABSTRACT

Kitchen gas stoves are very prevalent right from urban to rural areas. This paper focuses on the idea of automation of the kitchen gas stove which would provide maximum safety to the user and also to make the kitchen smarter and safer. The highlighting part of the project would be the use of multiple sensors that would detect the hazards and the necessary action would be taken by the based on it by the controller. This project is an Atmega/Ardiuno based embedded application which has a knob which will be controlled by a motor. The Automatic turning off mechanism of the knob would be in three cases. i) The knob will automatically turn off in the absence of a person in the kitchen for a specific amount of time. ii) When the flame on the burner is blown out accidently. iii) When smoke or gas leakage is detected by the sensor. This system provides convenient and safe use of the kitchen gas stove. Keywords — safety, automation, motion sensor, Smoke detection, Flame detection.

ARTICLE INFO

I. INTRODUCTION

The kitchen is the house has to many different appliances, such as a microwave, refrigerator, stove etc .These appliances make the work in the kitchen easier and smarter. The gas stove is the most important part of the kitchen which can be dangerous or hazardous if it is not functioning properly or if we are careless towards that. This is because it has a surface which exposes high heat and flames. Old age people and children are on more risk, if they are around or using such devices like gas stove. As old age people tend to forget that, they can keep the stove on this could lead to an unwanted accident. Same thing is applicable to children as well as, who have a lack of knowledge about the function of the gas stove. The goals of this project is to prevent hazardous on the stove, specifically fires from becoming disasters and before such kind of situation arises the smart system would perform its work accordingly. The system is cost efficient system and could be used in most of the households. If people are away from the stove but still in the house, their stove will automatically turn off and the user will be notified through a message. If the stove knob is in the on position and flame blows off then knob will automatically get turn off. Technological enhancement and development has made companies make their appliances to be smartly controlled by mobile device. These devices can control the time, temperature, alarms, etc. There are many brands/companies that have such devices. However, customers could only avail the facility of such smart system if they were using the companies' brand. If such a device/system is implemented that can control any companies' device, it would be very convenient and cheaper for the user.

Our solution is a system that can detect availability of movement in the kitchen and smoke as well as gas leakage using a motion sensor, MQ2 flammable smoke detector and flame sensor. These sensors will send information to a microcontroller and according to the program microcontroller will act and output will be provided to the motor and according to that the signal provided by microcontroller then motor will off the knob of stove. The functionality that we would like to accomplish with this are, Firstly, stove knob will automatically turn off in the absence of movement in the kitchen. Then if a fire starts or smoke is detected while they are in the kitchen then it will work accordingly.

II. LITERATURE REVIEW

[1] IEEE paper of: ''IMPLEMENTATION OF AUTOMATIC SAFETY GAS STOVE,

Ajinkya Yalmar, Mahesh Parihar, Vivek kadam Department of instrumentation Engineering, Ramarao Adik Institute of Technology, Nerul" Product survey "In the above paper, the members have developed a automatic safety gas system which work on three modes of operations. The three modes are: 1. Detection mode 2.Timer mode 3.Remote access mode.

[2]IEEE paper of 'AUTOMATIC GAS STOVE WITH ADVANCED SAFETY FEATURES' by Manu Mathew, Neelakantha V L,MITE Moodbidri, Karnataka.
 Product Survey "In this paper design and working method of automatic gas stove with advanced safety features is explained. The whole system works on microcontroller and actuates the motor, GSM and buzzer unit. The method proposed in the above paper reduces human interference, safety features and wastage of LPG."

[3]IEEE paper of 'DESIGN OF A SIMPLE GAS KNOB' by Shankey Garg, Jyotir moy Chatterjee, Raghvendra kumar Agarwal IIT Raipur.
Product Survey "The proposed system in the above paper uses a magnetic sensor which is being fitted in the knob that is basically used to establish communication among whole system .The magnetic sensor is used to turn the knob on /off."

III. BLOCK DIAGRAM AND EXPLANATION OF THE SYSTEM
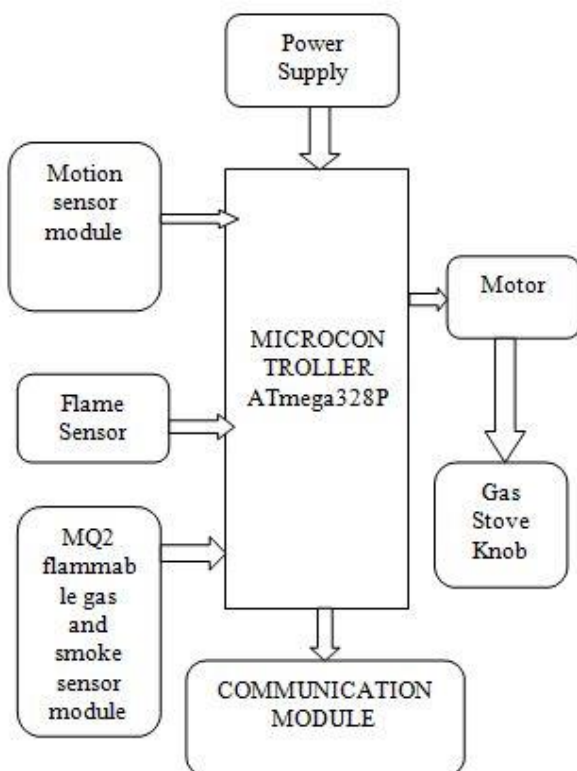
A. The sensor unit which contain the gas, smoke, flame and motion detectors that monitor your kitchen's environment.

B. If it senses high levels of smoke or gas, or if the motion sensor recognizes that the stove was left on accidentally as well as if flame blown off that time this unit signals the microcontroller then the microcontroller signals to the motor and that motor make knob turn off.

C. Whenever gas stove knob get automatically into the off mode that time user will be notifided through the massage.

IV. METHODOLOGY

With the arrival of the concept of the home automation our main concern is about our safety in the kitchen. So we decided to go for the smart gas safety system with automatic knob. We had gone through the certain number of IEEE papers and did our research on the topic. We took some decisions on what kind of system we want to make the project to achieve automation with maximum safety. We fixed the sensors and other components to be used and checked for their availability in the offline as well as online market. We tried to get the sensors for minimum price in offline market and rest we ordered online. By considering the specifications of each sensor we go for designing the circuit. We are preparing the circuit diagram to be efficient and working on to make it meets all the specification and expectation. Then we designed a board which includes microcontroller, Ports, Power supply, Reset circuitry, Crystal, etc. Then we did our sensor implementation. Then we did code wise sensor installation. After that the soul aim of our project is automatically turning off the gas stove knob So, we worked on that mechanism and then last but not the least is that checking the observations.

V. AUTOMATICALLY TURNING OFF MECHANISM

The basic aim of this project is turn off the knob automatically whenever hazard is detected. A 12V motor is used to turn off the knob by implementing it for partial rotation.

For turning off mechanism we are using DC motor, whenever we turn on the knob that means, any input is given to the motor then voltage generation is observed in that motor then microcontroller is reset and after that based on the coding action will take place. Then whenever hazard is detected microcontroller sends the signal to the motor and then it turns off the knob immediately. The rotation of motor is controlled by giving suitable time delay in microcontroller programming. Input from microcontroller is first interfaced to motor driver IC and then to the motor. To turn off the gas stove knob the rotation of motor is transmitted to the knob by gear arrangement. The gear arrangement is done by using two gears from which one is used on the shaft of the motors

and other one on the gas knob. When the control signal from the microcontroller is given to the motor that time the gear fitted on the shaft rotates in the off direction. This arrangement is set up at the front side of the gas stove knob.

VI. OPERATION MODES OF THE SYSTEM

A. DETECT : With the help of sensor unit our system firstly detect the hazard causing situations as well as motion in the kitchen

B. REACT: Based on the conditions according to the system programming it react by turning off the gas stove knob.

C. DEFEND: In this mode our system automatically turn off the knob & alerts the user by sending the notification regarding any type of hazard.
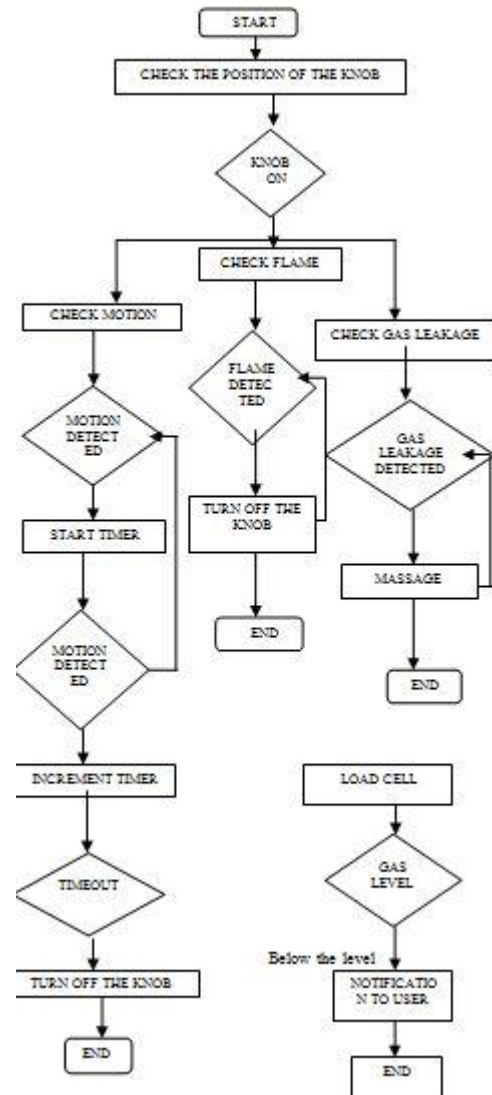
VII.SYSTEM ARCHITECTURE
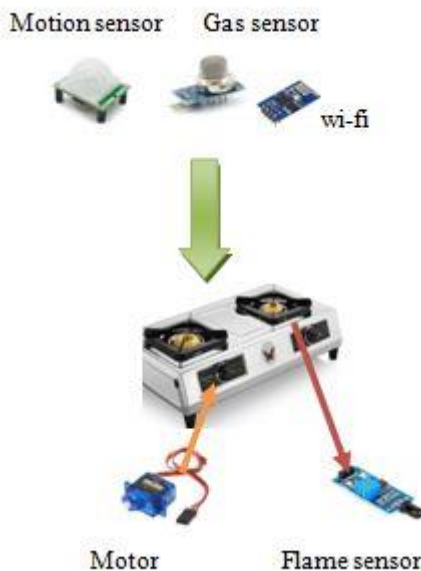
Components:

1.   Motion sensor
2.   Gas/Smoke detector
3.   Flame sensor
4.   DC motor
5.   Load cell
6.   ATmega328P

VIII.   FLOW CHART OF ALGORITHM

VIII.   CONCLUSION

Our system works on detect, react & defend mechanism. It detects the hazardous situation which might be caused due to accidental gas leakage, fire or smoke in the kitchen and also if the gas stove is kept on unsupervised. The react mechanism of our system includes automatically turning off the gas knob when there is no motion sensed in the kitchen, if the knob is on and the flame is blown out and incases of smoke and gas leakage detection. It acts smartly by notifying the user about the gas leakage, knob position, gas level of the cylinder. In case if the knob is on, the the user will get a notification and the user can revert back if he wants to keep the knob on/off. This system is an Iot based system and can be a part of the smart home system ecosystem. The communication part can be achieved by using either Gsm or android app or Wi-Fi. It is an economical system will be easy for installation. This system will be able to safeguard the kitchens from accidents.

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[4] Automatic Gas Stove With Advance Safety Features by Manu Mathew, Neelkantha V L (2015).

[5] Implementation of Automatic Safety Gas stove By Ajinkya Yalmar and Mahesh Parihar.