

GAS DETECTION AND AUTOMATIC DOOR UNLOCKING SYSTEM

A Project Report Phase – II

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering Degree in Electronics and Communication Engineering

by

K.LOKESH DURGA PRASAD (39130198)

M.V.V.MANEESH (39130277)



**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

APRIL - 2023



SATHYABAMA

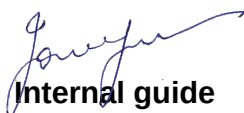
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with "A" grade by NAAC
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai – 600 119
www.sathyabama.ac.in

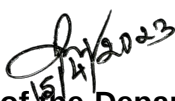
DEPARTMENT OF ELECTRONICS AND COMMUNICAITON ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this final year project report is the bonafide work of K.LOKESH DURGA PRASAD (39130198), M.V.V.MANEESH (39130277) who carried out the project entitled "**GAS DETECTION AND AUTOMATIC DOOR UNLOCKING SYSYTEM**" under our supervision from NOVEMBER 2022 to APRIL 2023.


Internal guide

Dr.R.M.JOANY,M.E,Ph.D.,


Head of the Department

Dr.T.RAVI,M.E,Ph.D.,

Submitted for Viva voce Examination held on 20/04/2023


Internal Examiner

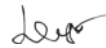

External Examiner

DECLARATION

We K.LOKESH DURGA PRASAD (39130198) , M.V.V.MANEESH (39130277) hereby declare that the Project Report entitled “**GAS DETECTION AND AUTOMATIC DOOR UNLOCKING SYSYTEM**” done by us under the guidance of **Dr.R.M.JOANY, M.E., Ph.D.**, Associate Professor Department of Electronics and Communication Engineering , Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Electronics and Communication Engineering .

DATE:20/04/2023

PLACE: Chennai

1. 

2. Maneesh

SIGNATURE OF THE CANDIDATES

ACKNOWLEDGEMENT

We are pleased to acknowledge our sincere thanks to **Board of Management of SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. We are grateful to them.

We convey our thanks to **Dr. N. M. Nandhitha, M.E., Ph.D.**, Professor & Dean, School of Electrical and Electronics and **Dr. T. Ravi, Ph.D.**, Professor & Head, Department of Electronics and Communication Engineering for providing us necessary support and details at the right time during the progressive reviews.

We would like to express our sincere and deep sense of gratitude to our Faculty Incharge **Dr.R.M.Joany,M.E.,Ph.D.**, for her valuable guidance, suggestions and constant encouragement paved way for the successful completion of our project work.

We wish to express our thanks to all Teaching and Non-teaching staff members of the Department of Electronics and Communication Engineering who were helpful in many ways for the completion of the project.

ABSTRACT

Gas leaks can cause serious health hazards and even lead to fires or explosions if not detected and addressed quickly. To ensure safety, gas detection systems are installed in various places such as homes, offices, and factories. However, in case of a gas leak, it is important to quickly evacuate the affected area and ensure that no one is trapped inside.

To address this issue, a gas detection and automatic door unlocking system is proposed. The system is designed to detect the presence of gas and, upon detection, automatically unlock the doors to ensure safe evacuation of the area. The system uses a gas sensor that detects the presence of gas and sends a signal to a microcontroller. The microcontroller then activates a relay that unlocks the doors.

The proposed system is simple and easy to implement, requiring minimal hardware and software components. It can be integrated into existing security systems and is compatible with various types of doors. The system is reliable, fast, and efficient in detecting and responding to gas leaks, ensuring the safety of occupants in the affected area.

In conclusion, the gas detection and automatic door unlocking system is an effective solution to address the safety concerns of gas leaks. By quickly detecting the presence of gas and automatically unlocking doors, the system can minimize the risk of injuries or fatalities in the event of a gas leak.

TABLE OF CONTENTS

CHAPTER No.	TITLE	PAGE No.
	ABSTRACT	v
	LIST OF FIGURES	viii
1	INTRODUCTION	1
	1.1 Introduction	1
	1.2 Ideology	2
	1.3 Objective	2
2	LITERATURE SURVEY	5
	2.1 Literature Survey	5
	2.2 Problems in existing work	11
3	AIM AND SCOPE OF THE PROJECT	13
	3.1 Aim of the project	13
	3.2 Scope of the project	14
4	SYSTEM DESIGN	15
	4.1 Existing work	15
	4.2 Proposed work	18
	4.3 Difference between existing and proposed work	19
5	REQUIREMENT ANALYSIS	21
	5.1 Hardware requirements	22
	5.2 Software requirements	30
	5.3 Libraries required	31
	5.4 System Architecture	32

6	RESULTS AND DISCUSSION	34
	6.1 Results	34
	6.2 Discussion	35
	6.3 Advantages	36
	6.4 Limitations	37
7	SUMMARY AND CONCLUSION	39
	7.1 Future Scope	39
	7.2 Implementation Issues	41
	REFERENCES	
	A. SOURCE CODE	43
	B. SCREENSHOTS	46
	C. RESEARCH PAPER	47

TABLE OF FIGURES

FIGURE No.	FIGURE NAME	PAGE No.
Fig 3.1	Aim of the project	13
Fig 4.1	Gas leakage and alarm system	16
Fig 4.2	Wireless gas detection system	16
Fig 4.3	Arduino	17
Fig 4.4	IOT based gas detection system	17
Fig 4.5	Block diagram of existing work	17
Fig 4.6	Gas detection and unlocking system	19
Fig 4.7	Block diagram of proposed work	19
Fig 5.1	Arduino	23
Fig 5.2	MQ-5 Gas sensor	24
Fig 5.3	MQ-7 Gas sensor	25
Fig 5.4	LCD display	26
Fig 5.5	Servomotor	27
Fig 5.6	Relay module	28
Fig 5.7	LED	29
Fig 5.8	Arduino IDE	31
Fig 5.9	System Architecture	33
Fig 6.1	Before gas leakage	34
Fig 6.2	After gas leakage	35

CHAPTER 1

INTRODUCTION

1.1 Introduction:

Gas leaks are a serious concern in various settings such as homes, offices, and factories. When gas leaks occur, they can lead to health hazards, fires, and even explosions. While gas detection systems are already installed in many places, these systems only detect the presence of gas and do not provide a complete solution for ensuring safety. In the event of a gas leak, it is crucial to evacuate the area as quickly as possible to avoid any harm to occupants.

To address this issue, the proposed project aims to develop a gas detection and automatic door unlocking system. The system will complement existing gas detection systems by automatically unlocking the doors upon detection of gas, ensuring the safe evacuation of occupants from the affected area. The system is designed to be simple, yet effective, and requires minimal hardware and software components.

The system uses a gas sensor that is capable of detecting the presence of gas in the environment. Upon detection, the gas sensor sends a signal to a microcontroller, which is responsible for activating a relay that unlocks the doors. This automated process ensures that the doors are unlocked quickly, minimizing the risk of harm to occupants in the event of a gas leak.

The proposed system is also versatile, as it can be integrated into existing security systems and is compatible with various types of doors. This system is reliable, fast, and efficient in detecting and responding to gas leaks, ensuring the safety of occupants in the affected area.

In conclusion, this project proposes a gas detection and automatic door unlocking system that provides an additional layer of safety in case of gas leaks. By ensuring a quick and automated response, the system ensures the safe evacuation of occupants, thereby minimizing the risk of injuries or fatalities. This system is easy to install and can work with various types of doors,

making it an ideal solution for homes, offices, and factories.

1.1 Ideology:

The ideology behind a gas detection and automatic door unlocking system is to ensure the safety of occupants in a building or facility by detecting the presence of dangerous levels of gas and taking appropriate action to prevent harm.

The gas detection system consists of sensors that are designed to detect the presence of specific gases, such as carbon monoxide or natural gas. These sensors are connected to a control unit that analyzes the readings from the sensors and triggers an alarm when gas levels exceed safe limits.

The automatic door unlocking system is linked to the gas detection system, and it is designed to unlock the doors of the building automatically when the gas alarm is triggered. This enables occupants to quickly evacuate the building and avoid harm in the event of a gas leak.

The gas detection and automatic door unlocking system can also be connected to a building's HVAC system to automatically shut off the ventilation and prevent the circulation of dangerous gases throughout the building.

Overall, the ideology behind this system is to prioritize the safety of occupants by providing early detection of gas leaks and taking swift action to prevent harm.

1.2 Objective:

Gas leaks can pose a significant risk to people and property, especially in homes, offices, and industries where toxic and combustible gases can cause health problems, explosions, and fires. The gas detection and automatic door unlocking system project aims to enhance safety measures in these areas by detecting gas leaks and unlocking doors automatically to allow people to exit the area quickly and safely.

The system comprises several components, including gas sensors, an alarm system, and a door unlocking mechanism. The gas sensors are placed strategically in areas where gas leaks are likely to occur, such as near gas pipelines, storage tanks, and heating systems. The sensors detect the presence of gas and send a signal to the alarm system to activate an alarm. The alarm system alerts people in the area of the gas leak and provides instructions on how to evacuate safely. The door unlocking mechanism is activated when gas is detected, allowing people to exit the area quickly and safely.

However, several technical challenges need to be addressed when designing and developing the gas detection and automatic door unlocking system. One of the primary challenges is to ensure the accuracy of the gas detection system. The system must be able to detect a wide range of gases accurately and reliably to avoid false alarms and ensure the safety of the occupants. Sensor placement is also critical to the effectiveness of the system. The sensors must be placed in areas where gas leaks are likely to occur to detect the gas accurately.

Communication between components is another challenge that needs to be addressed. The gas detection and automatic door unlocking system comprises several components that need to communicate with each other, including the gas sensors, alarm system, and door unlocking mechanism. Ensuring seamless communication between these components is critical for the effective operation of the system.

Power supply is another challenge that needs to be addressed. The system needs a reliable and continuous power supply to ensure uninterrupted operation. Backup power sources may also be required in case of power outages.

Integration with existing security systems can pose technical challenges, particularly in older buildings with outdated security systems. The gas detection and automatic door unlocking system may need to integrate with existing security systems to ensure maximum safety and security.

Maintenance and calibration of the gas sensors is also critical to the effectiveness of the system. The gas sensors need to be calibrated regularly to ensure accurate and reliable gas

detection. Maintenance and calibration can be time-consuming and require specialized knowledge.

Cost-effectiveness is another challenge that needs to be addressed. The system needs to be cost-effective to make it accessible to a wide range of users. Balancing the cost of the system with its features and effectiveness can pose technical challenges for developers.

In conclusion, the gas detection and automatic door unlocking system project is a critical initiative to enhance safety measures in homes, offices, and industries. The project aims to provide a user-friendly, cost-effective, and reliable solution to address the risks posed by gas leaks in various settings. By detecting gas leaks accurately and providing timely alerts and instructions for evacuation, the system aims to minimize the potential damage caused by gas leaks and ensure the safety of the occupants. While several technical challenges need to be addressed, the gas detection and automatic door unlocking system project has the potential to provide an effective solution to enhance safety measures in areas where gas leaks are common.

CHAPTER 2

LITERATURE SURVEY

2.1 Literature Survey:

The following shows a survey done for dual home automation for with and without internet Realtime which includes an instant feedback mechanism that drives the appliances. This system is reliable to integrate on multiple platforms with the help of ESP32 master which serves as standard firmware. Further, the study was extended to multiple operation platforms like Linux, Windows, and IOS are discussed as follows. In this detailed survey, we have learned a lot in stabilizing our concepts from the existing feedback mechanisms that were designed in the previous study.

Satyendra K. Vishwakarma, Prashant Upadhyaya, Babita Kumari, and Arun Kumar Mishra, IJSR “Smart Energy Efficient Home Automation System Using IoT”, IJSR Transaction on Computer Science Engineering 2021.

This paper presents a step-by-step procedure of a smart home automation controller. It uses IoT to convert home appliances to smart and intelligent devices, with the help of design control. An energy-efficient system is designed that accesses the smart home remotely using IoT connectivity. The proposed system mainly requires, Node MCU as the microcontroller unit, IFTTT to interpret voice commands, Adafruit a library that supports MQTT acts as an MQTT broker, and Arduino IDE to code the microcontroller. This multimodal system uses Google Assistant along with a web-based application to control the smart home. The smart home is implemented with the main control unit that is connected to the 24-hour available Wi-Fi network. To ensure, that the Wi-Fi connection does not turn off, the main controller is programmed to establish an automatic connection with the available network and connected to the auto power backup.

Pros: The target scaling factor is efficient throughout the multiple platforms switching 9.

Cons: Slower transit cycles when compared to CoAP, low scalability, and lack of security Encryption.

Shardha Somani, Parikshit Solunke, Shaunak Oke, Parth Medhi. Prof. P. P. Laturkar, IEEE “IoT Based Smart Security and Home Automation”, IEEE Transactions on Augmented Reality, 2021

This paper focuses on a system that provides features of Home Automation relying on IoT to operate easily, in addition to that it includes a camera module and provides home security. The android application basically converts smartphones into a remote for all home appliances. Security is achieved with motion sensors if movement is sensed at the entrance of the house; a notification is sent that contains a photo of the house entrance in real-time. This notification will be received by the owner of the house via the internet such that the app can trigger a notification. So, the owner can raise an alarm in case of any intrusion or he/she can toggle the appliances like opening the door if the person is a guest. The system uses Raspberry Pi, a small-sized computer that acts as a server for the system. The smart home consists of two modules. Home automation consists; of a fanlight and door controller, and a security module that consists; of a smoke sensor motion sensor, and camera module.

Pros: Implementation of IR Interface was an excellent Idea for creating universal remote.

Cons: The system Uses Infrared Radiation for data transfer which is much faster than CoAP but could be easily mapped with 38 kHz of regular frequency.

Tui-Yi Yang, Chu-Sing Yang, IJEEE “A Dynamic Distributed Energy Management Algorithm of Home Sensor Network for Home Automation System”, IJEEE Transactions on Electrical and Electronics Engineers, 2017.

This paper proposes an optimization of home power consumption based on PLC (Power Line Communication) for an easy-to-access home energy consumption. This also proposes a Zigbee and PLC-based renewable energy gateway to monitor the energy generation of renewable energies. ACS and DDEM algorithms are proposed for the design of intelligent distribution of power management systems to make sure ongoing power supply of home networks. To provide efficient power management the power supply models of home sensor networks are classified into groups viz. main supply only, main supply and backup battery, rechargeable battery power, and non- rechargeable battery power.

Devices with particular features are assigned to these groups. It targets establishing a real-time processing scheme to address variable sensor network topologies.

Pros: Fast and secured since the data encryption is 64bit ratio and it follows MQTT protocol

Cons: Does not support a large database size, and it has no support for ROLE, COMMIT, and Stored Procedures.

Tushar Chaurasia, and Prashant Kumar Jain “Enhance Smart Home Automation System based on Internet of Things”, Transactions on Artificial Neural Networks, 2019.

This paper proposes a system that develops a model to reduce the computation overhead in existing smart home solutions that use various encryption technologies like AES, ECHD, hybrid, etc. these solutions use an intermediate gateway for connecting various sensor devices. The proposed model provides a method for automation with sensor-based learning. The system uses a temperature sensor for development but other sensors can also be used as per requirement. These smart home devices with sensors can configure themselves autonomously and can operate without human intervention. 11 This work minimizes encryption decryption and focuses on authentication and automation of smart

home devices with learning. The system bypasses the local gateway mentioned in the existing system to provide better security for smart home devices and sensor data and save computation overhead. The real-time broker cloud is directly connected with the smart home and manages all incoming and outgoing requests between users and devices. The main purpose to use a real-time broker cloud saves time for cryptographic operations.

Pros: Bringing AR with Deep Neural schema is an Excellency and this system can be integrated with the 7 senses of the future world.

Cons: It has a range of support between 3.5Hz to 75Hz which in turn directly matches the neural frequency that potentially messes up sensory organs.

Suraj, Ish Kool, Dharmendra Kumar, Shovan Barman “Visual Machine Intelligence for Home Automation”, MDPI Transactions on Applied Science, 2020.

The paper presents a vision-based machine intelligence system to sense the on/off state of commonhome appliances. The proposed method of sensing the state of appliances results in a novel homeautomation system. The accessibility of the suite of devices in the home over a remote network isfacilitated by the IP Addressing methods in the IoT. This project uses two boards viz. Raspberry Pi and Intel Galileo Gen 2. The communication between the User devices, Raspberry Pi, and the Intel Galileo boards happens over a wireless network. The UDP protocol is deployed to facilitate the wireless communication of the nodes present in the home automation network. A Pi Cam anda US Logitech camera are attached to the rotating shaft of two different servo motor capture snapshots that are passed as inputs to the Machine Learning based models trained using dlib-C++

to detect the state of the operation of the appliances. The proposed method uses visual modality toautomate the appliances, as privacy concerns may emerge while using the images from some specific places, as a counter to this issue, 12 an SPDT switch is added to the Raspberry Pi which when turned off ensures that even if the images are taken from the webcams, they are just passed as inputs to the machine learning models and are not displayed on the website when the users access the website on the server address obtained from Raspberry Pi.

Pros: High Visual and Artificial Database was integrated which can be a link between and virtualand physical world. A creative contextual database has a created a huge responsive factor

Cons: Superimposing virtual environmental capacity has no range of lower frequency AR camerasupport.

Vikram N, Harish KS, Nihaal M S, Raksha Umesh, and, Shetty Asshik Ashok Kumar, “A Low-Cost Home Automation System using Wi-Fi-based Wireless sensor Network incorporating Internet of things”, Procedia Computer Science Transactions on Mobile Device, 2015.

This paper illustrates a methodology to provide a low-cost Home Automation System (HAS) using Wireless Fidelity (Wi-Fi). This crystallizes the concept of internetworking of smart

devices. A Wi-Fi-based Wireless Sensor Network (WSN) is designed for the purpose of monitoring and controlling the environmental, safety, and electrical parameters of a smart interconnected home. The different sections of the HAS are; the temperature and humidity sensor, gas leakage warningsystem, fire alarm system, burglar alarm system, rain-sensing, switching and regulation of load &voltage, and current sensing. The primary requirement of HAS to monitor and control devices is accomplished using a Smartphone application. The application is developed using Android Studio based on the JAVA platform and the User Interface is exemplified. The primary focus of the paperis to develop a solution cost-effective and flexible in the control of devices and implements a widerange of sensors to capture various parameters. 13.

Pros: Implementing a local server reduces cognitive allocation in the server.

Cons: Error Factors are high since it is purely based on local server data.

Mrs. Paul Jasmin Rani, Jason Bakthakumar, Praveen Kumar B, Praveen Kumar U. Santhosh Kumar. “Voice Controlled Home Automation System using Natural Language Processing and Internet of Things”, INCC Transactions on National Security Science and Computation, 2018.

The paper focuses on the construction of a fully functional voice-based home automation system that uses the Internet of Things, Artificial Intelligence, and Natural Language Processing (NLP) to providea cost-effective, efficient way to work together with home appliances using various technologies suchas GSM, NFC, etc. it implements a seamless integration of all the appliances toa central console, i.e.,the mobile device. The prototype uses Arduino MK1000, known as GenuineMK1000. The NLP in this project gives the user the freedom to interact with the home applianceswith his/her own voice and normal language rather than complicated computer commands. The appliances are connected to the mobile device through an Arduino Board that establishes the concept of the Internet of Things. The Arduino Boards are interfaced with the appliances and programmed in such a way that they respond to mobile inputs.

Pros: Only a few notable parameters throughout the project.

Cons: Rate of prediction is proportionally less when compared to real-world predictions.

Jonathan J. Hull, Berna Erol, Jamey Graham, Qifa Ke, Hidenobu Kishi, Jorge Moraleda, Daniel G. Van Olst, Research Gate “Paper-Based Augmented Reality”, ResearchGate Transaction on Camera and Paper documentation, 2014.

A new method for augmenting paper documents with electronic information is described that does not modify the format of the paper document in any way. Applicable to both commercially printed documents as well as documents that are output from PC's, the technique we call Paper-Based Augmented Reality substantially improves the utility of paper. We describe the recognition technology that makes this possible as well as several applications. An implementation on a cameraphone is discussed that lets users retrieve data and access links from paper documents to electronic data. Recognition is performed at 4 frames per second on a Treo 700w and support is provided for several user applications, including “clickable paper” – printed web pages whose appearance is unchanged but that can be navigated with a camera phone.

Pros: Augmented reality with virtual automation was brought to the physical world with the paper content.

Cons: Linking patches of text will increase a lot of security reasons.

Mikko Kytö^{1,2}, Barrett Ens², Thammathip Piumsomboon², Gun A. Lee², and Mark Billingham², Research Gate “Pinpointing: Precise Head- and Eye-Based Target Selection for Augmented Reality”, Research Gate Transactions on Augmented Reality in Computer Science Engineering, 2018.

Head and eye movement can be leveraged to improve the user's interaction repertoire for wearable displays. Head movements are deliberate and accurate and provide the current state-of-the-art pointing technique. Eye gaze can potentially be faster and more ergonomic but suffers from low accuracy due to calibration errors and the drift of wearable eye-tracking sensors. This work investigates precise, multimodal selection techniques using head motion and eye gaze.

A comparison of speed and pointing accuracy reveals the relative merits of each method, including the achievable target size for robust selection. We demonstrate and discuss example applications for 15 augmented realities, including compact menus with deep structure, and a proof-of-concept method for online correction of calibration drift.

Pros: Accuracy has reached 97% with a simple algorithm.

Cons: 97% precise and accurate but depends purely on real-time saturation and hue point of target images.

Subramani Roy Choudri, A. Divija, G. V V N Vijayalakshmi, P. Vamsi, JARTMS “TOUCHLESS HOME AUTOMATION USING AUGMENTED REALITY”, JARTMS Transactions on Augmented Reality and Web Interface, 2021.

As human life is heading towards a busy schedule it becomes necessary to automate our home appliances. Human error is something that cannot be completely erased. With the busy schedule in hand, there is defiantly a possibility of missing something that may be trivial to us but can result in a catastrophe. For these reasons, Our Project home automation can increase efficiency, security, and reliability. AR has recently evolved for the automation of various electrical appliances by popping virtual objects into the real world.

Pros: Target Image can be linked to the Virtual world.

Cons: Target Image can be linked-to automation with an augmented environment but in the case of wet hands, this linking process will not produce tokens to respective servers.

2.2 Problems in existing works:

Gas detection systems with SMS alerts have some additional potential problems and challenges compared to gas detection systems alone, and gas detection and door unlocking systems. Some of the potential problems that may arise with gas detection systems with SMS alerts include:

False alarms: False alarms can be a problem with gas detection systems with SMS alerts,

particularly if the system is too sensitive or if there is interference from other sources. False alarms can cause people to become complacent about real alarms and may lead to unnecessary evacuations.

Delayed alerts: SMS alerts can be delayed due to network issues or other technical problems, which could lead to a delay in emergency response measures.

Communication problems: Communication problems can arise if the gas detection system and SMS alert system are not properly integrated or if there is a problem with the communication network. Communication problems could lead to a failure to trigger emergency response measures.

Power failure: Gas detection systems with SMS alerts require a reliable power supply to operate. If there is a power failure, the system may not function properly, which could result in a failure to detect dangerous levels of gas or a failure to trigger emergency response measures.

Maintenance challenges: Gas detection systems with SMS alerts require regular maintenance to ensure that they are functioning properly. The added complexity of the SMS alert system could lead to additional maintenance challenges.

To ensure the effectiveness of a gas detection system with SMS alerts, it is important to properly install, calibrate, and maintain the system, and to regularly test the system to ensure that it is functioning properly. It is also important to have appropriate security measures in place to prevent unauthorized access to the SMS alert system. Finally, it is important to provide appropriate training to building occupants to ensure that they are aware of the system and how to use it properly, and to have backup systems in place in case of communication or power failures.

CHAPTER 3

AIM AND SCOPE OF PROJECT

3.1 Aim of Project:

The gas detection and door unlocking system is designed to address the potential danger posed by the presence of harmful gases in an environment. In many settings, such as industrial facilities or laboratories, there may be a risk of gas leaks that could pose a serious threat to individuals in the area.

The system aims to provide an early warning of any gas leaks by detecting the presence of these gases and triggering an alarm to alert people to the danger. Additionally, the system is designed to automatically unlock doors to allow for quick and safe evacuation in the event of a gas leak.

By doing so, the system helps to minimize the risk of harm or injury to individuals in the area, and to prevent damage to property. This can be especially important in settings where large numbers of people may be present, or where the potential consequences of a gas leak could be severe.

Overall, the aim of the gas detection and door unlocking system is to improve safety and reduce the risks associated with the presence of harmful gases in an environment.

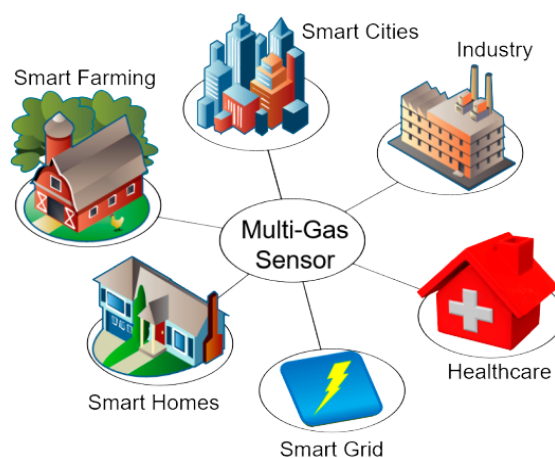


Fig 3.1: Aim of Project

3.2 Scope of the project:

The scope of the gas detection and door unlocking system project would involve several phases of development, starting with the design phase. This would involve selecting the appropriate gas detectors, evaluating their performance in the specific environment, and designing the software algorithms that will interpret the sensor data and trigger the alarm and door unlocking mechanisms.

Once the design is complete, the system will need to be installed and tested. This will involve the physical installation of the gas detectors, the door unlocking mechanism, and the software components of the system. The system will then need to be tested in a variety of scenarios to ensure that it is working effectively and accurately detecting gas leaks and triggering the appropriate response.

Other considerations that may fall within the scope of the project include regulatory compliance, such as ensuring that the system meets all relevant safety standards and regulations. Environmental factors, such as the temperature and humidity of the environment, may also need to be taken into account when designing and testing the system.

User requirements will also need to be considered, such as ensuring that the alarm and door unlocking mechanisms are clearly and easily understood by all users of the system. Additionally, ongoing maintenance and support will need to be provided to ensure the system continues to operate effectively and safely over time.

Overall, the scope of the project is to deliver a fully functional gas detection and door unlocking system that is tailored to the specific needs of the environment in which it will be deployed, meets all relevant safety and regulatory standards, and is effective in detecting gas leaks and facilitating quick and safe evacuation in the event of an emergency.

CHAPTER 4

SYSTEM DESIGN

4.1 Existing work:

Gas Leak Detection and Alarm System: This is a project that uses a gas sensor to detect the presence of gas leaks and alerts the user through an alarm system. It is commonly used in homes and industries to prevent gas-related accidents.

Wireless Gas Detection System: This is a project that uses wireless sensors to detect the presence of gas and transmit the data to a central monitoring system. It is commonly used in industries where gas leaks can cause serious damage.

Arduino Gas Sensor: This is a project that uses an Arduino board and gas sensor to detect the presence of gas and display the data on an LCD screen. It is commonly used in homes and small businesses.

IoT-Based Gas Detection and Monitoring System: This is a project that uses IoT technology to detect and monitor gas levels in real-time. It is commonly used in industries and homes to prevent gas-related accidents.

These are just a few examples of the existing gas detection projects. The field of gas detection is constantly evolving, and new projects are being developed all the time to improve gas detection accuracy and safety.



Fig 4.1: Gas leakage system and alarm system



Fig 4.2 : wireless gas detection system



Fig 4.3: Arduino gas detection system

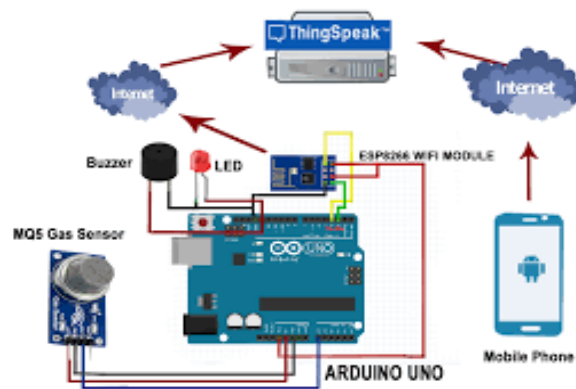


Fig 4.4: IOT based gas detection system

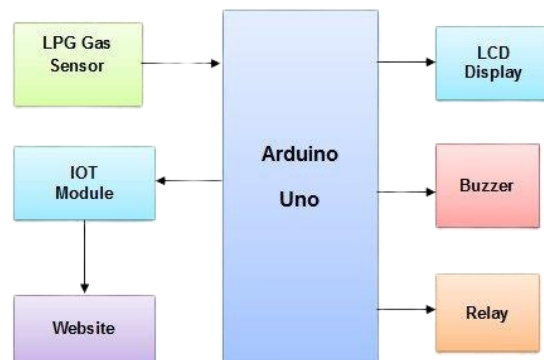


Fig 4.5: Block Diagram of Existing Work

4.2 Proposed work:

Design and development of the gas detection sensor: The first step would be to design and develop a gas detection sensor that can detect the presence of harmful gases in the environment. This can be done by using various sensors such as MQ-2, MQ-5, MQ-7, and MQ-9, which are commonly used for gas detection.

Integration of the gas sensor with a microcontroller: The next step would be to integrate the gas detection sensor with a microcontroller such as Arduino or Raspberry Pi. The microcontroller will receive the gas detection signal and analyze it to determine the presence and level of gas in the environment.

Development of a door locking system: The next step would be to develop a door locking system that can be controlled by the microcontroller. This can be done by using a servo motor or a solenoid lock that can be activated by the microcontroller.

Integration of the gas sensor and door locking system: The next step would be to integrate the gas sensor and door locking system so that when the gas sensor detects the presence of gas, the door locking system will automatically activate and lock the door to prevent people from entering the area.

Overall, the proposed work for a gas detection and door unlocking system involves designing and developing a gas detection sensor, integrating it with a microcontroller, developing a door locking system, and integrating the gas sensor and door locking system. This system can be used in various settings such as homes, laboratories, factories, and other industrial settings to ensure the safety and security of people.

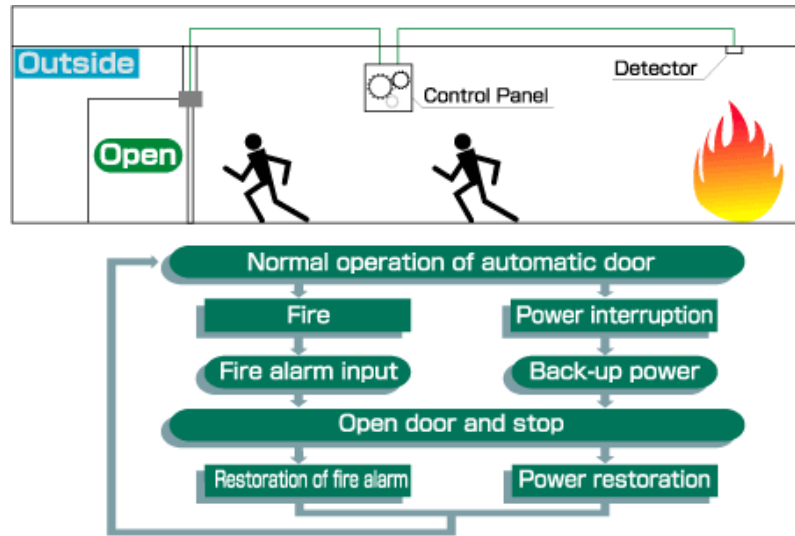


Fig 4.6: Gas detection and door unlocking system

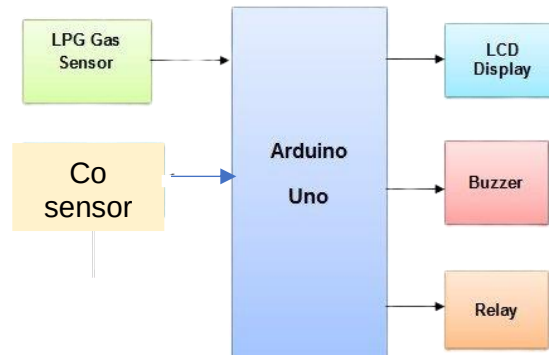


Fig 4.7: Block diagram of proposed work

4.3 Difference between existing and proposed work:

Existing models are designed with an alert system which helps us to get notified. Through IoT and Cloud computing lots of tech improvements are made. Live controlling system is still not in practice in most cases due to wiring problems. Here we have taken the existing wired system into a wireless proposed model. Due to wired control, this model is still facing a lot of failure rates during installation. Fire safety failure for the wired unit will be a biggest challenge, and heat issues will be the challenges in the existing method.

Our model is based on wireless technology that works in complete DC source. Here we

use AVR ATMEGA 328P for data testing and operation of servo motors. Using an Ethernet modem and Recent Arduino Nano 33 Inbuilt connectivity we can control the system with full wireless data.

Due to this the design fabrication will be reduced and the cost of the system will be more effective compared to the existing models. Still, we face one small problem in handling the battery monitor levels but we have a solution to charge the battery in our future model. Using Solar panels, we can power the entire SMPS system so that the whole system will be reliable and effective.

The main difference between the existing and proposed model is, in the existing model whenever the gas sensor detects the gas leakage the gas sensor sends information to the Arduino and Arduino process the information and activate the GSM module and sends a notification alert to the respective person. But whenever the person doesn't see the notification, this may lead to disaster.

So we proposed a new method that there is no involvement of a man power the doors and windows can automatically open whenever the gas is detected by gas sensor.

CHAPTER 5

REQUIREMENT ANALYSIS

A gas detection and automatic door unlocking system should be designed to ensure the safety of the occupants of a building in case of a gas leak. The gas detection system should be able to detect gas leaks in real-time, monitor the gas concentration level continuously, and alert the users immediately when a gas leak is detected. It should also be able to detect various types of gases like natural gas, LPG, carbon monoxide, etc., and have a high degree of sensitivity to detect even small gas leaks. The gas detection system should provide accurate and reliable readings and have a quick response time to minimize potential safety hazards.

The automatic door unlocking system should work in conjunction with the gas detection system to ensure safety. It should automatically unlock the door when a gas leak is detected, quickly and reliably in case of an emergency. The system should be easy to operate and maintain, and allow for manual override in case of a malfunction or false alarm. It should be compatible with the existing door locking system and equipped with a backup power source to ensure continuous operation.

Overall, the gas detection and automatic door unlocking system should be designed to ensure the safety of the occupants of the building in case of a gas leak. It should be reliable, accurate, and quick to respond to minimize potential hazards. It should also be easy to operate and maintain to ensure its continued functionality.

The total requirements for running an Arduino project will vary depending on the specific project you are working on. However, in general, you will need the following:

- An Arduino board - In this case, an Arduino Uno.
- A computer with the Arduino IDE installed - This is where you will write, compile, and upload your code to the Arduino board.
- USB cable - To connect the Arduino board to your computer for programming.

- Power supply - The Arduino Uno can be powered using a USB cable or an external power supply.
- Components and modules - Depending on your project, you may need various electronic components such as resistors, capacitors, sensors, LEDs, motors, etc.
- Breadboard - A breadboard is a tool for prototyping and testing circuits without the need for soldering.
- Jumper wires - These are used to connect components on the breadboard.
- Additional software libraries - As mentioned in the previous answer, you may need to install additional libraries in the Arduino IDE to use specific components or modules in your project.

5.1. HARDWARE REQUIREMNT:

Arduino:

Arduino Uno is a fantastic microcontroller board that's easy to use and perfect for beginners and experts alike. It has a ton of features packed into a small board, including 14 digital input/output pins (with 6 PWM outputs), 6 analog inputs, and a 16 MHz quartz crystal. It even has a USB connection and a reset button, making it super convenient to work with.

The best part about the Arduino Uno is how accessible it is. The Arduino software is free and open-source, which means anyone can download it and start programming their board right away. Plus, there are tons of tutorials and resources available online, so you're never alone in your learning journey.

One of the coolest things about the Arduino Uno is how versatile it is. You can connect it to all sorts of sensors, motors, and other electronic components, which makes it perfect for building interactive projects and prototypes. And if you need even more functionality, you can always add a shield to extend its capabilities.

Overall, the Arduino Uno is an amazing board that's perfect for anyone looking to get started with electronics and programming. It's easy to use, versatile.



Fig 5.1: Arduino

Gas sensors:

MQ 5 sensor:

The MQ-5 sensor is a gas sensor that can detect the presence of various types of flammable gases, including natural gas (methane) and LPG (propane and butane). The sensor works on the principle of gas adsorption, which means that the sensor detects the presence of gas by measuring the change in resistance of its sensing element when exposed to the gas.

The MQ-5 sensor has a small heating element that heats up the sensing element, which is typically made of tin dioxide (SnO_2). When the sensing element comes into contact with the target gas, the gas molecules are adsorbed onto its surface, which causes a change in its resistance. The change in resistance is then measured by the sensor's circuitry and converted into an output voltage that can be read by a microcontroller or other device.

The MQ-5 sensor is typically used in gas detectors, gas leak alarms, and other safety applications where the presence of flammable gases needs to be monitored. It is relatively inexpensive and widely available, making it a popular choice for hobbyists and professionals alike.

When using the MQ-5 sensor, it's important to calibrate it properly to ensure accurate readings. The sensor can also be affected by humidity and temperature, so it's important to take these factors into account when designing a system that uses the sensor.



Fig 5.2. MQ-5 gas sensor

MQ – 7 gas sensor:

The MQ-7 sensor is a gas sensor that can detect the presence of carbon monoxide (CO) gas in the air. It works on the principle of gas adsorption, similar to the MQ-5 sensor.

The MQ-7 sensor has a small heating element that heats up the sensing element, which is typically made of tin dioxide (SnO_2). When the sensing element comes into contact with carbon monoxide, the gas molecules are adsorbed onto its surface, which causes a change in its resistance. The change in resistance is then measured by the sensor's circuitry and converted into an output voltage that can be read by a microcontroller or other device.

The MQ-7 sensor is typically used in gas detectors, carbon monoxide alarms, and other safety applications where the presence of carbon monoxide needs to be monitored. It is relatively inexpensive and widely available, making it a popular choice for hobbyists and professionals alike. Like the MQ-5 sensor, it's important to calibrate the MQ-7 sensor properly to ensure accurate readings. The sensor can also be affected by humidity and temperature, so it's important to take these factors into account when designing a system that uses the sensor.

It's worth noting that the MQ-7 sensor is not suitable for detecting other gases, and it should only be used for detecting carbon monoxide. It's also important to keep in mind that carbon monoxide is a highly toxic gas that can be deadly if not detected, so proper precautions should be taken when using the MQ-7 sensor in safety-critical applications.



Fig 5.3. MQ – 7 gas sensor.

lcd display:

An LCD (liquid crystal display) display is a type of flat-panel display commonly used in electronic devices such as televisions, computer monitors, and smartphones. LCDs are lightweight, energy-efficient, and capable of displaying high-quality images with excellent color accuracy.

LCDs consist of several layers, including two polarizing filters, a liquid crystal layer, and a backlight. The liquid crystal layer is sandwiched between the two polarizing filters and changes the orientation of light passing through it when an electric current is applied. This allows specific pixels to be selectively activated or deactivated, resulting in the display of images or text on the screen.

There are many different types of LCD displays available, including TFT (thin-film transistor), IPS (in-plane switching), VA (vertical alignment), and more. Each type of LCD display has its own unique set of characteristics, such as viewing angle, response time, contrast ratio, and color gamut.

LCD displays are widely used in a variety of consumer electronics and industrial applications due to their low power consumption, high reliability, and excellent image quality.



Fig 5.4: lcd display

Servo motor:

A servo motor is a type of motor that is designed to provide precise control over the position, speed, and acceleration of a load. Servo motors are commonly used in a wide range of applications, such as robotics, CNC machines, industrial automation, and aerospace.

The basic components of a servo motor include a DC motor, a gear train, a control circuit, and a feedback mechanism. The feedback mechanism typically consists of a position sensor, such as an encoder or a potentiometer, which provides feedback to the control circuit about the position of the motor shaft.

The control circuit of a servo motor uses this feedback to adjust the motor's speed and direction of rotation, in order to maintain a precise position of the load. This allows for very precise and accurate control over the motion of the load, making servo motors ideal for applications where precise positioning is required.

Servo motors come in many different sizes and power ratings, ranging from small hobbyist motors to large industrial motors capable of handling heavy loads. They are often used in combination with other motion control components, such as stepper motors, linear actuators, and pneumatic cylinders, to create complex motion control systems.



Fig 5.5: SERVO MOTOR

Servo Motor Working Mechanism

It consists of three parts:

1. Controlled device
2. Output sensor
3. Feedback system

It is a closed-loop system where it uses a positive feedback system to control motion and the final position of the shaft. Here the device is controlled by a feedback signal generated by comparing output signal and reference input signal.

Relay

What is a relay?

A relay is an electromagnetic switch that is used to turn on and turn off a circuit by a low power signal, or where several circuits must be controlled by one signal.

Most of the high end industrial application devices have relays for their effective working. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.



FIG 5.6: RELAY MODULE

LED:

LED stands for Light Emitting Diode, which is a type of semiconductor device that emits light when an electric current is passed through it. LEDs have become increasingly popular as a lighting solution in recent years, replacing traditional incandescent and fluorescent bulbs in many applications.

There are several advantages of using LEDs over traditional lighting solutions. First, LEDs are more energy-efficient and last longer than incandescent and fluorescent bulbs. They use less energy to produce the same amount of light, making them more cost-effective in the long run. Additionally, LEDs do not contain harmful substances like mercury, which can be found in fluorescent bulbs.

LEDs also offer greater design flexibility than traditional lighting solutions. They can be made in a variety of shapes and sizes, allowing for unique and creative lighting designs. Additionally, LEDs can produce a range of colors, from warm white to cool white, and even RGB colors for mood lighting and color-changing effects.

LEDs are commonly used in a range of applications, including indoor and outdoor lighting, automotive lighting, backlighting for displays, and more. They can be found in everything from household light bulbs to streetlights and traffic lights.

When selecting an LED, it's important to consider several factors, including the color temperature, color rendering index (CRI), and lumen output. The color temperature refers to the perceived color of the light produced by the LED, ranging from warm white (around 2700K) to cool white (around 6500K). The CRI measures how accurately the LED renders colors compared to natural light, with a higher CRI indicating better color accuracy. The lumen output refers to the brightness of the LED, with higher lumen outputs producing brighter light.

Overall, LEDs are a versatile and energy-efficient lighting solution that offer numerous advantages over traditional lighting solutions.

As LED technology continues to advance, we can expect to see even more innovative and creative uses for this technology in the future.



Fig 5.7 led (light emitting diode)

Breadboard:

breadboard is a device used for prototyping electronic circuits. It allows electronic components to be easily connected together without the need for soldering. Breadboards are commonly used by hobbyists and students for experimenting with electronics, as well as by professional engineers for quickly testing and prototyping new circuit designs. Breadboards are made up of a grid of holes arranged in rows and columns, with each hole allowing a wire or electronic component lead to be inserted.

The rows of holes are typically connected together by a metal strip running underneath the board, allowing electrical connections to be made between components.

Breadboards come in various sizes and configurations, with larger breadboards offering more space for components and smaller breadboards being more portable and easier to store. Some breadboards also come with built-in power supplies and other features to make circuit prototyping even easier.

When using a breadboard, it's important to follow some basic guidelines to ensure that your circuit works as intended. For example, components should be placed in the correct orientation and inserted firmly into the breadboard holes. Additionally, wires should be trimmed to the correct length to avoid excess slack, which can lead to signal interference and other problems.

Overall, breadboards are an essential tool for anyone working with electronics, from the hobbyists to professionals. They provide a convenient and flexible way to prototype and test new circuit designs, allowing you to quickly iterate on your ideas and bring your electronic projects to life

5.2 Software Requirements:

Arduino IDE (Integrated Development Environment) is an important tool that can be used in the development of the gas detection and door unlocking system project.

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino IDE is a software tool that can be used to write, compile, and upload code to the Arduino board. It includes a code editor, a compiler, and a programmer, all in one package.

In the gas detection and door unlocking system project, Arduino boards can be used to control the hardware components of the system, such as the gas detectors, alarms, and door unlocking mechanism. The Arduino board can be programmed using the Arduino

IDE to read the sensor data, trigger the alarm and door unlocking mechanism, and perform other tasks required by the system. The Arduino IDE is easy to use and is supported by a large community of developers. It allows developers to write code in a simplified version of the C++ programming language and includes many pre-written libraries that can be used to control various hardware components.

Overall, the Arduino IDE is an important tool in the development of the gas detection and door unlocking system project, as it allows for the easy programming and control of the hardware components of the system

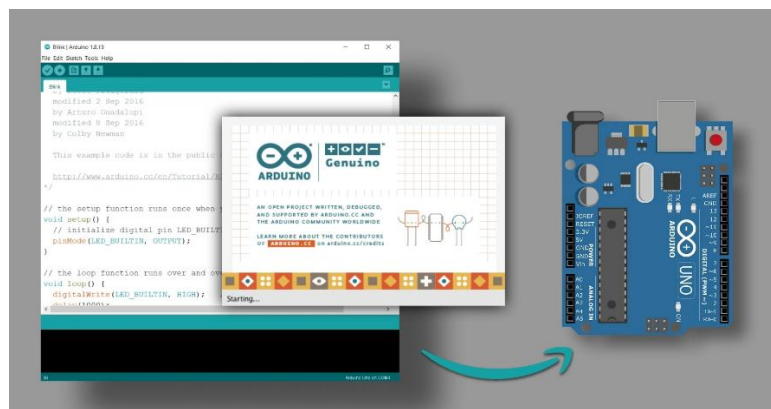


Fig 5.8: Arduino ide

5.3 Libraries required:

The specific libraries required for an Arduino Uno project will depend on the particular project you are working on. However, there are a few standard libraries that are commonly used in Arduino projects and are included with the Arduino IDE:

- Servo - This library allows you to control servo motors.
- LiquidCrystal - This library is used for controlling LCD displays.
- Wire - This library is used for I2C communication.
- SPI - This library is used for SPI communication.
- Adafruit NeoPixel - This library is used for controlling NeoPixel LED
- WiFi - This library is used for connecting to Wi-Fi networks.
- Ethernet - This library is used for connecting to Ethernet networks.

- SD - This library is used for reading and writing data to SD cards.

To install a library in the Arduino IDE, you can navigate to Sketch > Include Library > Manage Libraries and search for the library you want to install. Once you have installed a library, you can include it in your project by navigating to Sketch > Include Library and selecting the library from the list.

5.4 System Architecture:

The architecture of a gas detection and automatic door unlocking system for LPG and carbon monoxide (CO) sensors typically includes the following components:

LPG and CO Sensors: These sensors are used to detect the presence and concentration levels of LPG and CO gases in the environment.

Microcontroller: A microcontroller or microprocessor is used to receive and process data from the sensors. It also performs the necessary calculations and sends signals to activate the automatic door unlocking mechanism when the gas concentration levels exceed a certain threshold.

Wireless Communication Module: A wireless communication module is used to transmit the data from the microcontroller to a central control system.

Central Control System: The central control system receives data from the microcontroller and processes it to determine whether the gas concentration levels are safe or dangerous. If the gas concentration levels exceed a certain threshold it displays the level of gas concentration in an lcd display then, the central control system sends a signal to unlock the doors and windows, allowing for natural ventilation and preventing the buildup of dangerous levels of gas.

Automatic Door Unlocking Mechanism: An automatic door unlocking mechanism is used to unlock the doors and windows when the gas concentration levels exceed a certain threshold. The specific mechanism used will depend on the building's design and requirements.

Overall, the architecture of a gas detection and automatic door unlocking system for LPG and CO sensors is designed to provide an effective way to detect gas leaks and prevent the buildup of dangerous gas concentrations by allowing for natural ventilation. The specific implementation of the system will depend on the requirements and specifications of the building and the system design.

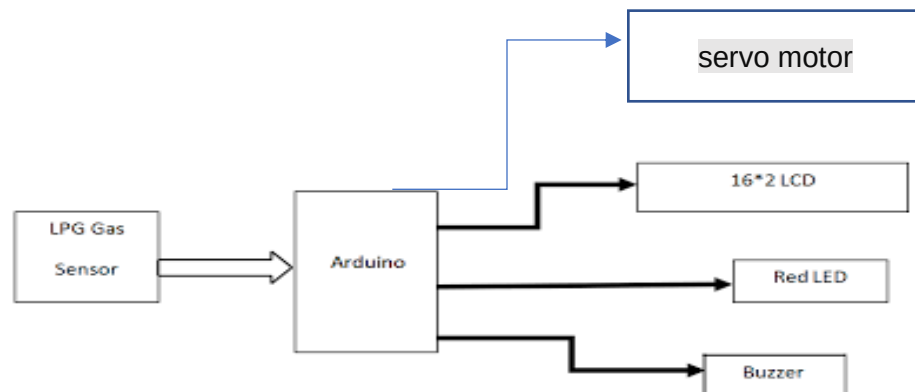


FIG 5.9: System Architecture.

CHAPTER 6

RESULTS AND DISCUSSION

6.1 Results:

The system provides a full overview of gas detection and door unlocking system which includes the carbon monoxide gas in it in a order to increase the security of lives.

Present

Technology is indeed to increase the life security of human beings. By our project we are proposing an idea to open a door as soon as possible if they were any kind of gas leakages

Without any interference of human beings. By following our proposed method the certain action can be taken immediately without any time lapse.

These results demonstrate that our project can be implemented at any work place and even not only in work place the project can also be implemented in the houses too. Since our project comprises of two sensors namely lpg (mq-5) sensor and carbon monoxide (mq-7) sensor it can increase the life security.

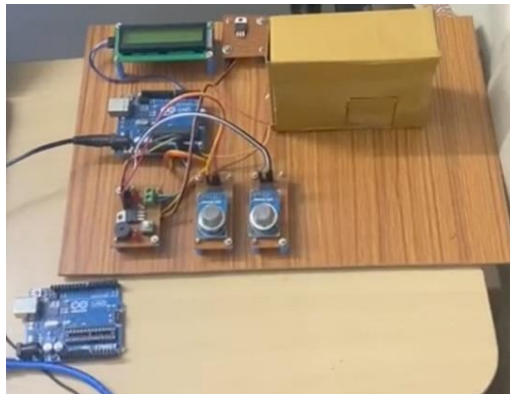


Fig 6.1: Before Gas Detection



Fig 6.2: After Gas Detection

6.2 Discussion:

A gas detection and door unlocking system is an interesting project that can be useful in various settings such as homes, laboratories, and industrial environments where there is a risk of gas leakage. Let's discuss some aspects of this project.

The first part of this project involves the gas detection system. The system should be designed to detect the presence of harmful gases such as carbon monoxide, methane, and propane, among others. There are different types of gas sensors available in the market that can be used for this purpose, including electrochemical sensors, infrared sensors, and catalytic sensors. The sensor should be able to detect even small concentrations of gas and send a signal to the microcontroller.

The microcontroller should be programmed to process the signals from the gas sensor and determine the level of gas concentration. If the concentration exceeds a certain threshold, the microcontroller should trigger an alarm to alert the occupants of the building. The alarm can be a sound or a visual signal, such as flashing lights.

The second part of the project involves the door unlocking system. The system should be designed to unlock the door automatically when the gas concentration exceeds the threshold level.

This can be achieved using an electromagnetic door lock that can be activated by the

microcontroller. The microcontroller should be connected to the door lock via a relay module.

When the gas concentration exceeds the threshold level, the microcontroller should activate the relay module, which, in turn, should trigger the door lock to open automatically. This will allow the occupants to exit the building quickly in case of a gas leak.

It's worth noting that this project requires careful planning and execution to ensure the safety of the occupants. It's important to choose high-quality sensors and components and to test the system thoroughly before deploying it. Additionally, it's recommended to include a manual override switch in case the automatic unlocking system fails to work.

In conclusion, a gas detection and door unlocking system can be a valuable addition to any building where there is a risk of gas leakage. With careful planning and execution, this project can be an effective way to enhance the safety of the occupants.

6.3 Advantages:

- The main objective of the functions is to improve the quality of life and convenience in the Home
- To Create greater security and more efficient use of Energy and Resources
- To build a strong security firewall to avoid the System from security and Hazard threats
- To reduce manpower and increase the use of the digital world
- To implement devices like that care of or Life (MQ-5) is an Example of Gas Leakage of our proposed system.
- To monitor the state of actions that happen around us. Get real-time alerts about the gaseous presence in the atmosphere
- Prevent fire hazards and explosions

- Supervise gas concentration levels
- Ensure worker's health
- Real-time updates about leakages
- Cost-effective installation
- Data analytics for improved decisions
- Measure oxygen level accuracy
- Get immediate gas leak alerts

6.4 Limitations:

False alarms: False alarms can be a major limitation of gas detection and door unlocking systems. These systems can generate false alarms due to environmental factors such as humidity or temperature changes or other gases present in the environment that the system is not designed to detect.

Limited detection range: Gas detection sensors may have limited detection range, which can limit the effectiveness of the system in large areas or when detecting gas leaks at a distance.

Maintenance requirements: Gas detection and door unlocking systems may require regular maintenance to ensure reliable operation. This can include replacing sensors or batteries, which can be time-consuming and costly.

Complexity: These systems can be complex and difficult to install, configure and use, requiring specialized technical knowledge and skills.

Cost: These systems can be expensive to purchase and install, particularly if they require specialized equipment or sensors.

Security vulnerabilities: Gas detection and door unlocking systems can be vulnerable to hacking or unauthorized access, which can compromise the safety and security of the building or occupants.

Power source: These systems require a reliable and stable power source, which can be a challenge in areas with frequent power outages or unstable power supply.

CHAPTER 7

SUMMARY AND CONCLUSION

By summarizing, the output of a Gas Detection and Door Unlocking System can vary depending on its design and functionality. The system may generate alerts or alarms and open the door when it detects the presence of harmful gases, such as carbon monoxide or natural gas, in the environment.

The output may also include information about the location of the gas leak and the severity of the situation. In addition, the system may unlock the doors automatically or send a signal to the user to unlock the doors manually in case of an emergency. The system's output may be displayed on a screen, or communicated through an audible or visual alarm.

Ultimately, the generated output of a Gas Detection and Door Unlocking System aims to provide timely and accurate information to help prevent accidents, save lives, and ensure the safety.

7.1 Future scope:

Gas detection and door unlocking systems are designed to ensure safety and security in various settings such as homes, offices, and industrial facilities. The future work of these systems involves the integration of new technologies and advancements to improve their functionality, reliability, and efficiency. Here are some potential areas of focus for future work in gas detection and door unlocking systems:

IoT Integration: The integration of the Internet of Things (IoT) technology can enhance the functionality of these systems by allowing them to communicate with other devices and systems, providing more detailed insights, and enabling remote monitoring and control.

Artificial Intelligence (AI) and Machine Learning (ML): The incorporation of AI and ML technology can enhance the accuracy and efficiency of these systems by enabling them

to learn and adapt to changing environments, recognize patterns, and make more informed decisions.

Mobile Applications: The development of mobile applications can enable users to monitor and control their gas detection and door unlocking systems from their smartphones, providing real-time updates and alerts.

Cloud Computing: The integration of cloud computing technology can provide secure storage, processing, and analysis of data collected by these systems, enabling more robust and intelligent monitoring and control.

Enhanced Security Features: The addition of advanced security features such as facial recognition, fingerprint recognition, and voice recognition can improve the security of door unlocking systems and prevent unauthorized access.

Environmental Monitoring: The integration of environmental sensors can enable gas detection systems to monitor and detect other harmful pollutants in addition to gas leaks, providing a more comprehensive approach to environmental monitoring and safety.

User Experience: The design and development of user-friendly interfaces can enhance the user experience and encourage wider adoption and use of these systems.

Overall, the future work of gas detection and door unlocking systems involves the incorporation of new technologies and advancements to improve their functionality, reliability, and efficiency, and to ensure the safety and security of people and environments.

7.2 Implementation issues:

Sensor accuracy: Gas sensors must be accurate and sensitive enough to detect dangerous levels of gas. The accuracy of gas sensors can be affected by environmental factors, such as temperature and humidity, as well as the presence of other gases. To ensure accurate gas detection, it is important to choose the right type of sensor and to calibrate it properly.

False alarms: False alarms can occur when the gas sensor detects gas that is not actually present. This can be caused by environmental factors or by malfunctioning equipment. False alarms can be a nuisance and can cause people to become complacent about real alarms. To minimize false alarms, it is important to properly maintain and test the equipment and to adjust the sensitivity of the sensor as needed.

Emergency response: In the event of a gas leak, it is important to have a plan for emergency response. This may involve automatically unlocking doors to allow people to exit the building, notifying emergency services, and sounding an alarm. The emergency response plan should be clearly documented and tested regularly to ensure that it is effective.

User privacy: The use of gas sensors raises concerns about privacy, as it involves the collection and storage of data about the environment and the occupants of the building. It is important to ensure that user privacy is protected by implementing appropriate data security measures, such as encryption and access controls.

Power supply: Gas detection and door unlocking systems require a reliable power supply to operate. In the event of a power outage, backup power sources may be necessary to ensure that the system continues to function. The backup power source should be tested regularly to ensure that it is functional and has enough capacity to power the system for an extended period of time.

REFERENCES

- [1] G. Bourhis, O. Horn, O. Habert, A. Pruski: An Autonomous Vehicle for People with Motor Disabilities, IEEE Robotics and Automation Magazine, Vol. 8, No. 1, March 2001, pp. 20 – 28.
- [2] J.M. Detriche, B. Lesigne: Robotic system MASTER, European Conference on the Advancements of Rehabilitation Technology, Maastricht, Pays-Bas, Holland, 05 – 08 Nov. 1990, pp. 12 – 15.
- [3] J.L. Jaffe: A Case Study: The Ultrasonic Head Controlled Wheelchair and Interface, OnCenter: Technology Transfer News, Vol. 1, No. 2, 1990.
- [4] N.I. Katevas, N.M. Sgouros, S.G. Tzafestas, G. Papakonstantinou , P. Beattie, J.M. Bishop, P. Tsanakas, D. Koutsouris: The Autonomous Mobile Robot SENARIO: A Sensor Aided Intelligent Navigation System for Powered Wheelchairs, IEEE Robotics
- [5] C.H. Kuo, H.H.W. Chen: Human-oriented Design Autonomous Navigation Assisted Robotic Wheelchair for Indoor Environments, IEEE International Conference on Mechatronics, Budapest, Hungary, 03 – 05 July 2006, pp. 230 – 235.
- [6] A. Landi: Update on Tetraplegia, Journal of Hand Surgery, Vol. 28, No. 3, June 2003, pp. 196– 204.
- [7] A.Lankenau, T. Rofer: A Versatile and Safe Mobility Assistant, IEEE Robotics and Automation Magazine, Vol. 8, No. 1, March 2001, pp. 29 – 37.
- [8] M. Mazo: An Integral System for Assisted Mobility (Automated Wheelchair), IEEE Robotics and Automation Magazine, Vol. 8, No. 1, March 2001, pp. 46 – 56.
- [9] H.A. Yanco: Wheellesley: A Robotic Wheelchair System: Indoor Navigation and User Interface, Lecture Notes in Artificial Intelligence, Vol. 1458, Assistive Technology and Artificial Intelligence, Applications in Robotics, User Interfaces and Natural Language Processing, Berlin, Springer, Germany, 1998, pp. 256 – 268.

A. SOURCE CODE

```
#include <EEPROM.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include <Servo.h>

Servo myservo;
LiquidCrystal_I2C lcd(0x27,16,2);

int redLed = 10;
int greenLed = 12;
int buzzer = 8;
int ServoMotor = 9;
int smokeA0 = A0;
int smokeA1 = A1;
int sensorThres1 = 500;
int sensorThres2 = 330;

void setup()
{
  pinMode(redLed, OUTPUT);
  pinMode(buzzer, OUTPUT);
  pinMode(smokeA0, INPUT);
  pinMode(smokeA1, INPUT);
  myservo.attach(ServoMotor);
  Serial.begin(9600);
  lcd.init();
  lcd.backlight();
  myservo.write(0);
}
```

```

void loop()
{
  int analogSensor1 = analogRead(smokeA0);
  int analogSensor2 = analogRead(smokeA1);
  Serial.print("Pin A0: ");
  Serial.println(analogSensor1);
  Serial.print("Pin A1: ");
  Serial.println(analogSensor2);
  lcd.setCursor(0,0);
  lcd.print("Smoke Level:");
  lcd.print(analogSensor1-450);
  lcd.setCursor(0,1);
  lcd.print("LPG Level:");
  lcd.print(analogSensor2-600);

  if ((analogSensor1-450 > sensorThres1) || (analogSensor2-600 >
sensorThres2))
  {
    digitalWrite(redLed, HIGH);
    lcd.setCursor(0, 0);
    lcd.print("Alert....!!! ");
    lcd.setCursor(0, 1);
    lcd.print(" ");
    digitalWrite(greenLed, LOW);
    tone(buzzer, 1000, 200);
    myservo.write(90);
  }

  else
  {

```

```
digitalWrite(redLed, LOW);  
digitalWrite(greenLed, HIGH);  
lcd.setCursor(0, 2);  
lcd.print(".....Normal.....");  
noTone(buzzer);  
myservo.write(0);  
}  
delay(500);  
lcd.clear();  
}
```

B. SCREEN SHOTS

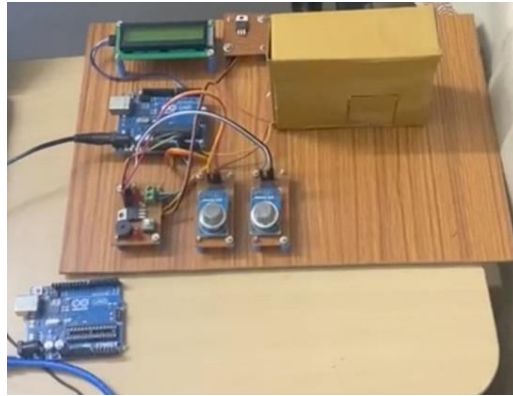


Fig: Before Gas Leakage



Fig: After Gas Leakage.

C. RESEARCH PAPER

GAS DETECTION AND AUTOMATIC DOOR UNLOCKING SYSTEM

K Lokesh Durga Prasad ¹, M V V Maneesh ², R M Joany ³
Department of Electronics and Communication Engineering,
Sathyabama Institute of Science and Technology,
Chennai, India
lokeshkalluri148@gmail.com

Abstract

A gas detection and automatic door unlocking system is a safety mechanism designed to detect hazardous gases in a specific area and activate an automatic response to prevent harm to individuals or property. The system typically includes a gas sensor, a control unit, and an automatic door locking/unlocking mechanism.

The gas sensor is responsible for detecting hazardous gases like carbon monoxide, methane, or hydrogen sulfide. Once the gas sensor detects the presence of such gases, it transmits a signal to the control unit which then triggers the automatic door unlocking mechanism.

The automatic door unlocking mechanism can be linked to the building's access control system, which manages access to the building or certain areas within it. When the gas detection system detects the presence of hazardous gases, it communicates with the access control system to unlock the doors in the affected area, enabling people to exit the building quickly and safely.

Gas detection and automatic door unlocking systems are typically installed in areas where hazardous gases are likely to be found, such as laboratories, chemical storage areas, or industrial facilities. The system can help to prevent severe accidents and ensure the safety of people and property in these areas.

Key-terms: hazardous gas , carbon monoxide , LPG , Arduino , Door unlocking.

households. However, they are considered hazardous because they can cause explosions if they build up in closed spaces. Over the years, there have been several incidents of explosions caused by these hazardous gases. The number of deaths caused by cooking gas cylinder and stove bursts in the state last year has been pegged as the second highest in the country, after Gujarat. The latest statistics of the National Crime Records Bureau (NCRB) show that 586 people died in Tamil Nadu because of the explosion of cooking gas cylinders. Whereas Gujarat registered 735 such deaths last year including one at the Glorietta and Shopping Complex in Ayala Center Makati in 2007, which was caused by methane, and another at an LPG refilling station in Pasig City in 2017. To address this issue, various studies have developed microcontroller-based systems that can detect and alert people to gas leaks. The system includes gas sensors, alarms, and a GSM module that sends SMS notifications to individuals. Overall, the goal of these studies is to prevent explosions caused by hazardous gases by detecting and alerting individuals to leaks in the air.

The paper is organized as follows: Section II explains the references we took , Section III explains the methodology materials and methods. Section IV discusses the data and results obtained from the testing. Finally, Section IV gives conclusion.

I. INTRODUCTION

Industrial gases have numerous applications, including manufacturing, electronics and semiconductor, food and beverage, and pharmaceuticals. These gases are also useful in

II. LITERATURE SURVEY

The survey conducted was focused on a dual home automation system that operates in real-time and has the ability to provide instant

feedback to control appliances. The system was tested both with and without an internet connection and was found to be reliable when integrated with various platforms using the ESP32 master firmware as the standard. The study was expanded to include multiple operating platforms such as Linux, Windows, and IOS. Through this survey, the researchers were able to improve their understanding of feedback mechanisms and their design, based on the findings of previous studies.

2.2.1 Satyendra K. Vishwakarma, Prashant Upadhyaya, Babita Kumari, and Arun Kumar Mishra, IJSR "Smart Energy Efficient Home Automation System Using IoT", IJSR Transaction on Computer Science Engineering 2021.

This paper describes a smart home automation system that uses IoT to control and manage home appliances remotely. The proposed system is designed to be energy-efficient and intelligent, and it uses a variety of technologies such as Node MCU, IFTTT, Adafruit, and Arduino IDE to create a multimodal system that can be controlled using Google Assistant and a web-based application. The main control unit is connected to a 24-hour Wi-Fi network and is programmed to automatically establish a connection with the network and connect to the auto power backup. Overall, the system aims to make the home automation process more efficient and convenient for users.

Pros: The target scaling factor is efficient throughout the multiple platforms switching 9

Cons: Slower transit cycles when compared CoAP, low scalability, and lack of security encryption.

2.2.2 Shardha Somani, Parikshit Solunke, Shaunak Oke, Parth Medhi. Prof. P. P. Laturkar, IEEE "IoT Based Smart Security and Home Automation", IEEE Transactions on Augmented Reality, 2021.

This paper describes a home automation system that uses IoT to make controlling home appliances easier, while also including a camera module for home security. The system includes an Android application that turns a smartphone into a remote control for all the appliances in the house. For security, the system uses motion sensors at the entrance of the house that send a notification containing a real-time photo of the entrance to the owner of the house if any movement is detected. This notification can be used to raise an alarm in case of an intrusion or

to toggle appliances, such as opening the door if the person is a guest. The system is powered by a Raspberry Pi, which acts as a server for the system. The smart home is divided into two modules: the home automation module, which includes a fan, light, and door controller, and the security module, which includes a smoke sensor, motion sensor, and camera module.

Pros: Implementation of IR Interface was an excellent Idea for creating universal remote.

Cons: The system Uses Infrared Radiation for data transfer which is much faster than CoAP but could be easily mapped with 38 kHz of regular frequency.

2.2.3 Tui-Yi Yang, Chu-Sing Yang, IJEEE "A Dynamic Distributed Energy Management Algorithm of Home Sensor Network for Home Automation System", IJEEE Transactions on Electrical and Electronics Engineers, 2017

This paper proposes an optimization of home power consumption based on PLC (Power Line Communication) for an easy-to-access home energy consumption. The paper also proposes a Zigbee and PLC-based renewable energy gateway to monitor the energy generation of renewable energies. The design incorporates ACS and DDEM algorithms for the intelligent distribution of power management systems to ensure ongoing power supply of home networks. To provide efficient power management, the power supply models of home sensor networks are classified into groups, namely main supply only, main supply and backup battery, rechargeable battery power, and non-rechargeable battery power, and devices with particular features are assigned to these groups. The paper aims to establish a real-time processing scheme to address variable sensor network topologies, thereby providing an effective approach to optimize home power consumption.

Pros: Fast and secured since the data encryption is 64bit ratio and it follows MQTT protocol

Cons: Does not support a large database size, and it has no support for ROLE, COMMIT.

2.2.4 Subramani Roy Choudri, A. Divija, G. V. V.N.Vijayalakshmi, P. Vamsi, JARTMS "TOUCH LESS HOME AUTOMATION USING AUGMENTED REALITY", JARTMS Transactions on Augmented Reality and Web Interface, 2021.

It is interesting to see how augmented reality (AR) can be used to automate home appliances. AR is a technology that overlays digital information onto the physical world, allowing users to see virtual objects in real-time. With the integration of AR, it can be possible to control home appliances by simply pointing a smartphone or tablet at them, and interacting with virtual buttons or menus. This can provide an intuitive and easy-to-use interface for home automation, and can also enhance the overall user experience. However, the implementation of AR-based home automation would require careful consideration of factors such as hardware compatibility, user experience design, and security concerns.

Pros: Target Image can be linked to the Virtual world

Cons: Target Image can be linked to automation with an augmented environment but in the case of wet hands, this linking process will not produce tokens to respective servers

2.2.5 Mikko Kytö^{1,2}, Barrett Ens², Thammathip Piumsomboon², Gun A. Lee², and Mark Billingham², Research Gate "Pinpointing: Precise Head- and Eye-Based Target Selection for Augmented Reality", Research Gate Transactions on Augmented Reality in Computer Science Engineering, 2018.

This paper explores the use of head and eye movements to enhance the interaction capabilities of wearable displays. Head movements are found to be accurate and deliberate, and are currently the state-of-the-art method for pointing on such displays. However, eye gaze has the potential to be faster and more ergonomic, though it suffers from low accuracy due to calibration errors and sensor drift. The paper investigates multimodal selection techniques using both head and eye movements, comparing their speed and pointing accuracy and discussing the benefits and limitations of each method. The paper also demonstrates several augmented reality applications that utilize these techniques, including deep-structured compact

menus and an online correction method for calibration drift.

Pros: Accuracy has reached 97% with a simple algorithm.

Cons: 97% precise and accurate but depends purely on real-time saturation and hue point of target images.

2.2.6 Jonathan J. Hull, Berna Erol, Jamey Graham, Qifa Ke, Hidenobu Kishi, Jorge Moraleda, Daniel G. Van Olst, Research Gate "Paper-Based Augmented Reality", Research Gate Transaction on Camera and Paper documentation, 2014.

The paper presents a new method for augmenting paper documents with electronic information, called Paper-Based Augmented Reality. This technique does not modify the format of the paper document in any way and is applicable to both commercially printed documents and documents output from PCs. The paper describes the recognition technology that enables this and several applications. The implementation on a camera phone is also discussed, which allows users to retrieve data and access links from paper documents to electronic data. The recognition is performed at 4 frames per second on a Treo 700w, and support is provided for several user applications, including "clickable paper," which is printed web pages that can be navigated with a camera phone while maintaining their appearance.

Pros: Augmented reality with virtual automation was brought to the physical world with the paper content

Cons: Linking patches of text will increase a lot of security reasons

III METHODOLOGY

Many existing models have an alert system to notify users through IoT and cloud computing, which has improved technology. However, live controlling systems are not widely implemented due to wiring problems. To address this, a proposed wireless model was developed as an alternative to existing wired systems. Despite this improvement, the wireless model still faces

challenges, such as high failure rates during installation. The biggest challenge for the wired unit remains fire safety failures, while the live parameter challenges in the existing system relate to heat issues.



PROPOSED WORK:

Our model is based on wireless technology that works in complete DC source. Here we use AVR ATMEGA 328P for data testing and operation of servo motors. Using an Ethernet modem and Recent Arduino Nano 33 Inbuilt connectivity we can control the system with full wireless data. Due to this the design fabrication will be reduced and the cost of the system will be more effective compared to the existing models.

Our model is based on wireless technology that works in a complete DC source. Here we use AVR ATMEGA 328P for data testing and operation of servo motors. Using an Ethernet modem and Recent Arduino Nano 33 Inbuilt connectivity we can control the system with full wireless data. Due to this, the design fabrication will be reduced and the cost of the system will be more effective compared to the existing models. Still, we face one small problem in handling the battery monitor levels but we have a solution to charge the battery in our future model. Using Solar.



IV CONCLUSION :

The gas leak detector described here has a number of advantages, including its simplicity and its ability to warn people about LPG gas leaks. The system has potential for further development, with plans to add a GSM module and a tripper circuit to improve efficiency and safety. The system also includes an audio-visual warning system, and is both easy to use and low cost. An additional benefit of the device is that, in the event of a gas leak occurring when nobody is home, the GSM module can send immediate messages to stakeholders to alert them to the problem, which can reduce the severity of any accidents. Furthermore, the GSM module adds to the safety of the system. Additionally, it is possible to implement automatic door opening control in real-time installations.

V REFERENCES :

- [1] A. Lankenau, T. Rofer: A Versatile and Safe Mobility Assistant, IEEE Robotics and Automation Magazine, Vol. 8, No. 1, March 2001, pp. 29 – 37.
- [2] A. Landi: Update on Tetraplegia, Journal of Hand Surgery, Vol. 28, No. 3, June 2003, pp. 196– 204.
- [3] C.H. Kuo, H.H.W. Chen: Human-oriented Design of Autonomous Navigation Assisted Robotic Wheelchair for Indoor Environments, IEEE International Conference on Mechatronics, Budapest, Hungary, 03 – 05 July 2006, pp. 230 – 235
- [4] G. Bourhis, O. Horn, O. Habert, A. Pruski: An Autonomous Vehicle for People with Motor Disabilities, IEEE Robotics and Automation Magazine, Vol. 8, No. 1, March 2001, pp. 20 – 28.
- [5] H.A. Yanco: Wheellesley: A Robotic Wheelchair System: Indoor Navigation and User Interface, Lecture Notes in Artificial Intelligence, Vol. 1458, Assistive Technology and Artificial Intelligence, Applications in Robotics, User Interfaces and Natural Language Processing, Berlin, Springer, Germany, 1998, pp. 256 – 268.
- [6] J.L. Jaffe: A Case Study: The Ultrasonic Head Controlled Wheelchair and Interface, OnCenter: Technology Transfer News, Vol. 1,

No. 2, 1990.

- [7] J.M. Detriche, B. Lesigne: Robotic system MASTER, European Conference on the Advancements of Rehabilitation Technology, Maastricht, Pays-Bas, Holland, 05 – 08 Nov. 1990, pp. 12 – 15.
- [8] M. Mazo: An Integral System for Assisted Mobility (Automated Wheelchair), IEEE Robotics and Automation Magazine, Vol. 8, No. 1, March 2001, pp. 46 – 56.
- [9] N.I. Katevas, N.M. Sgouros, S.G. Tzafestas,

G. Papakonstantinou, P. Beattie, J.M. Bishop, P. Tsanakas, D. Koutsouris: The Autonomous Mobile Robot SENARIO: A Sensor Aided Intelligent Navigation System for Powered Wheelchairs, IEEE Robotics and Automation Magazine, Vol. 4, No. 4, Dec. 1997, pp. 60 – 7

- [10] U. Cortés, C. Urdiales, R. Annicchiarico, C. Barrué, A.B. Martinez, C. Caltagirone: Assistive Wheelchair Navigation: A Cognitive View, Studies in Computational Intelligence: Advanced Computational Intelligence Paradigms in Healthcare – 1, Vol. 48, 2007.

