SMS Based Gas Leakage and Fire Detection Alert System

Noman Mazher[1], Maria Latif[2], Jazzba Asad[2], and Faiza Nawaz[2]

[1]Affiliation not available
[2]Department of Information Technology, University of Gujrat

July 14, 2022

Abstract

Safety is the foremost aspect in today"s world. In this world of technology, people need technology to help them in danger conditions. Gas leakage becomes a severe issue that results in many accidents which lead to mortal and monetary harm. It is need of hour to install the gas leakage detection systems on public places. This paper presents a system design that identifies the leakage of gas and warns the user about the situation by sending SMS on user"s phone with the help of GSM. Smart kitchen by means of IOT is aimed, created and verified. Our system has more features than existing systems because those were manual while our system is automatic and provides rapid reply and correct identification that can save many lives and prevents humans from many hazardous cases.

SMS Based Gas Leakage and Fire Detection Alert System

Maria Latif[2], Jazzba Asad[3], Faiza Nawaz[4], Noman Mazher
[2]*Department of Information Technology, University of Gujrat*
[3]*Department of Information Technology, University of Gujrat*
[4]*Department of Information Technology, University of Gujrat*
[1] *noman.mazher@gmail.com*
[2] *14241556-055@uog.edu.pk*
[3]*14241556-050@uog.edu.pk*
[4] *14241556-023@uog.edu.pk*

Abstract - Safety is the foremost aspect in today's world. In this world of technology, people need technology to help them in danger conditions. Gas leakage becomes a severe issue that results in many accidents which lead to mortal and monetary harm. It is need of hour to install the gas leakage detection systems on public places. This paper presents a system design that identifies the leakage of gas and warns the user about the situation by sending SMS on user's phone with the help of GSM. Smart kitchen by means of IOT is aimed, created and verified. Our system has more features than existing systems because those were manual while our system is automatic and provides rapid reply and correct identification that can save many lives and prevents humans from many hazardous cases.

Keywords: gas sensor; gas leakage detector; buzzer; microcontroller

I. INTRODUCTION

IOT has changed the living of human beings. It's a hot topic in the industry but not a fresh idea. It's a concept of network devices that can sense and gather data throughout the world around us with the help of sensors, and then share that data across the Internet where it can be processed and utilized for many interesting purposes. [1][2] Creating IOTs has put on much attractiveness over the past few years as it presents a new facet to the globe of technologies. [7]

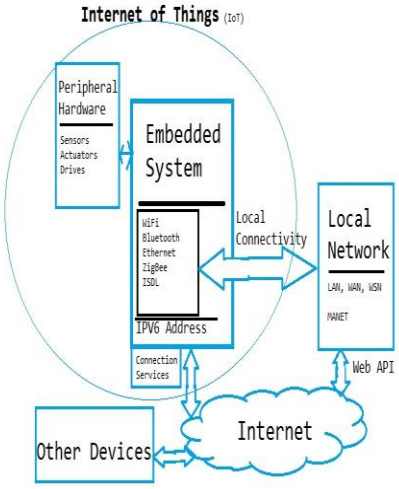

Figure 1: Working of IOT

The IOTs connect both living things and inanimate. It uses sensors for data collection, and also changes the kinds of objects that

communicate over the IP network. The physical items that are connected to each other have one or more sensors. Every sensor examines a particular situation such as position, vibration, movement, temperature. These sensors are connected to each other and to that system which understands the data and then presents that data in the form of information obtained from sensor's data feed and then gives the latest information on the company's system and people. [3]

Though, many people are familiar the term Smart Home. It is not smart because of its well construction, or it uses space effectively and not even because of its environmentally friendly feature**.** In fact, a home is smart because of interactive technologies it uses. Smart Home is defined as residence having many devices such as electronic, electrical, entertainment and many other systems and all these things have sensors due to which they have capability to commune with each other and remotely function by a person by means of time schedule, no matter wherever the person is, whether in the home or anywhere or any place of the world, by means of internet and mobile devices. [4] The benefits of Smart homes are that, they offer relief, protection, energy competence and ease of home proprietor at all times, even if someone is at home or not. In the development of upcoming housing-based representation of care, the idea of Smart Homes plays an imperative part. A lot of research groups such as MIT, Cisco, Xerox, IBM, Siemens, and Microsoft etc. are working in this field.

Smart kitchen quarter of the household appliance market grasp vast prospective, because the use of devices in the kitchen is more than any other area of the home that's why kitchen has enormous such devices which facilitate the work in kitchen. Also, a lot of people want to spend fewer times in cooking and also want their food to be quickly prepared, which is why people choose to purchase all those devices that help them in cooking and many other tasks in the kitchen. Smart kitchens reduce the expenditure, enhance the energy effectiveness, and guarantee the protection and health checking. [5]

People go in the kitchen for cooking on a regular basis. Natural gas is a kind of energy resource that is generally used in homes for cooking, and heating. But this energy resource can become hazardous if ever leakage happens in the gas cylinder. Several disasters took place due to gas leakage that consequence in monetary victims as well as mortal injuries. Our plan is to diminish the hazards in Kitchen using the Internet of Things. In this paper, we have given the solution to the problem stated. For this, we illustrated the design and implementation of SMS based gas leakage or fire detection and alert system. The work aim of scheming such system is to identify leakage of gas and then aware the person about this. The subscriber by means of alerts and status accumulated in the database and demonstrated on mobile screen in the form of SMS using GSM module, if the leakages of gas or fire happened. [6] This system not only alerts in the form of alarm but in fact, the main element of this system is to send SMS so that the person knows about the gas

leakage no matter where he is. Besides this feature of SMS, this system also provides many other protection features that are included with mechanization methods comprising of temperature, weight and gas sensors. [12] Through simulation, we will show the working of this system in this paper.

II. RELATED WORK

'Look dream Gas Leakage Detector 433mhz for Security Systems Wireless' [8] device is used for flammable gas. Whenever the density of gas attains and acts in response to the value of density that is set up according to the nearby atmosphere, then this device detects this and alerts by alarm as caveat status. After this sound, the density of this gas falls, and normally recommence on the manageable condition. Then, this obtains the counter density automatically from the one who set up this, send the manageable position and recommence in the same way. The alarm consists of three sign lamps showing colors of red, yellow, green which discretely show the following states:

1. Green Sign: This sign indicates the normal function of alarm and also that it is control status.
2. Red Sign: This sign shows the caveat status of alarm along with the chamber sound.
3. Yellow Sign: This sign indicates that alarm is not working properly and this is transducer problem.

A system 'Integrated remote control gas leakage detection and shut-off system' [9] identifies the detrimental leakage of gas and/or liquid and then cut off the gas and/or liquid leakage supply automatically. All the functionality of this system is electronically, means this is an electronic system. Whenever the detrimental gas and/or liquid leakage happens, this system identifies this situation electronically and then broadcast the information of this detrimental gas and/or liquid leakage as an electronic indicator, then obtain this electronic indicator and then cut off the gas and/or liquid leakage regulator by electronically starting the system which results in the blockage of gas and/or liquid leakage.

The aim of the device 'A wireless LPG leakage monitoring system' [10] is to identifies the LPG (liquefied petroleum gas) leakage and then through a SMS it aware the person (user) about this leakage and then robotically stoppage the delivery of power in the urgent disaster situation along with the staring of alarm. The supplementary feature of this system includes the constant examine of LPG intensity that is in gas cylinder, through load sensor and whenever the intensity of LPG attains the 2 kg limit that is a reduced amount than the threshold, it enables the person (user) to buy the new cylinder in appropriate time and it can robotically order it by GSM module. [11] This mechanism guarantees the protection and avoid from suffocation and detonation caused by leakage of LPG.

III. PROPSED SYSTEM

In this proposed system, we used Sensing Unit, Microcontroller, Buzzer, GSM Module, Alert Unit, and LCD Display.

1. **Sensing Unit:**
   In this system, we used three types of

sensors: Gas sensor, temperature sensor and weight sensor**.**

- **Gas Sensor:**
  Firstly, gas sensor is used in the system. We have chosen MQ2 gas sensor, which has the ability to sense the concentration of gas from 300ppm to 500ppm in the air. We have set 1000ppm as hazardous point.
- **Temperature Sensor:**
  The second sensor used in this system is temperature sensor that determines the temperature of kitchen. We have chosen LM35 heat sensor, which has the ability to sense fire and it can determine the temperature alteration from 55 °C to 150 °C. When temperature exceeds from this limit, then this signify the happening of fire. We have set 55 °C as fire blazing beginning point. [12]

- **Weight Sensor:**
  The third one is weight sensor, on which gas cylinder is positioned and it tells the load of cylinder.

These three sensors are highly sensitive and are directly attached to microcontroller and also being controlled by it.

2. **Microcontroller:**
   It is hardware based single chip that consists of CPU, memory, IO, timers and, serial and parallel ports. It is used to run a device that has program accumulated in the ROM and it doesn't alter the duration of system. We have chosen microcontroller of P1C16F1938 because it makes this system much easier and also the usage of microcontroller in such system lessen the cost.

3. **Buzzer:**
   It is an audio indicating machine and it is used for alarms, to alert people. For this system, we have chosen piezoelectric buzzer [11] that is determined by microcontroller indicators. It produces sounds whenever the unusual situation happens.

4. **GSM Module:**
   GSM module is connected to microcontroller with the help of MAX32 connector. It helps to connect the user with the internet. And it is used in such mobile phone applications where we have to transmit SMS or data to other mobile phone interface through GPRS feature. [11]

5. **Alert Unit:**
   The alert unit in this system is any mobile phone device to which SMS alert is send. We have proposed this system for alert reason. When the obtained readings from sensors goes above or below the limit that we have set, then this alerts the user with the help of SMS on the user's mobile device. This all works by application installed on user's phone. This

application is connected to microcontroller and it also gets signals through it.

6. **LCD:**
   LCD is connected with microcontroller and its role in the system is to only present the real time readings obtained from sensors.

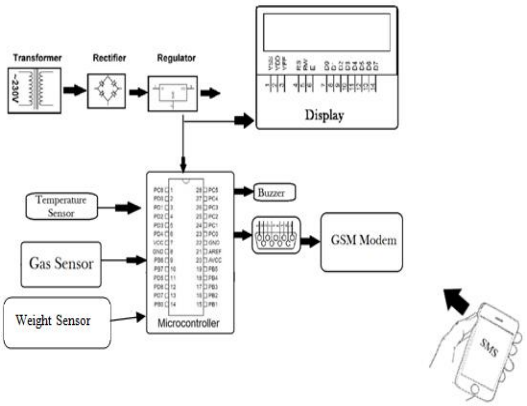

Figure 2: Circuit Diagram of the System

This system is basically based on three sensors. The microcontroller is constantly collecting data through these sensors in the form of analog packets. Then it performs data processing and changes the obtained readings into ppm and degree Celsius. The readings of changed data are presented on LCD. When the readings are above than the limit that we have set, then this system along with alarm sends the alert to the user in the form of SMS via GSM module on the number that is written in the source program. The working of this system can be better comprehended with the help of flowchart. Figure 3 explains the flowchart for the design of this system.

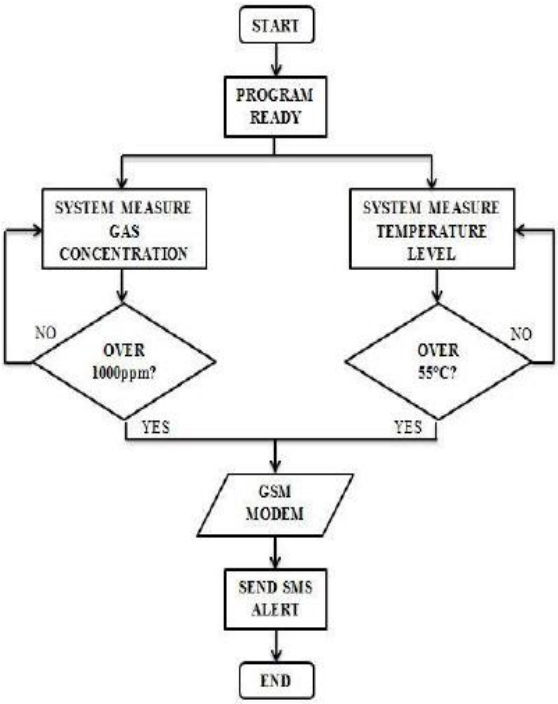

Figure 3: Flowchart of the System

IV. RESULT

We test the working of system by discharging gas in the air nearby sensor. Firstly, all the units of the systems were tested to ensure that they are in working state and are giving correct outputs.

The room temperature is 25 °C, but for testing we raised the temperature. Before releasing the gas, the gas sensor showed 0ppm and after discharging gas, the gas sensor showed the output of 267ppm on LCD display. The sensor sense the increase in gas concentration and send SMS message to user by using GSM module.

The SMS “GAS LEAKAGE” is send to user’s phone when the gas exceeds the set limit and SMS “GAS EMPTY” is send when the weight of gas is lower than the limit.

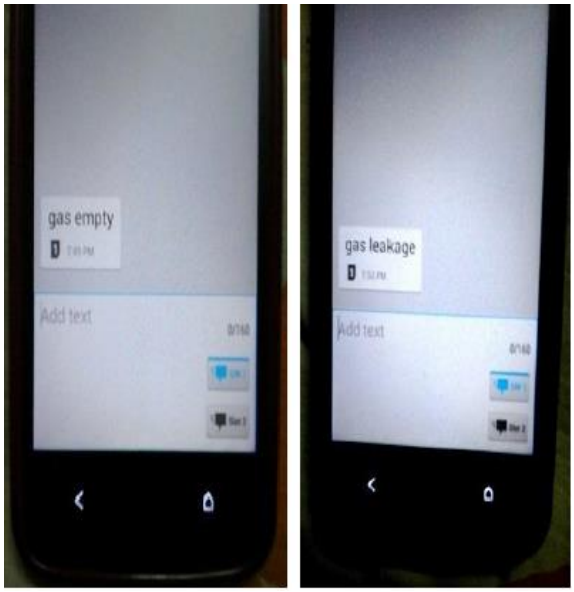

Figure 4: Message send to end user

V. CONCLUSION

Smart kitchen by means of IOT was aimed, created and successfully verified in this paper. Through simulation, we appraised the performance of system. This project is simulated using bluemix software. The outcome of the test demonstrates the ability of system to check the leakage of gas in the kitchen and send SMS alert to user's phone when the concentration of gas is above or below the set limit. Smart kitchen offers all the protection automation factors. The more work is coming in this domain. One more thing to add in these systems is battery power supply and to add many other methods for these systems to be more protective.

REFERENCES

1. M. Ahmadi and B. S. Ghahfarokhi, "Preserving privacy in location based mobile coupon systems using

anonymous authentication scheme," in *2016 13th International Iranian Society of Cryptology Conference on Information Security and Cryptology (ISCISC)*, 2016: IEEE, pp. 60-65.
2. M. Ahmadi, "Hidden fear: Evaluating the effectiveness of messages on social media," Arizona State University, 2020.
3. M. Ahmadi, K. Leach, R. Dougherty, S. Forrest, and W. Weimer, "Mimosa: Reducing malware analysis overhead with coverings," *arXiv preprint arXiv:2101.07328,* 2021.
4. M. Ahmadi, P. Kiaei, and N. Emamdoost, "SN4KE: Practical Mutation Testing at Binary Level," *arXiv preprint arXiv:2102.05709,* 2021.
5. P. Kiaei, C.-B. Breunesse, M. Ahmadi, P. Schaumont, and J. Van Woudenberg, "Rewrite to reinforce: Rewriting the binary to apply countermeasures against fault injection," in *2021 58th ACM/IEEE Design Automation Conference (DAC)*, 2021: IEEE, pp. 319-324.
6. M. Du, Z. Chen, C. Liu, R. Oak, and D. Song, "Lifelong anomaly detection through unlearning," in *Proceedings of the 2019 ACM SIGSAC Conference on Computer and Communications Security*, 2019, pp. 1283-1297.
7. H. Jain, R. Oak, and J. Bansal, "Towards Developing a Secure and Robust Solution for E-Voting using Blockchain," in *2019 International Conference on Nascent Technologies in Engineering (ICNTE)*, 2019: IEEE, pp. 1-6.
8. K. S. Jhala, R. Oak, and M. Khare, "Smart collaboration mechanism using blockchain technology," in *2018 5th IEEE International Conference on Cyber Security and Cloud Computing (CSCloud)/2018 4th IEEE International Conference on Edge Computing and Scalable Cloud (EdgeCom)*, 2018: IEEE, pp. 117-121.
9. M. Khare and R. Oak, "Real-Time distributed denial-of-service (DDoS) attack detection using decision trees for server performance maintenance," in *Performance Management of Integrated Systems and its Applications in Software Engineering*: Springer, 2020, pp. 1-9.
10. J. C. Newman and R. Oak, "Artificial Intelligence: Ethics in Practice," *login Usenix Mag.,* vol. 45, no. 1, 2020.
11. R. Oak, "A study of digital image segmentation techniques," *Int. J. Eng. Comput. Sci,* vol. 5, no. 12, pp. 19779-19783, 2016.
12. R. Oak, "Extractive techniques for automatic document summarization: a survey," *International Journal of Innovative Research in Computer and Communication Engineering,* vol. 4, no. 3, pp. 4158-4164, 2016.
13. R. Oak and M. Khare, "A novel architecture for continuous authentication using behavioural biometrics," in *2017 International Conference on Current Trends in Computer, Electrical, Electronics and Communication (CTCEEC)*, 2017: IEEE, pp. 767-771.
14. R. Oak, "A literature survey on authentication using Behavioural biometric techniques," *Intelligent Computing and Information and Communication,* pp. 173-181, 2018.
15. R. Oak, M. Khare, A. Gogate, and G. Vipra, "Dynamic Forms UI: Flexible and Portable Tool for easy UI Design," in *2018 Second International Conference on Inventive Communication and Computational Technologies (ICICCT)*, 2018: IEEE, pp. 1926-1931.
16. R. Oak, M. Du, D. Yan, H. Takawale, and I. Amit, "Malware detection on highly imbalanced data through sequence modeling," in *Proceedings of the 12th ACM Workshop on artificial intelligence and security*, 2019, pp. 37-48.
17. R. Oak, "Poster: Adversarial Examples for Hate Speech Classifiers," in *Proceedings of the 2019 ACM SIGSAC*

Conference on Computer and Communications Security, 2019, pp. 2621-2623.

18. R. Oak, C. Rahalkar, and D. Gujar, "Poster: Using generative adversarial networks for secure pseudorandom number generation," in *Proceedings of the 2019 ACM SIGSAC Conference on Computer and Communications Security*, 2019, pp. 2597-2599.
19. R. Oak, "The Fault in the Stars: Understanding the Underground Market of Amazon Reviews," *arXiv preprint arXiv:2102.04217,* 2021.
20. V. Sehwag, R. Oak, M. Chiang, and P. Mittal, "Time for a background check! uncovering the impact of background features on deep neural networks," *arXiv preprint arXiv:2006.14077,* 2020.
21. Mitchell Bradley. July 20, 2017. Introduction to the Internet of Things (IoT) https://www.lifewire.com/introductin-to-the-internet-of-things-817766
22. Kevin Ashton. July 20,2017. That 'Internet of Things' Thing http://kevinjashton.com/2009/06/22/the-internet-of-things/
23. Francisco San. july 20, 2017 "An Introduction to the Internet of Things (IoT)" http://www.cisco.com/c/dam/en_us/solutions/trends/iot/introduction_to_IoT_november. pdf
24. What is a Smart Home http://www.smarthomeusa.com/smarthome/
25. Hashimoto, A., Mori, N., Funatomi, T., Yamakata, Y., Kakusho, K., & Minoh, M. (2008). Smart kitchen: A user centric cooking support system. In *Proceedings of IPMU* (Vol. 8, pp. 848-854).
26. Mowad, M. A. E. L., Fathy, A., & Hafez, A. (2014). Smart home automated control system using android application and microcontroller. *International Journal of Scientific & Engineering Research*, *5*(5), 935-939.Internet of Things: Ubiquitous Home Control and Monitoring System using Android based Smart Phone
27. Jojo. December 23, 2016 Gas leakage detector using arduino and GSM module with SMS alert and sound alarm. http://wifigsmalarmsystems.com/gasleakagedetector.html
28. Diduck, V. J. (2000). *U.S. Patent No. 6,025,788*. Washington, DC: U.S. Patent and Trademark Office.
29. Apeh, S. T., Erameh, K. B., & Iruansi, U. (2014). Design and Development of Kitchen Gas Leakage Detection and Automatic Gas Shut off System. *Journal of Emerging Trends in Engineering and Applied Sciences (JETEAS)*, *5*(3), 222-228.
30. Naik, R. N., Reddy, P. S. N., Kishore, S. N., & Reddy, K. T. K. (2016). Arduino Based LPG gas Monitoring & Automatic Cylinder booking with Alert System. *IOSR Journal of Electronics and Communication Engineering (IOSRJECE). e-ISSN*, 2278-2834.
31. Muhammad Yahya, H. (2013). Gas Leakage And Fire Alert Warning System Via GSM.