Fire and Gas Leakage Detection Robotic System Using NI myRIO

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Abstract: **Fire and gas leakage detections are vital issues for all spheres of lives where precautions are very important. To ensure safety condition a system has been developed which is reliable in detecting fire and gas leakage. Here, we are designing a robotic system using the fire and gas sensor, speech recognition system which are connected with a NI myRIO hardware and LabVIEW. The aim of this project is to propose and discuss a design of gas leakage and fire detection system that can automatically detect, alert and notify the user about fire and gas leakage.**

Keywords: **NImyRIO, LabVIEW, Speech recognition.**

1. Introduction

Fire and gas leakage pose the risk of fatality for both civilians and firefighters. According to the recent survey of fatal accidents thousands of people experience fatal injuries due to fire operations. Besides the threats from fire and toxic gas, potential dangers like falling and explosions can also cause casualties to the rescue team, as the situation at scenes remains unknown. The prevalent method of detecting fire and gas leakage is installing detectors on the ceiling, but these detectors cannot display the details of the environment. Therefore, a robot is needed to serve as the pioneer to take videos, to detect the severity of fire and gas leakage, and to operate at a safe distance by firefighters.

Voice controlled robot is a mobile robot, where the motions can be controlled by user giving specific commands. For kids who are lost and old people who cannot dial numbers it will be very helpful they have to just give the command (like call mom or call Raju)

Now a days, there are places where robberies are happening frequently even though the house is completely locked, voice recognition security system can be developed, so that there will be reduction in this crime rate. It can also be used in toys for kids. A robotic arm is under development for the ones who lost their arms. Also, if used in large scale it is used to develop robots with military application. It can be used to target our enemy without crossing our border. Since there are many smart phones in markets it will have many more applications in the future. Therefore, we combined the concepts of voice recognition and gas sensor and fire sensors. This is one of the efficient solutions to the fire and gas accidents.

2. Literature Survey

"Robot control through voice recognition using LabVIEW": K. Manu Subhash, M. C. Chinnaaiah, I. B. S. N. Varma (2020).

The robotic moves according to the speech commands given and matched with the predefined commands stored in the voice recognition module. It is found that the voice recognition module consumed less memory as there are only a few commands stored in it. As speech is the input for the project, this can be used by any person with or without technical knowledge and make the use of the robot according to the needs. Use of LabVIEW makes this project compatible to any device and can be altered according to the requirement of the customer without much effort. Many industries, hospitals can be helped in large scale by bringing this out, as the motors we used will run with the help of battery or some small power supply, which can be taken as a reference. We ran some tests by adjusting the frequency to avoid minor disturbances and for its efficient working also time delay is given where it can be adjusted. Moreover, we also analysed the test result to rectify the problems and limitations in our approach. The project can be further improvised by adding IR Sensor which detects the obstacle presence (if any) and can be used to stop the robot.

"Voice Controlled Wheel Chair using LabVIEW": Vigneswaran's, Subbiah Srinivasan G. (2020).

In our day-to-day life many accidents are happening all-over the world. Quadriplegia, also known as Tetraplegia, is defined as paralysis caused by illness or injury to a human that result in the partial or total loss of use of all their limbs and torso. Those who are affected by this problem are taken care and given training to learn how to use wheel chairs. Our project mainly focuses on helping them to move around by using a Voice controlled wheel chair by just simply using voice commands. In this way it easier for them to move effortlessly. this project will make the victim independent of others for their mobility and at the same time controlling the Wheel chair using commands gives them an ease for controlling the same. Adding the feature of detecting the obstacle will improve the efficiency of the project.

"Voice Recognition Robot with Real Time Surveillance and Automation": Lochan Basyal, Sandeep Kaushal, Gurjeet Singh (2018).

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Voice recognition robot is a technology that deals with the operations based on predefined voice command. A real time obstacles detection and avoidance mechanism has been achieved by using ultrasonic sensor and also the concept of automation is demonstrated with the operation of lighting and horn mechanism of robot with voice command. This technique also be enhanced by applying surveillance camera with raspberry pi and broadcasting of real-time video through an internet and assessed by web server.

3. Methodology

A. Existing System

In the existing method, different gas sensing technology is used. Already there are some sorts of remedial measures such as when the leakage is detected, alert message. An android embedded system is proposed to detect fire and gas for safety purpose. But all these methods are stationary. There are many disadvantages due to stationary condition. To overcome this problem, we are designing a mobile robotic system to detect fire and gas leakage accidents.

B. Proposed System

The methodology of the fire and gas leakage detection robotic system using NI myRIO is described under the two sections. They are hardware section and software section.
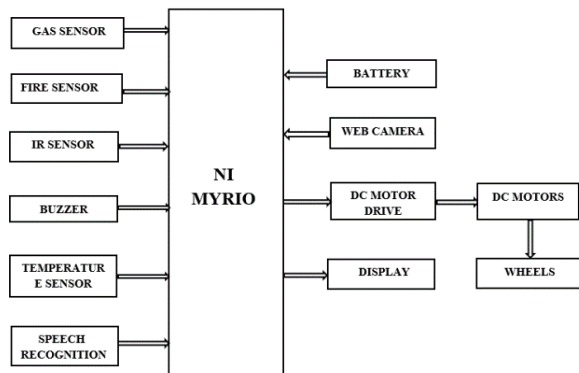

Fig. 1. Block diagram of fire and gas leakage detection robotic system using NI myRIO

4. Implementation

A. Software Section

The software part plays vital role in controlling the hardware according to the user commands, having the hardware alone cannot help in accomplishing the intended task. Such an imperative task is carried out with the aid of the application program developed using the NI LabVIEW software. The input to the robot is given by user's voice which is converted to commands using speech recognition system present in Windows OS, these commands are taken by the host program and writes to the shared variable between the host program and the code running on the NI myRIO. Using the Wi-Fi hosting capability of the NI myRIO, it has been possible for the host device to communicate wirelessly over a WLAN network. The code on the myRIO continuously monitors the value updates on the shared variable and executes the appropriate cases. The LabVIEW Integrated Development Environment consists of two windows-the front panel and the block diagram. Front panel is the window through which the user interacts with the program and the block diagram holds graphical source code of LabVIEW.
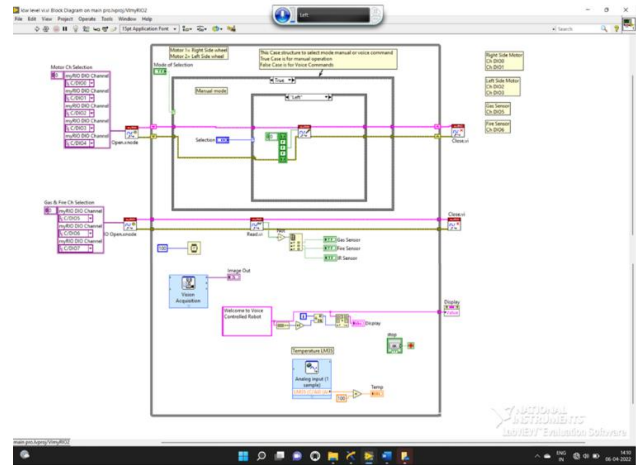

Fig. 2. Implementation of fire and gas leakage detection robotic system using LabVIEW
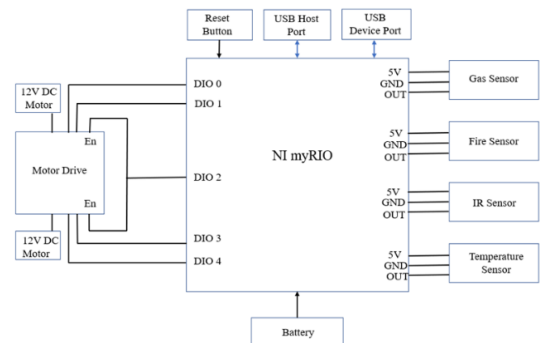
B. Hardware Section

Fig. 3. Interconnections of fire and gas leakage detection robotic system using NI myRIO

In the robotic system three sensors are used and conditions are given while programming for these sensors. In first and second step, a gas sensor, a fire sensor and an IR sensor are calibrated on the basis of their given reference value. The obstacles are detected using IR sensor. According to the third condition if the NI myRIO gets the sensor value more than the setup reference value then it will notify that gas or fire is present. And report will be displayed. The robotic moment is monitored through the voice commands given by the user.

5. Requirements

A. Software Requirements
- LabVIEW
- Windows speech recognition

B. Hardware Requirements
- NI MyRIO

- Gas sensor
- Fire sensor
- IR sensor
- Temperature sensor
- Power supply
- DC motor driver
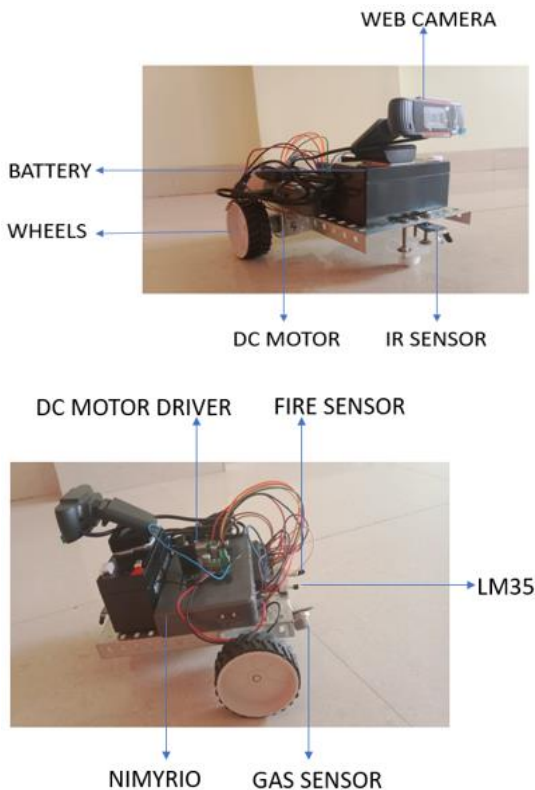- DC motor
- Wheels
- Buzzer
- Web Camera

Fig. 4. Proposed model of fire and gas leakage detection robotic system using NI MyRIO

6. Source Outcome

The Fire and gas leakage detection robotic system is designed using NI myRIO, Dc motor driver, Dc motors and battery. The movement of robotic system is controlled using a voice command.
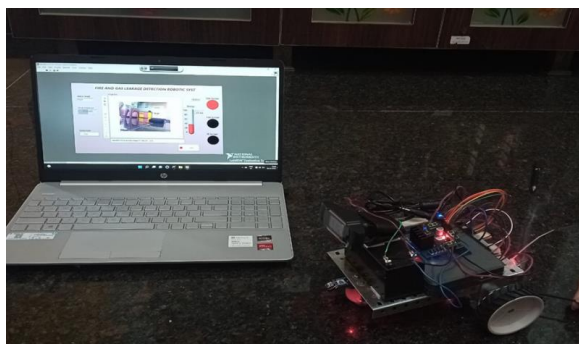

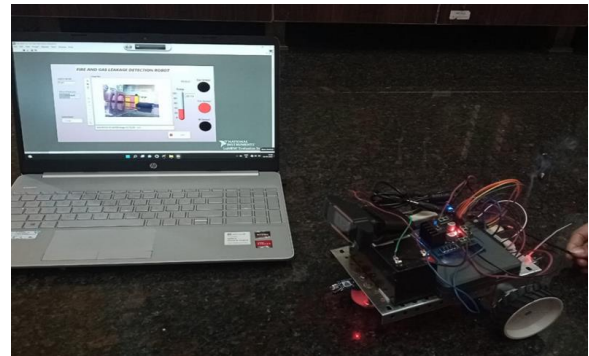Fig. 5. LED starts to glow when gas is detected

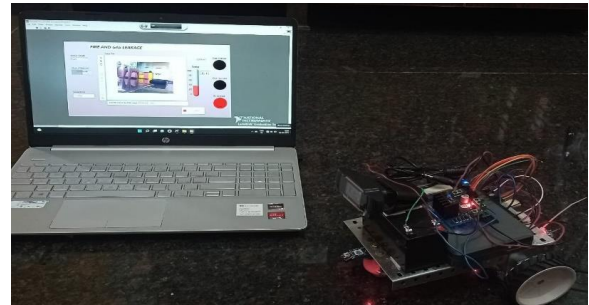Fig. 6. LED starts to glow when fire is detected

Fig. 6. LED starts to glow when obstacle is detected

7. Conclusion

The system is very useful, accurate and easy to install. The robot movement can be easily operated by voice commands given by the user hence it is user friendly. Due to lack of fire & LPG security system. Many people are suffering from fire and gas disasters in every year. This problem can be reduced by ensuring fire & gas security in different industries, hotels, hospitals and other public places, this system can help reducing losses of lives, livelihoods and properties.

A. Advantages

- Minimize the risk and consequences of an accidental event.
- Ensure a safe working for the personnel.
- It is possible to get instantaneous results with high accuracy.
- The system enables monitoring of gas leakages in remote locations.
- The system can easily operate by voice commands.

8. Future scope

- Future modification may include addition of GPS and GSM module for location detection and SMS alert systems.
- Instant fire controlling methods can also be installed like water sprinkling, sand buckets, fire blankets etc.

References

[1] Q. I. Sarhan, "Arduino Based Smart Home Warning System," 2020 IEEE 6th International Conference on Control Science and Systems Engineering (ICCSSE), 2020, pp. 201-206.
[2] A. Samiha, F. H. Sarker, R. N. K. Chowdhury, A. K. M. R. R. Habib and R. Rahman, "Ogrodut: GSM based Gas Leakage Detection and

Ventilation System using Arduino and Servo Motor," 2019 International Energy and Sustainability Conference (IESC), 2019, pp. 1-6.

[3] N. Andrews, S. Jacob, S. M. Thomas, S. Sukumar and R. K. Cherian, "Low-Cost Robotic Arm for differently abled using Voice Recognition," 2019 3rd International Conference on Trends in Electronics and Informatics (ICOEI), 2019, pp. 735-739.

[4] S. Patil, A. Abhigna, Arpitha, Deepthi and Priyanka, "Voice Controlled Robot Using Labview," 2018 International Conference on Design Innovations for 3Cs Compute Communicate Control (ICDI3C), 2018, pp. 80-83.

[5] R. I. Rashid, S. M. Rafid and A. Azad, "An Automated Fire Suppression Mechanism Controlled using an Arduino," 2018 IEEE Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER), 2018, pp. 49-54.

[6] Emad S. Othman, "Voice Controlled. Personal Assistant Using Raspberry Pi, International Journal of Scientific & Engineering Research, vol. 8, no. 11, pp. 1611-1615, 2017.

[7] M. Asadullah and K. Ullah, "Smart home automation system using Bluetooth technology," 2017 International Conference on Innovations in Electrical Engineering and Computational Technologies (ICIEECT), 2017, pp. 1-6.

[8] National Instruments "NI-myRIO project essentials guide".

[9] Ahuja, Nutan D. et al. "Computer controlled robotic arm." 16th IEEE Symposium Computer-Based Medical Systems, 2003. Proceedings. (2003): 361-366.