



System Controlled Embedded Robot for Security Applications using Zigbee

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Abstract — Nowadays we come across incidences of GAS leakages and instant FIRE catch up, and due to these incidents lots of human lives are lost. So to overcome and control this loss of humans in such calamities we have designed a robot which is loaded with four sensors viz , FIRE sensor, GAS sensor, PIR sensor and ultrasonic sound sensor. These sensors would check for and bio-hazardous gas leakages and fire possibilities. And the PIR sensor in this robot will check for presence of any living organism, if yes can be taken to a safe area from the affected area. The ultrasonic sound sensor would assist the robot in finding the obstacles in its way. There is also a mobile camera at the robot sight for live streaming of the sight. This robot is controlled wirelessly by the system (COMPUTER) and even the data of all four sensors is updated as per the demand of controller at the controller system.

Keywords- GAS leakage, robot, 4 sensors, camera, controller

I. INTRODUCTION

Our project deals with provided safety & security to places which mostly deal with dangerous substances such; bio-hazardous gases, and oil refineries, isolated area from humans etc. So the main objective is to reduce human risk in industries.

1.1 Motivation

We have taken the reference for this project from a topic named Web based embedded robot for safety & security applications using zigbee in the International Journal of Wireless & Mobile Networks (IJWMN), Vol. 4, No. 6, December 2012. We were really interested at first sight towards the project. Hence we made a few innovative changes in the above project & tried to make it even more interesting by our innovations.

1.2 Objective of Project

As we mentioned earlier our main objective for making this project is as far as possible minimize the human life risk. We can afford the loss of a machine or a robot in this project instead of loss of human life. Another objective is give a replica by this project for a large scale use of this project for defence purpose and security applications.

II. LITERATURE SURVEY

This project proposed an embedded system for safety and security purpose robot using zigbee communication. The robot has sensors for detecting Gas leakage and intruder detection. MQ6 Gas sensor detects the presence of bio hazardous gases like LPG, iso-butane, propane, LNG and alcohol, and the PIR sensor detects only the living organism (Intruder). The robot also has FIRE Sensor, & a proximity switch for detecting fire and the distance between obstacle. The sensor details are first sent to the microcontroller which resides at the robotic side and then sent to the local system through Zigbee. This robot also has a cell phone operated camera through an application called IP WEBCAM. The robotic movement is controlled remotely from the local system by using the front end application VB 6.0. The Zigbee (IEEE 802.15.4) ports a frequency range of 2.4GHZ, 9600 baud rate with 256Kb of flash memory. It supports the range of 400m in open-air, line-of sight, outdoor environment. This proposed system is used wherever people cannot go or where things doing too dangerous for humans to do safely. That is the robot can move and reach to the high destiny gas leakage region.

2.1 Existing System

The existing system that is the Web Based Robot For Security Using Zigbee has Two sensors viz. A PIR sensor for intruder detection and A MQ6 Gas sensor for detection of bio-hazardous gases on the robot side and they are controlled by a local system wirelessly using zigbee. There is also a wireless high quality Audio-Visual Camera at the robot which is connected to the local system using a TV tuner. The microcontroller used in the existing system is AT89C51. The robot

has four wheels for movement. All the robots are controlled using a driver circuit which consists of four relays, the combination of four relays is made as the movement of the robot is required.

2.2 Disadvantages in Existing System

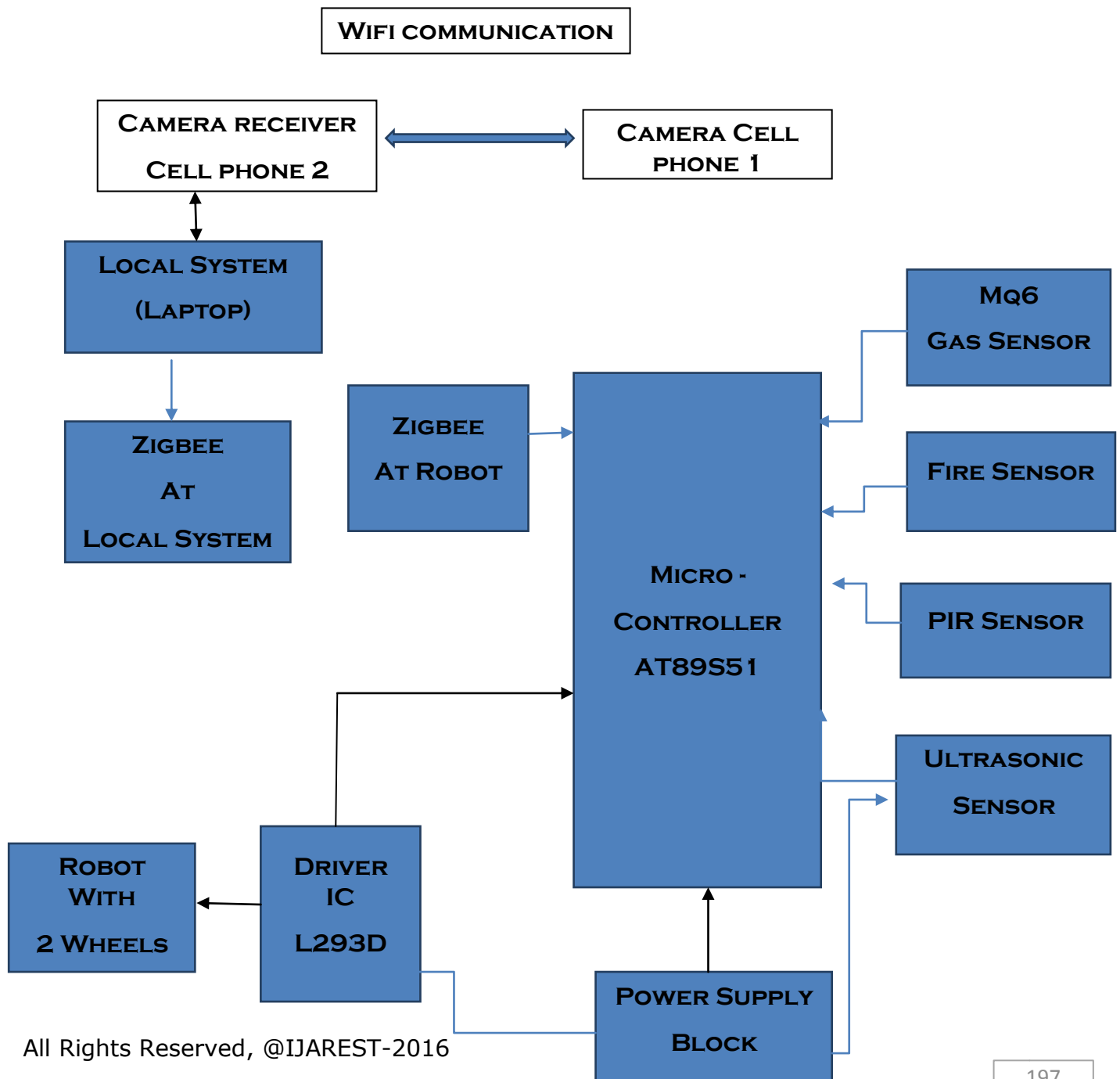
In the existing system the microcontroller used is AT89C51 which is not an ISP IC i.e. In System Programmable IC which means whenever we have to burn the IC we have to remove the IC from the PCB and then it can be programmed.

The use of relays for the driver circuit, is very complicated to use four relays and to check the combination of relays for robot movement.

The wireless Audio-Visual Camera which is used is very complicated as we need TV tuner to receive its signal, more importantly it is very costly.

2.3 Proposed System

In our modified project we are interfacing four sensors instead of two sensors. Here we are including the two sensors used in the existing system viz. PIR sensor MQ6 Gas sensor for the same purpose as in the existing system. And we have included two more sensors viz. Fire sensor for detection of fire and a Ultrasonic sensor for determining the distance between the robot and the obstacle. Instead of the AT89C51 microcontroller we have used the AT89S51 microcontroller as it is an In System Programmable IC and it supports serial as well as parallel transmission unlike the AT89C51. Instead of using the relays in the driver circuit to ease things out we are using a driver IC called L293D. Instead of using four motors we are using two motors and a caster wheel for a proper radius while turns. In place of the AV camera we are using cell phone operated camera controlled using IP WebCam.



There are 6 Major Blocks in the system, they are as follows:

1. **Microcontroller Block:**
It is the heart of the system. It comprises of the microcontroller AT89S51. This microcontroller is connected to various sensors, the driver block and the power supply block.
2. **Sensor Block:**
It comprises of the four sensors, the gas sensor, the PIR sensor, the fire sensor, the ultrasonic sensor. It is connected to the microcontroller on the robot sight. The information of these sensors is given to the microcontroller which is transferred to the local system through the zigbee module.
3. **Driver Block:**
It is connected to the microcontroller. It is used to controller the movement of the robot. It comprises of the IC L293D.
4. **Zigbee Module:**
It comprises of the two zigbee transceiver. One at the local system and one at the robot. It is used to transmit and receive data at both these places
5. **Local System:**
It is the laptop from which the robot is controlled. And the information taken continuously by the sensors is recorded and displayed at the local system. The local system is developed by a software either by Visual Basic 6.0 or C-Sharp.
6. **Camera Module:**
Two cell phones are connected through Wifi. The cell phone at the robot sends information through wifi to the cell phone at the local system.
7. **Power Supply:**
The power to the whole system is passed through this block..

2.4 Circuit Diagram Description

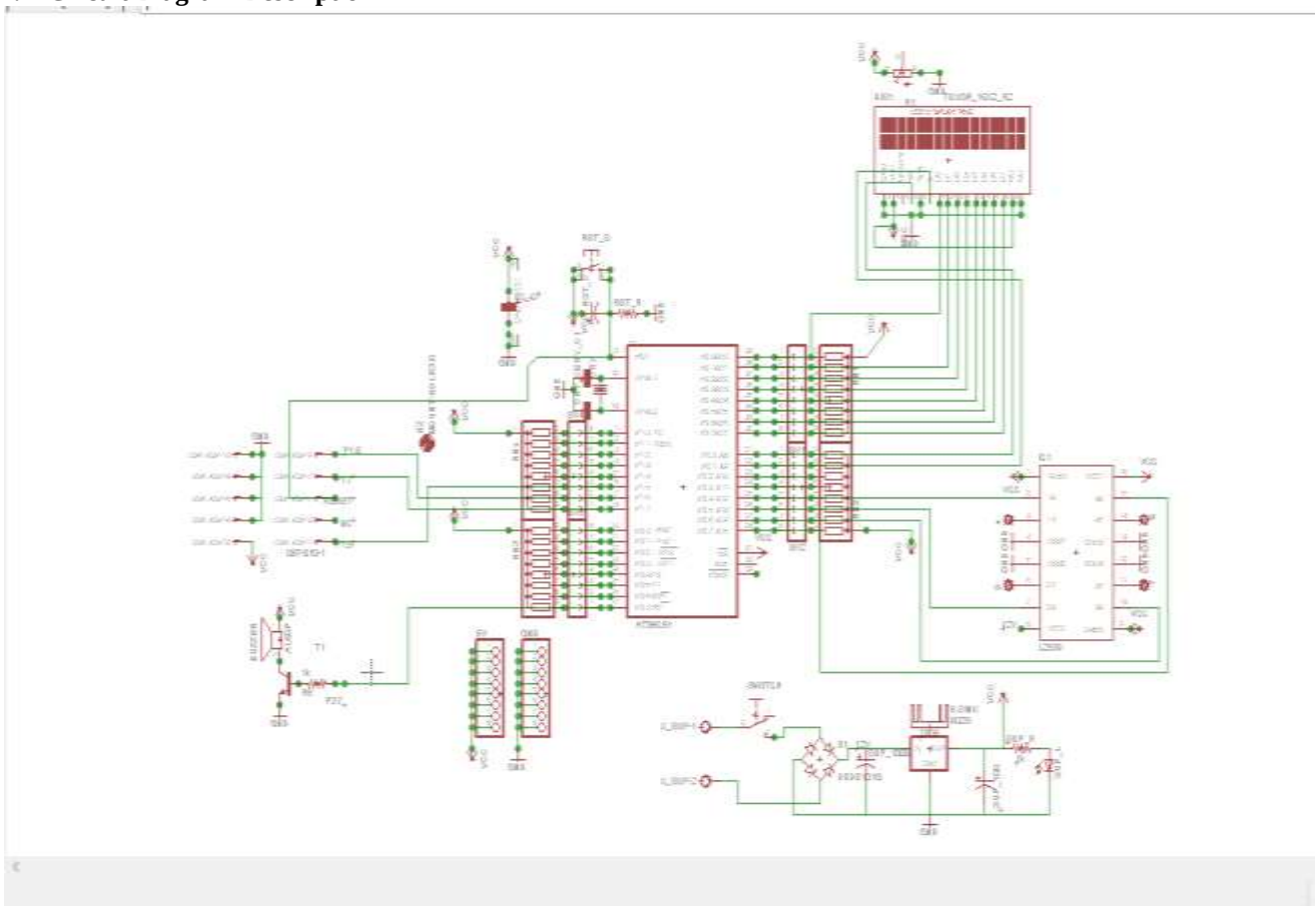


Fig 2 Circuit diagram

III. CONCLUSION

The proposed robot can be used in war field, mines, power station, military operations, industries, research and educational institutions and so on. And also be used wherever people cannot go or where things are too dangerous for humans to do safely. The Robotic movement is controlled remotely through the local system. The presence of bio hazardous gases like LPG iso-butane, propane, LNG and alcohol were detected through MQ6 Gas Sensor which is placed at the robot. Similarly the intruder (Human or Animal) entered into the room/ range is detected through the PIR sensor. The Fire sensor detects any chances of fire & the proximity switch detects the distance between the obstacle. The above four sensed parameters were sent to the local system through the zigbee communication which is presented at both the ends, that is at the robot and at the local system. And at the same time an audio and visual alarm is raised. The cell phone based camera is used for live streaming of the details on the site of robot. This system can be used where ever the safety and security are the major threat. In future this work may be enhanced and also zigbee-pro may be used to increase the communication distance between the Robot and with the local system.

REFERENCES

International Journal of Wireless & Mobile Networks (IJWMN), Vol. 4, No. 6, December 2012 (BASE PAPER)

- [1] V. Ramya, B. Palaniappan, and Subash Prasad, “ Embedded Controller for Radar based Robotic Security Monitoring and Alerting System”, International Journal of Computer Applications (IJCA), Volume 47-No. 23, June 2012.
- [2] V. Ramya, B. Palaniappan, K. Karthick and Subash Prasad “Embedded System for vehicle cabin toxic gas detection and alerting”, Journal of Elsevier Procedia Engineering, 30(2012).
- [3] V. Ramya, B. Palaniappan , “Embedded Technology for Vehicle cabin safety Monitoring and Alerting System”, International Journal of Computer Science Engineering and Applications, Volume 2-No.2, April 2012.
- [4] V. Ramya, B. Palaniappan , “Embedded system for Hazardous Gas detection and Alerting”, International Journal of Distributed and Parallel Systems (IJDPS) Vol.3, No.3, May 2012
- [5] Heng-Tze Cheng, Zheng, Pei Zhang, “Real-Time Imitative Robotic Arm Control for Home RobotApplications”, Carnegie Mellon University, IEEE, March 2011.
- [6] Hsian-I Lin, Yu-Cheng Liu, “Evaluation of Human-Robot Arm Movement Imitation”, Nat. Taipei university of Technol., Taipei, Taiwan, IEEE, May 2011.
- [7] M. Gao, F. Zhang, and J. Tian, “Environmental monitoring system with wireless mesh network based on embedded system,” in Proc. 5th IEEE Int. Symp. Embedded Computing, 2008, pp. 174-179.