VIRTUAL BLUE PRINTING ROBOT FOR INDOOR SURVELLIANCE IN COMBATTING URBAN

[1]NABAUDAY NATH, [2]SANDEEP KUMAR, [3]SWETHA

Electronics and Communication, Bharath Institute of Science and Technology, Chennai (India)

nathnabauday@gmail.com

luckysandy1310@gmail.com

ABSTRACT- The last decade has seen a worldwide increase in terrorism at a alarming scale. Though war and warfare have been a part of human life for centuries, terrorism is not warfare and hence there is a need to rethink the use of technology and tactics used in tackling terrorism. Also terrorism is no longer limited to mountains and forests, various events in the last few years have shown that terrorism is now a very urban problem, where innocent civilians are directly in the line of fire. Hence there is a need to create surveillance and weapon systems that can tackle urban terrorism. This project proposes the design and implementation of a robotic system that can be one of the solutions towards the above problem.

KEYWORDS- **Microcontroller, Odometer, Gas Sensor, Temperature Sensor, Wireless Camera, Motor Drives, Laser Module**

I.INTRODUCTION

The challenge with urban terrorism is that when terrorists or antisocial people or inside buildings like government buildings or public places like temples and hotels etc it becomes very difficult for the military personnel to do surveillance and to bring down the terrorist. This is because in a place like a building there could be hundreds of rooms and there can be many nook and corners where the terrorists can be hiding. Hence doing a thorough inspection of the place is required, which is both very dangerous and time taking. At the same time it requires great care because there is always a possibility of a civilian also being in any of the rooms. This project aims at constructing a robot that can do a very through scan of the whole building from corner to corner and while doing so prepare a virtual blue print of the building so that the security personnel can be absolutely sure that the whole place has been scanned and then they can take manual action wherever required. For the virtual blue printing the

Robot uses an interruption counter based odometer for calculating the distance covered in any direction.

Also the robot is equipped with additional features like obstacle sensors, fire sensors, poisonous gases sensors etc that can provide more detailed information to the security personnel about the place using which they can decide whether it is safe to enter the place or not.

The whole robotic process can be monitored and controlled from a remote display cum control system, where live video from the robot can be seen as well as information about all the other conditions can also be received in real time. Additionally a small weapon system can also be implemented on the robot, which can be triggered from the remote control system.

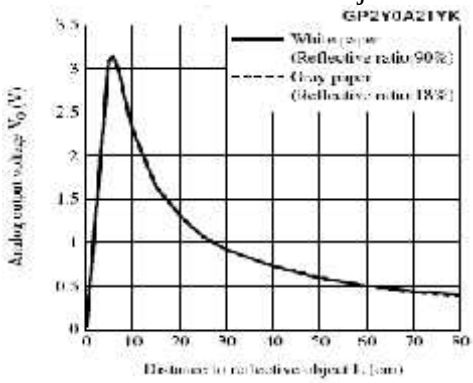
II. EXISTING SYSTEM

- In the existing system the whole building is being scanned in order to get the blue printing information of the combating urban.
- But the inside view and the real time condition detail is not obtained.
- In view of gathering the detail we need to send necessary squad inside, which is highly dangerous as they don't know regarding the circumstances, this may lead to loss of human resource.

III. PROPOSED SYSTEM

- The robot traces the distances between the walls (obstacle) and develops the virtual blue print of the room.
- Due to the presence of fire sensor and gas sensor in the Robot, it plays a fatal role in the time of fire accident or gaseous explosion and makes it a multi-functioning unit.
- The Robot can send all the necessary information of the war field to the control base station and can save a lot of human resources.
- We can treat it as a war field robot as we are able to operate it from a remote zone.

Fig1.Analog Output Voltage Vs Distance to Reflective Object



IV. HARDWARE REQUIREMENTS

1) **OPTO-INTERUPPTER**: It is the obstacle sensor, which calculates the distance between the module and obstacles. It consists of gallium arsenide infrared emitting diode coupled with silicon photo-transistor in a plastic housing. The gap between the housing calculates the number of interrupts by setting changing it from 'on' to 'off' state.

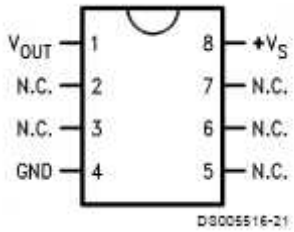
2) **SENSOR:**

- **Gas Sensor:** MQ5 is the gas sensor being used here due to its high

sensitivity to the various natural gases like LPG, methane, propane, butane, town gases as well as alcohol and other hazardous gases. It consists of micro AL2O3 ceramic tube, Tin Dioxide (SnO2) sensitive layer, which measures heat through electrode and heater are fixed into a stainless steel crust.

- **Temperature Sensor:** LM35, is a three terminal temperature sensor with operating range of -55 to 150^0c. As it draws only 60 µA from its power supply so it has very low self heating, less than1^0c in still air.

Fig 2. Pin Configuration



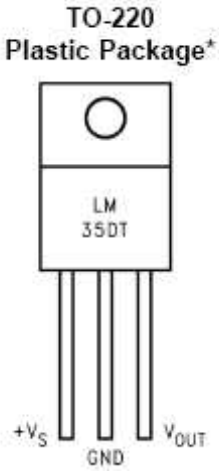


Fig3.-LM35DT

- **Odometer:** This sensor is used to detect the obstacles present on the path of the robot. GP2Y0A21YK has an optical transmitter and receiver. The rays transmitted get reflected from the obstacles and received by the receiver and hence by calculating the time, it sense the nearing obstacle. It operates at voltage range 4.5-5v.

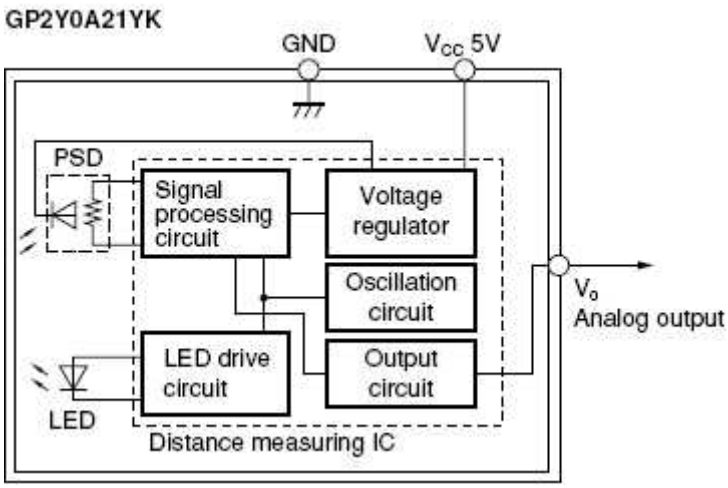


Fig4. INTERNAL BLOCK DIAGRAM

3) **Microcontroller: PIC18F45K22,** is a low power high performance Peripheral Interfacing Controller in Harvard Architecture with XLP Technology. It has 40 pins, in which 35 pins are used for peripheral interfacing and 5 pins are used for voltage regulation. It has four mode of operation. Mode A is used for sensor interfacing . Mode B is used for ICSP, Mode C is used for motor drives, where as Mode D for wireless transmission. Laser module is connected to the pin no 20.

4) **Motor Drives:** The robot movement is made by the Permanent Magnet mini DC motor. The stepper motor draws current of 110mA at voltage 5v dc gives 150 rpm. The motor has three modes of operation- front, back, left and right. The motor is turned right by logging 0 to the right stepper motor and allowing the left motor to rotate and while moving left vice versa.

5) **Photo Optical Interrupter:** The gaps between the opaque plastic housing calculates the number of rotation of the wheel and thus calculate the distance covered by the robot and executes this as blue printing.

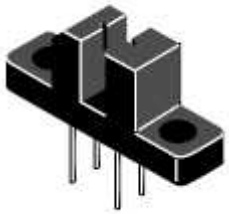


Fig 5. Photo Transistor Optical Interrupter Switch

6) **Wireless Camera:** Wireless camera is placed in the front of the robot so that we can get a clear video and audio in the control segment. Model number OV7670/OV7171 VGA camera is used which needs 9V power supply. The dimension of the video is 640x480 and is capture range is up to 50m. It gives a clear idea of the imbroglio of the area of operation.

7) **RF Transceiver:** The Robotics operations can be monitored from a remote base-station with the help of Zigbee transceiver placed in the robot as well as in the control segment. ZigBee uses the 2.4 GHz radio frequency to deliver a variety of reliable and easy-to-use standards anywhere in the world. ZigBee devices are often used in mesh network form to transmit data over longer distances. On a straight line of sight outdoor, it can operate upto 300m, whereas in indoor it can operate upto 100m.

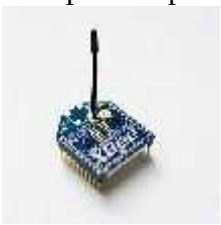


Fig6. ZigBEE ModulE

V. SOFTWARE REQUIREMENT

1) **MPLAB for microcontroller programming**: Microcontroller Programmers are all USB interfaced single socket universal or ISP programmers supporting different degree of devices. Super PRO 501S and Super PROIS01 are used as microcontroller programmer. In this we can simulate the program and we can get the final output.

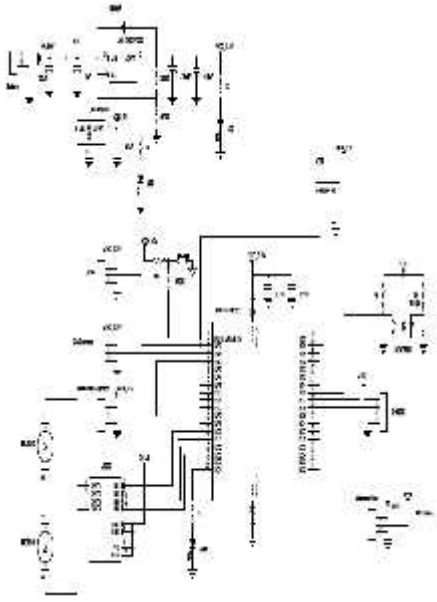
2) **VB for computer interface programming:** Visual basic is the third generation programming language and integrated development environment (IDE) launched by Microsoft for computer programming in 1991. Visual Basic provides a wide range of components to the programmer for application. It is also known as Macro or Scripting Language.

3) **Eagle for PCB Design:** It is a powerful and flexible software for PCB design offering high level functionality. It runs on Linux, Mac and Windows and allows feature enhancement for simulation. EAGLE (**E**asily **A**pplicable **G**raphical **L**ayout **E**dito r) is one such software created by the company called CADSOFT.

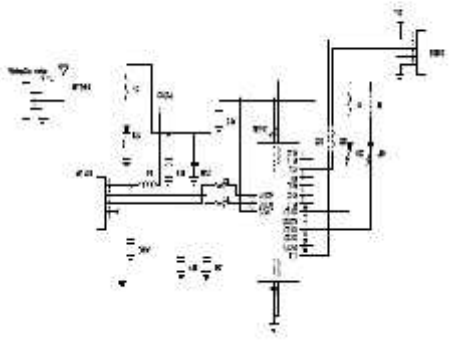
4) **OrCAD:** It is an Electronic Design Automation (EDA) that provides various tools for connecting electronic circuit design. OrCAD also supports simulation when provided. It was founded by John Durbetaki, Ken and Keith Seymour in 1985. It is the schematic design automation tool which supports an friendly environment for the electronic engineers and technicians to design the circuit.

VI. CIRCUIT DIAGRAM

A. ROBOT MODULE



B. CONTROL SECTION



VII. CONCLUSION

With the course of time there are lots of robots which are being used for human surveillance as per the need of the time. With the implementation of this robot concept in the field of defence will open a new era in the field of intelligent defence weapon. The use of this weapon in military service will save a lot of time and human resources. The further addition of sensor, firing module, smoke thrower, rocket launchers, etc is possible as we are using PIC microcontroller, we can interface a lot of peripherals.

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