HUMAN DETECTING ROBOT

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Abstract—

there are many different kind of catastrophe in natural and man-made disaster: earthquake, flooding, hurricane and they cause different disaster area like collapsed building, landslide or crater. During these emergency situations, and specially in urban disaster, many different people are deployed (policeman, fire fighters and medical assistance). They need to Co-operate to save lives, protect structural infrastructure, and evacuate victims to safety. In such situations, human rescuers must make quick decisions under stress, and try to get victims to safety often at their own risk. They must determine the location and status of victims and the stability of the structures as quickly as possible so that medics and firefighters can enter the disaster area and save victims. All of these tasks are performed mostly by human and trained dogs, often in very dangerous and risky situations. This is why since some years, mobile robots have been proposed to help them and to perform tasks that neither humans dogs nor existing tools can do. For this project, we will focus only on robots which will work in a disaster environment of man-made structure, like collapsed buildings.

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I. INTRODUCTION

An increasingly common requirement of computer systems is to extract information regarding the people present in an environment. As the sensor network and ubiquitous computing communities increasingly focus on creating environments that are seamlessly aware of and responsive to the humans that inhabit them, the need to sense people will become ever more pressing. Human-sensing encompasses issues from the lowest level instantaneous sensing challenges all the way to large-scale data mining. For example, we might ask of our sensors: Is there a person in this room? How many people are in this room? What is each person doing? What does each person need? The simplest applications of human sensing make direct use of such information to, for instance, open a door as people pass, turn lights on/off when a room is occupied/ empty, or lock a computer when the user moves away. However, looking further ahead in the future, human detection can be encompassed for higher and essential applications. Today, millions of people are affected by natural calamities like earthquake and landslides.

During these emergency situations, and specially in urban disaster, many different people are deployed (policeman, fire fighters and medical assistance). They need to Co-operate to save lives, protect structural infrastructure, and evacuate victims to safety. In such situations, human rescuers must make quick decisions under stress, and try to get victims to safety often at their own risk. They must determine the location and status of victims and the stability of the structures as quickly as possible so that medics and firefighters can enter the disaster area and save victims. So to reduce the risk of more human life we thought of building a robot that can be used for critical rescue operations of humans in occurrence of natural calamity. This mini project takes the first step towards achieving our objective. In a typical scenario, the robot will be deployed in the area of interest, perform sensory operations to collect evidence of a victim, and report the information to the rescue team. Wirelessly controlled through ZIGBEE (having a range of more than 40m) and accoutered with motion detector sensors, the robot will transfer a message to the operator instantly when motion is ascertained.

II. SYSTEM DESIGN

- The main elements of the robot are:

- 8051 Microcontroller Board.
- Motor Driver Board.
- PIR sensor modules
- Zigbee.
- Alarm Circuit
- LCD for display purpose

III. SYSTEM SCEMATIC AND SPECIFICATIONS

MICROCONTROLLER (Intel MCS-51):

The **Intel MCS-51** (commonly referred to as **8051**) is a Harvard Architecture, single chip microcontroller (µC) series which was developed by Intel in 1980 for use in embedded systems.

- Its important features are:
  - 8-bit ALU,8-bit data bus
  - 4 register banks
  - 128 bytes of on-chip RAM,4 Kbytes of on-chip ROM
  - UART(serial port)

All the important tasks are being performed by the micro-controller. First and foremost, it receives the data serially through the Zigbee module connected to it and accordingly directs the robot as wished by the operator.

Sr.No.	Command (letter transmitted)	Direction
1.	'W'	Forward
2.	'S'	Backward
3.	'A'	Turn Left
4.	'D'	Turn Right
5.	'Q'	Stop

Thus, the controller guides the motor driver to control the motion of the robot.

The next job to be performed by the controller is to monitor the status of the sensor. The output of the sensor is connected to one of the pins (P1.0) of the controller. The sensor output is digital in nature. Thus, it simplifies the work of controller, it will take the necessary action when its output is high.

The actions performed by it are as follows:

When PIR=1

- Alarm=1

  Alarm is connected to P1.1 pin of the micro-controller. Thus, when it receives output from the sensor it makes that particular pin high.

- Inform the operator

  As soon as motion is detected the controller will bring the operator to notice by wirelessly transferring a message to the him through zigbee.

- Display

  It will simultaneously display a message on the LCD fitted on the robot when the sensor senses a movement.

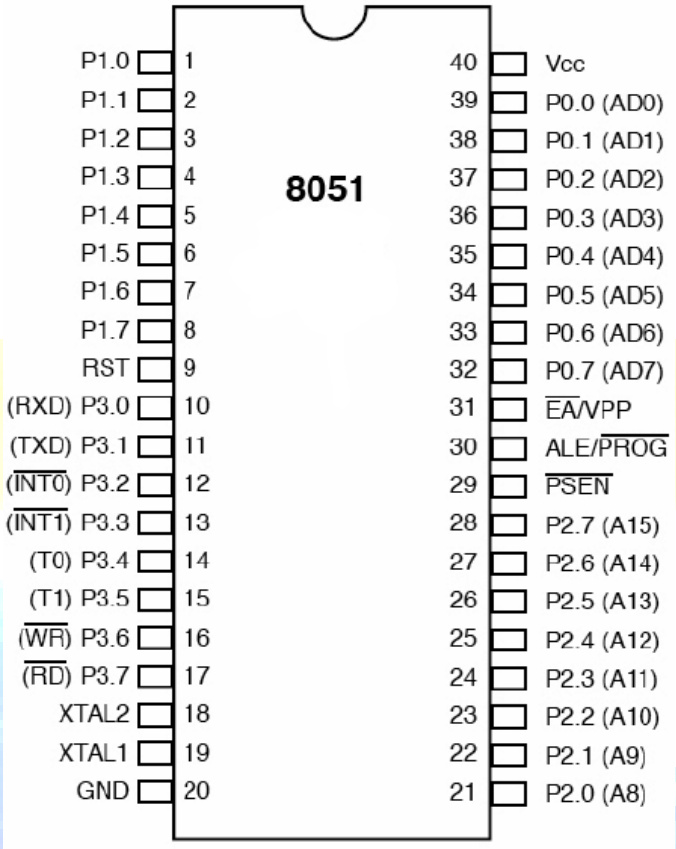
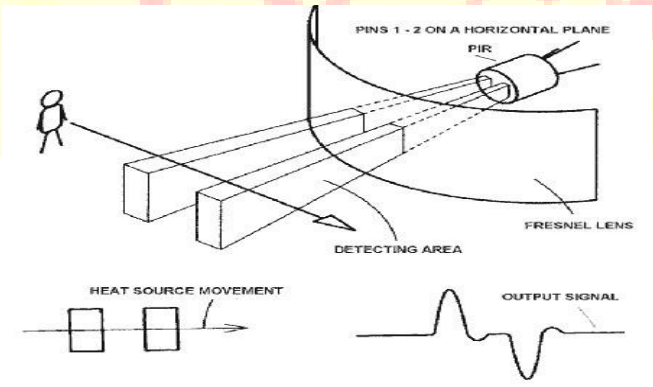


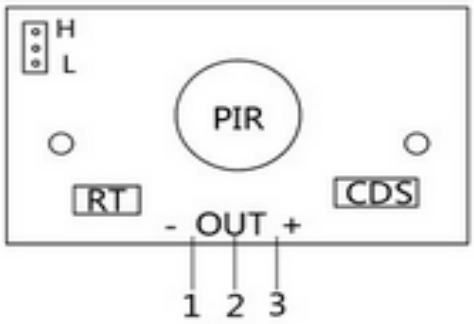
Fig: Pin Diagram of microcontroller 8051

PIR SENSOR:



The PIR sensor itself has two slots in it, each slot is made of a special material that is sensitive to IR. We see that the two slots can 'see' out past some distance (basically the sensitivity of the

sensor). When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors. When a warm body like a human or animal passes by, it first intercepts one half of the PIR sensor, which causes a positive differential change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. These change pulses are what is detected.



PIR sensor

Performance parameters**:**

- Supply Voltage: 4.8V to 20V
- Voltage Output High Level: 3.3V
- Maximum Detection Range: 3m to 5m
- Maximum Detection Angle: 100 degrees
- Delay Time: 5s to 200s
- Output: High and Low level (Digital)
- Quiescent Current: 50µA

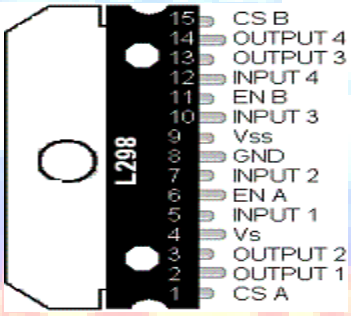
L298 MOTOR DRIVER**:**

- It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the input signals.

- The sourcing current of 8051 micro-controller is in a few tens milli amperes range which is a major reason that it cannot drive any DC motor. The requirement of a DC motor is few hundreds of milli amperes with no load condition.

- L298 is essentially a current amplifier, the function of which is to take a low-current control signal and turn it into a proportionally higher-current power source that can drive a motor.

- Hence, we need to use a motor driver which provide the required current to the motors for proper locomotion and simultaneously drive more than one motor(in this case two). It is available in two packages 15pin multi-watt and powerSO20 of which multi-watt package has been used. It has a total of 4 control inputs and 4 outputs which can be used to drive two motors at a time.



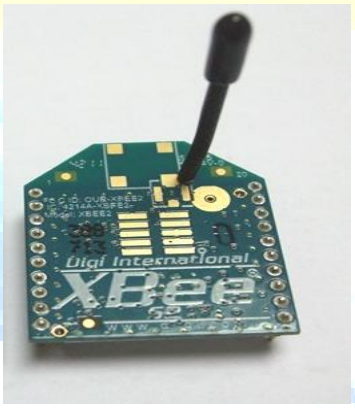
Pin diagram of L298

Performance Parameters:

- Power Supply (Vs):7.5V to 46V
- Logic Supply Voltage (Vss):4.5V to 7V
- Input Low Voltage:-0.3V to 1.5V
- Input High Voltage: 2.3V to 5V

ZIGBEE:

Zigbee is being used for the wireless data transmission between the robot and the operator. ZigBee is a standard that defines a set of communication protocols for low-data-rate short-range wireless networking. ZigBee-based wireless devices operate in 868 MHz, 915 MHz, and 2.4 GHz frequency bands. The maximum data rate is 250 K bits per second. ZigBee is targeted mainly for battery-powered applications where low data rate, low cost, and long battery life are main requirements.



Performance Parameters:

- Supply Voltage: 2.8 to 3.4V
- Operating Current(Transmit): 40mA(@3.3V)
- Operating Current(Receive): 40mA(@3.3V)
- Indoor/Urban Range: upto 40m
- Line of Sight Range: upto 120m
- RF Data Rate: 250 kbps
- Operating Frequency Band: ISM 2.4GHz

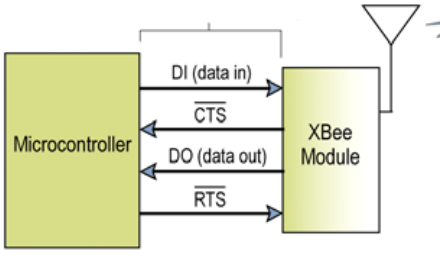
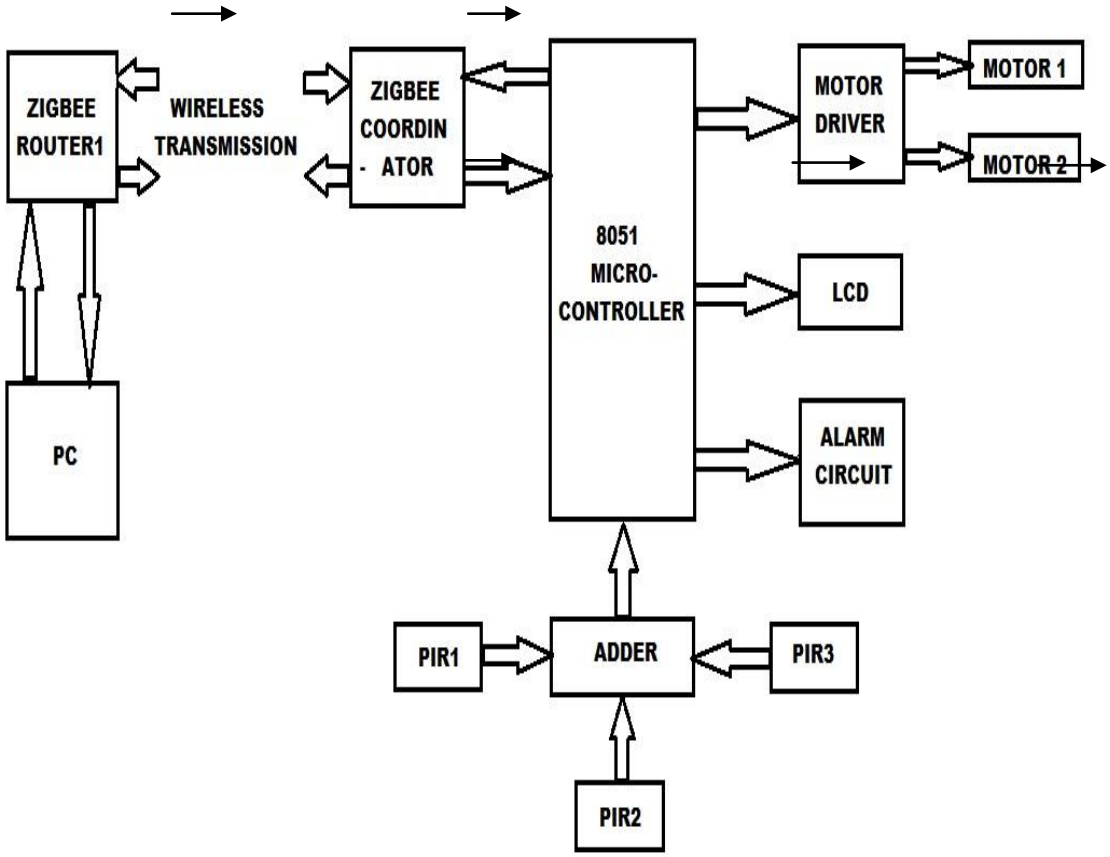


Fig: Interfacing Diagram of Zigbee.

IV. BLOCK DIAGRAM



V. ALGORITHM

1. Initialize all the input and output ports of micro-controller(LCD,Motor Driver).
2. Configure TMOD register in Timer 1/Mode2(Auto reloadable).
3. Set TH1=0xFD, so as to select baud rate as 9600.
4. Configure SCON register as Mode1(reception enable)(8bit data,1stop bit,1start bit).
5. Start the timer.
6. Initialize the LCD.
7. When receive interrupt flag is raised,compare the receive data as follow:-
    a. If data='W':move the bot forward.

b. If data='S':move the bot reverse.
c. If data='A':move the bot left.
d. If data='D':move the bot right.
e. If data='Q':to stop the bot.

8. Clear RI.
9. Check the status of PIR sensor. If PIR=1, send a message from bot to PC "HUMAN DETECTED".
10. Turn the alarm ON simultaneously display the message on LCD.
11. Turn the alarm ON simultaneously display the message on LCD.
12. Turn the alarm OFF.
13. Clear display screen.
14. Clear TI..
15. Goto step 7.

VI. REFERENCES:

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