

ELECTRONIC WORKSHOP LAB

MINI PROJECT REPORT

[6TH SEMESTER,SESSION 2019-2020,ECP310]

Department of Electronics and Communication Engineering

Topic : Obstacle detection with fire alarm

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INTRODUCTION

- OVERVIEW OF PROJECT

THE FUNCTION OF THIS MINI PROJECT IS TO SURVEY A COMFINED AREA WITH FIXED OBSTACLES THOROUGHLY AND CHECK FOR FIRE DAMAGES. ONCE IT DETECTS FIRE THROUGH THE FLAME SENSOR ITS BUZZER GOES 'ON' AND PEOPLE ARE ALERTED. IT SURVEYS THE ROOM IN A ZIGZAG PATTERN TAKING INTO CONSIDERATION DIFFERENT OBSTACLE CONSITIONS. THIS PROJECT IS CONDUCTED WITH THE HELP OF ATMEGA 328P.

• PROBLEM SOLVING CAPABILITY

CONFINED AREAS CAN BE CONTINUOUSLY MONITERED WITHOUT NEEDING THE EFFORT OF AN INDIVIDUAL , THUS SAVING RESOURCES AND ALSO PROVIDING MORE THOROUGH OBSERVATION OF THE GIVEN AREA .

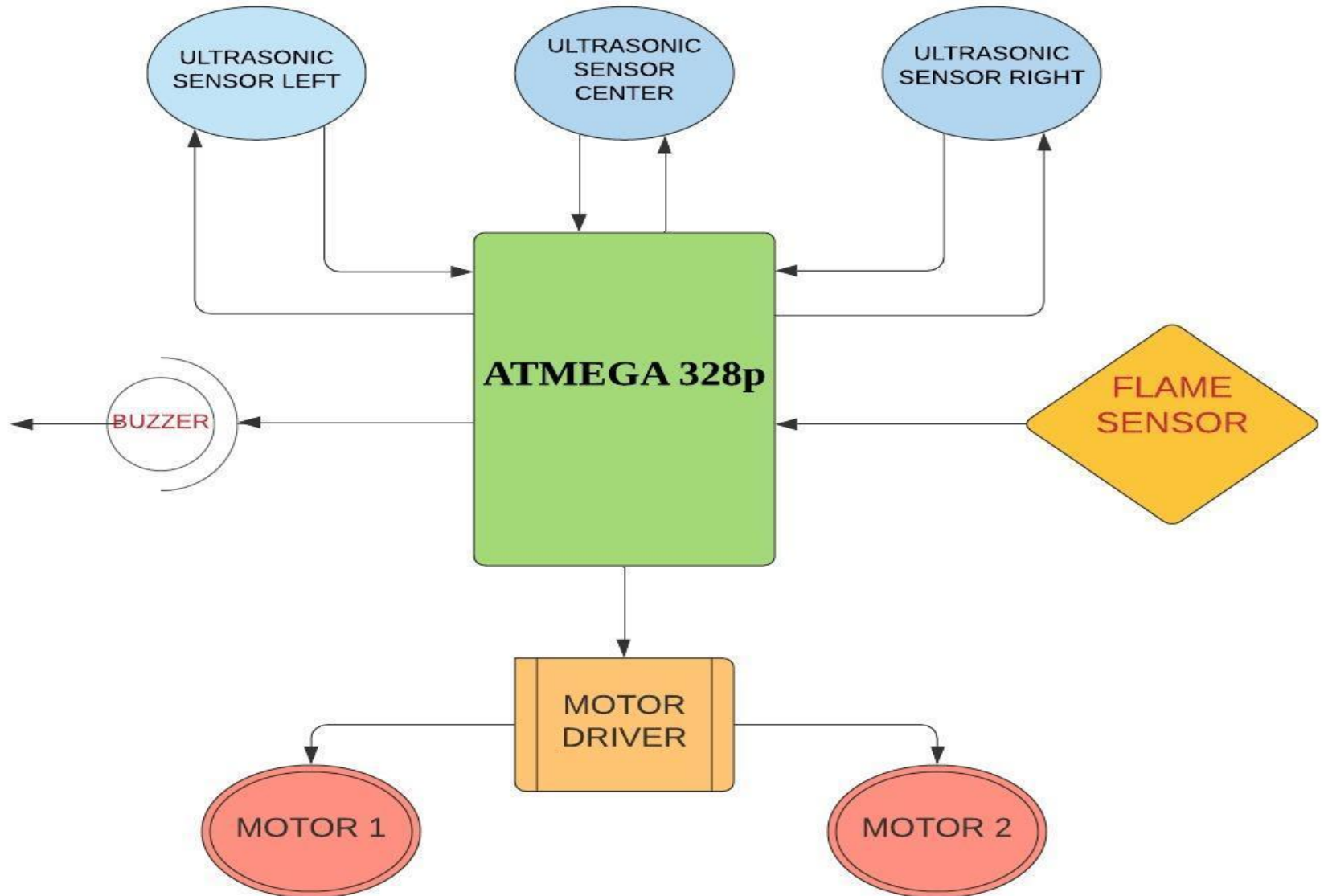
APPLICATION CONTAINS PLACES LIKE DATA STORAGE ROOMS, INDUSTRIAL FLOORS, ETC.



BLOCK DIAGRAM AND FUNCTIONAL DESCRIPTION



BLOCK DIAGRAM



FUNCTIONAL DESCRIPTION OF EACH BLOCK



- **ULTRASONIC SENSOR LEFT-:** An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity to its left to the Atmega328p.
- **ULTRASONIC SENSOR CENTER-:** This ultrasonic sensor send and receive ultrasonic pulses that relay back information about an object's proximity to its center to the Atmega328p.
- **ULTRASONIC SENSOR RIGHT-:** This ultrasonic sensor send and receive ultrasonic pulses that relay back information about an object's proximity to its right to the Atmega328p.

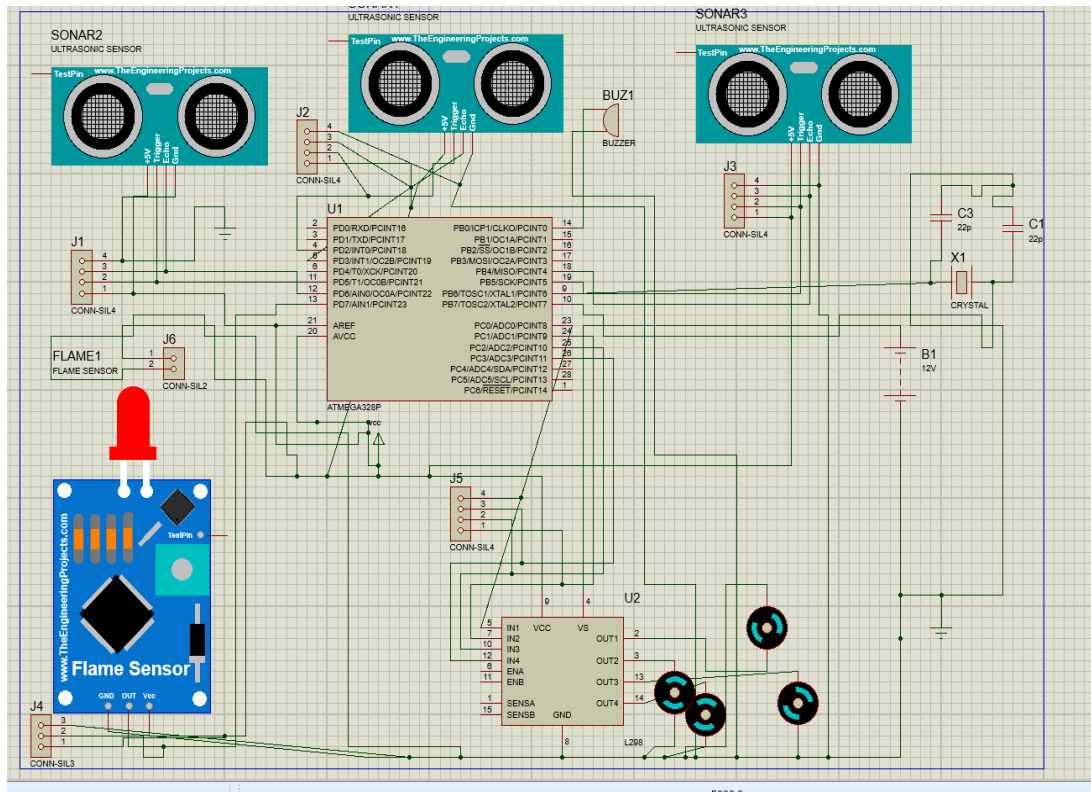


- **FLAME SENSOR-:** A flame-sensor is one kind of detector which is mainly designed for detecting as well as responding to the occurrence of a fire or flame. The sensor gives information of fire or flame near its to the Atmega328p.
- **ATMEGA 328p-:** Atmega328p is high performance, low power controller from Microchip. It is an 8-bit microcontroller based on AVR RISC architecture. It controls all the functions i.e. the input and output functions of other blocks in the diagram.
- **BUZZER -:** A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Atmega 328p gives signal to buzzer whenever it gets information about fire or flame from the flame sensor.



- **MOTOR DRIVER-:** Motor driver acts as an interface between the motors and the control circuits. Motor require high amount of current whereas the controller circuit works on low current signals. So the function of motor drivers is to take a low-current control signal and then turn it into a higher-current signal that can drive a motor. Atmega328p gives signal to motor driver which in turn makes the motor 1 and motor 2 run.
- **MOTOR 1-:**An electric motor is an electrical machine that converts electrical energy into mechanical energy. Force is generated within the motor through the interaction between a magnetic field and winding alternating (AC) or direct (DC) current. It is responsible for the rotation of two left wheels in the forward or reverse direction.
- **MOTOR 2-:** The Motor 2 rotates the two right wheels in forward or reverse direction.

Circuit diagram and its description



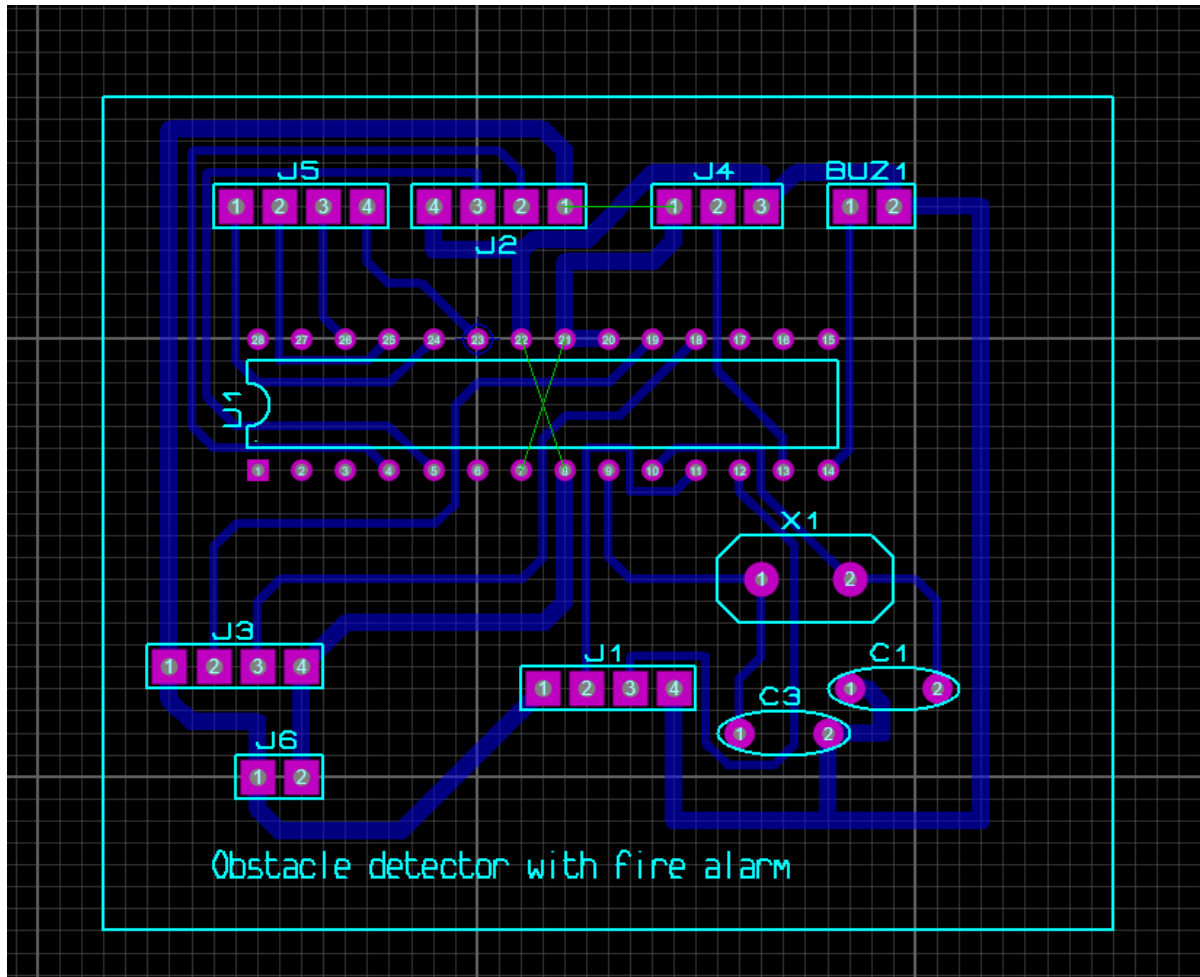
Now in the following schematic circuit diagram of the project it can be seen that :

- 3 ultrasonic sensors are used
- 1 flame sensor is used
- 1 buzzer for the indication.
- An IC ATMEGA 328P is also used in the circuit as a microcontroller.
- A buzzer is used.
- A motor driver is used L298N.
- Also a crystal oscillator circuit is also implemented, with 2 , 22pf capacitor and 1 ,16 MHZ crystal is also used.
- All of the components are commonly grounded and are also given common VCC.
- A 12 V external supply is also needed for the motor driver .

The sensors are connected to the Analog and the digital pins of the Ic during the process of connection we have matched the functional pins of Ic with that of the Arduino Uno playground.

Also we have made our program code according to these functional pins. In the schematic diagram we have connected the DC motors for showing proper working of Autonomous bot.

PCB LAYOUT

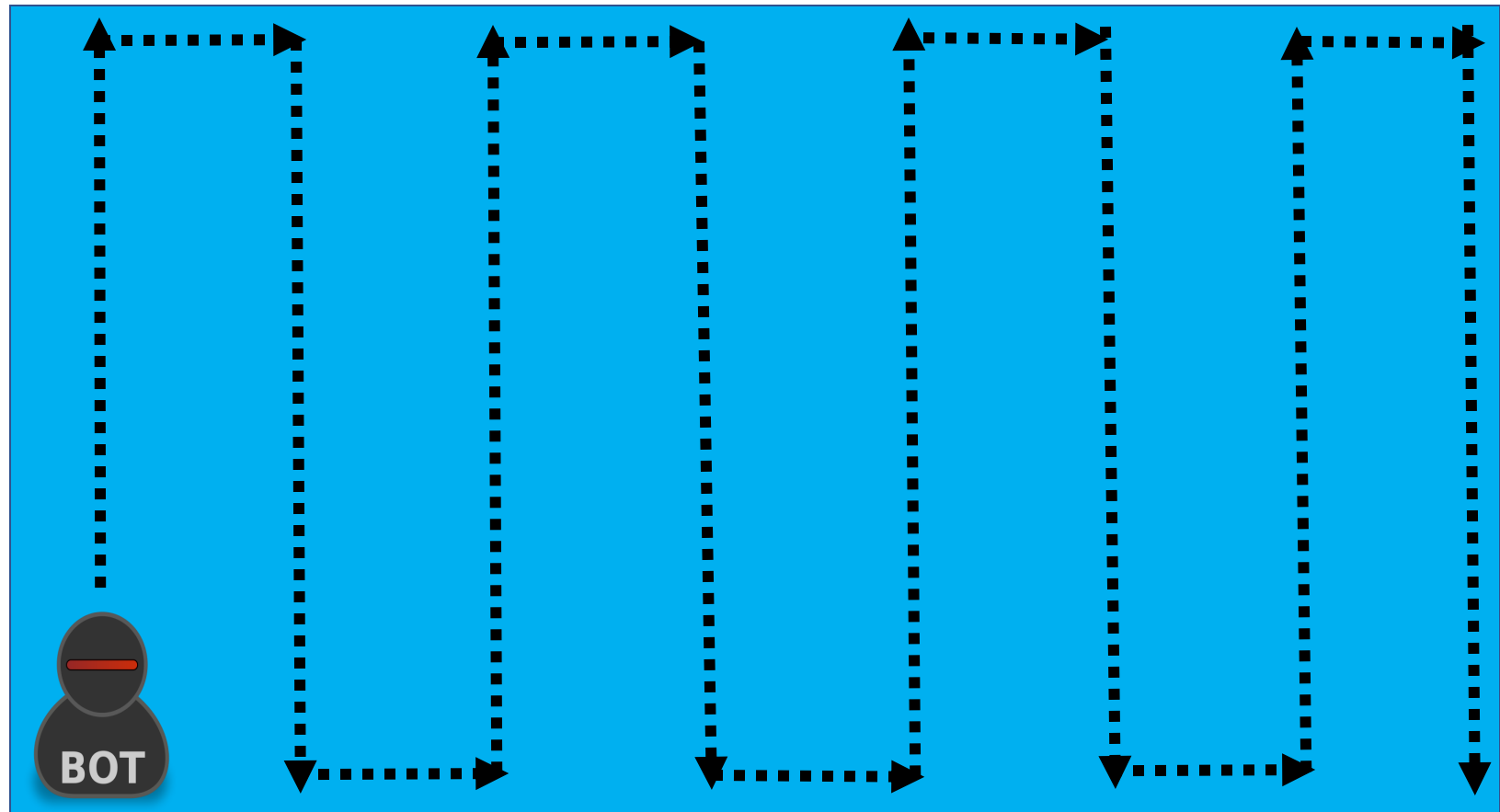


Above is the pcb layout of the above schematic diagram we have done the pcb layout on the software proteus , We have use the connectors for the connections , X1 is the oscillator ,C1 and C3 are the capacitors . We have tried to minize the number of jumpers as much as possible in the project.

There is a separate management of power supply a two pin connector is used for external power supply . J5 is used for the motor driver connections ,J2 is used for the front sensor , J3 is used for the right sensor,J1 is used for the left sensor; these all connectors are used as 4 pin connectors. There is a separate two pin connector for the buzzer.

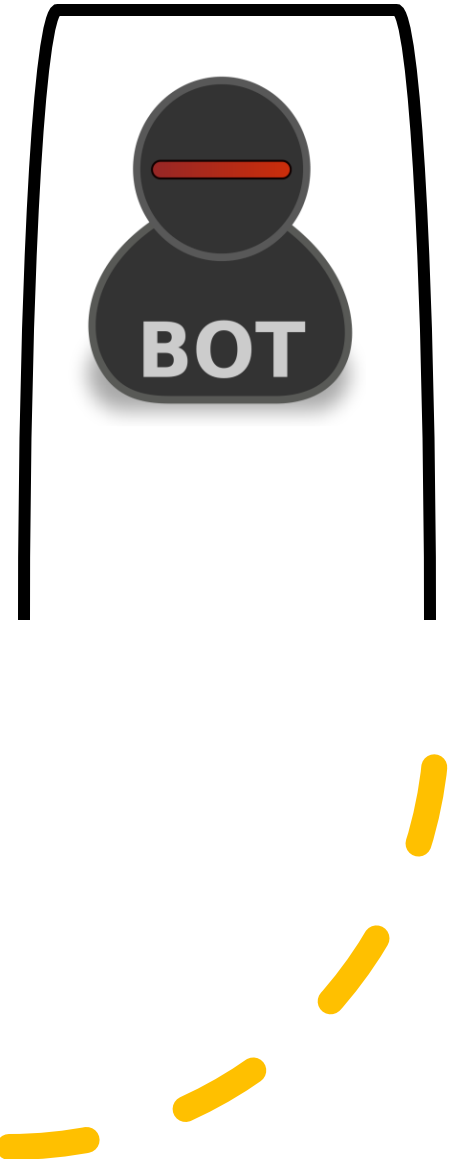
Algorithm for zigzag Motion of Bot

- There are total 4 situations based on the input received from ultrasonic sensors according to which ,the bot has to decide it's direction of motion .

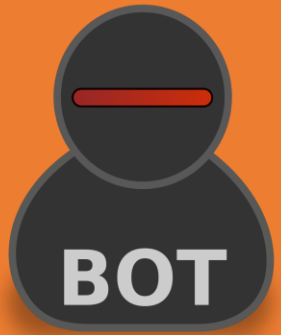


Case 1 : When the bot is covered by obstacle from all the three sides

**In this case , the only available direction to move is backward .
Hence the bot will turnaround by 180 degree and continue to move forward**



Case 2 : When the bot is covered by obstacle from front and left.

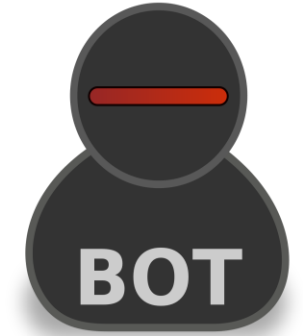


In this case , the only available direction to move is rightward . Hence the bot will turn by 90 degree to right ,move forward a little ,again take a 90 degree turn to right and then continue to move forward



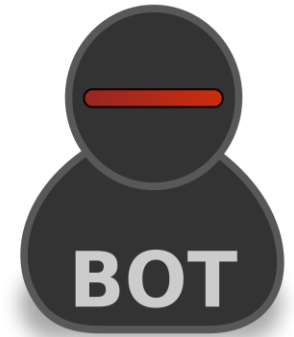
Case 3 : When the bot is covered by obstacle from front and right

In this case , the only available direction to move is leftward . Hence the bot will turn by 90 degree to left ,move forward a little ,again take a 90 degree turn to left and then continue to move forward.



Case 4 : When the bot is covered only from front .

In this case , the available directions to move are left and right. Hence for zigzag motion, if before this situation, bot took right ,then now bot will take left turn .Else bot will take right turn . For this ,a flag variable ***prev*** is used which stores the direction of motion the bot took previously .Whenever right turn is taken ***prev*** is set to 1.Whenever left turn is taken ***prev*** is set to 0.





[Link to the video of working of BOT](#)

[Link to the source code of bot](#)



RESULT AND FUTURE SCOPE

- FINDINGS OF OUR PROJECT :

CONDUCTION OF THIS PROJECT INDICATED USE OF ATMEGA 328P MICROCONTROLLER.ITS FOLLOWING FEATURES WERE EXPLOITED :

1. With program memory of 32 Kbytes ATMEGA328P applications are many.
2. With various POWER SAVING modes it can work on MOBILE EMBEDDED SYSTEMS.
3. With Watchdog timer to reset under error it can be used on systems with minimal human interference.
4. With advanced RISC architecture, the controller executes programs quickly.
5. Also with in chip temperature sensor the controller can be used at extreme temperatures.
6. Newly bought IC are not bootable , So we made a cicuit of bootloader and used it to boot the IC.

- **CIRCUIT ADVANTAGES :**

ITS COST EFFECTIVE WHICH IS ONE OF THE MOST IMPORTANT ADVANTAGES OF THIS MODEL.

BEST EFFECTIVE IN CONFINED AREAS, WITH THOROUGH AND CONTINUOUS OBSERVATION.

EASILY ACCESSIBLE AND ARRANGED WITH USE OF BASIC COMPONENTS AND SIMPLE DESIGN.

- **CIRCUIT LIMITATIONS:**

HARDER TO NAVIGATE AGAINST RANDOM OBSTACLES OR INSTANTANEOUS CHANGES IN THE ENVIRONMENT.

BUG DETECTION TAKES TIME.

SLOWER PROCESS TAKING TIME TO COVER A WHOLE ROOM.

- APPLICATIONS IN OTHER AREAS :

THERE ARE SOME OF APPLICATIONS FOR THE SAME CONCEPT USED HERE :

1. Industrial control systems.
2. SMPS and Power Regulation systems.
3. Digital data processing.
4. Analog signal measuring and manipulations.
5. Embedded systems like coffee machine, vending machine.
6. Motor control systems.
7. Display units.
8. Peripheral Interface system.