TECHKRITI'19

# ROBOGAMES 2019

## EVENT NAME: - IARC

*Date: - 05/03/2019*

### TEAM INFO

Team name: IIT KANPUR

Team leader's name: Abhishek Saini

Number of members in the team (max 5): 5

***MEMBERS:***

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# IMPORTANT NOTES AND GUIDELINES

- Filling of this form should be taken **seriously** as the selections would be based on the evaluation of this form.
- All the Information and facts provided by you must be **correct**.
- Any information and content which are taken from elsewhere must be given proper reference.
- Your content should be Brief and addition of unnecessary content should be avoided.
- Images should be used wherever you feel appropriate in a sense that it gives a better vision of your content.
- You can attach CAD diagrams, Electronic simulations provide links etc., related to your robot.
- **Any form of plagiarism shall lead to disqualification.**
- Attach the list of components used.
- Abstract must be submitted in .pdf format.
- If you want to attach a video with the abstract then upload your video on youtube/any cloud storage drive and paste the link in abstract.
- **In-case of multiple abstracts the latest shall be considered.**

***Name of abstract file should be:*** ***"Robogames: <Team Name> Event Name"***

# TECHKRITI'19

**Please check our website [www.techkriti.org](http://www.techkriti.org) for further updates**


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# Introduction

(in about 300 words)

The basic task was to do line following and wall following and during these tasks the bot also had to detect some nodes and had to measure some given distance.

Our bot was also made keeping all these tasks to be accomplished and we had tried our best to bring out the best performance from our bot. Calibrations were made to make the bot follow the line/wall properly with minimal deviation form the line.

For line following part, we have used IR sensor array ( with 6 sensors) and for wall follow part, ultrasonic sensors were used ( 3 sensors were used, one on each side except the back).

We have made use of the circular check points given in the arena for switching between codes from line following to wall following. For node detection, IR sensors were coded in such a way that it can differentiate between false node and true node.

For displaying number of nodes and the distance that should be calculated, we have used a multi-colour oled screen (ssd1331).

During the making of CAD model, care was taken to make sure that we made the bot as concise as possible so as to reduce some mechanical problems such as toppling, overweight and so on.

The whole of the electronic circuit was made on a 10x10 general purpose board. Effort was made to make it as condense and clean as possible so that any debugging of circuit becomes easy.

The bot is fully autonomous with on board power supply of 12v from Li-ion battery. The bot's framework was made from acrylic using laser cutting (for easy manufacturing, and lightweight) .

# CONSTRUCTION

(Describe the anatomy of your robot by giving **details about the all mechanical and electrical components** used also include images, references and links wherever appropriate in not more than 600 words )

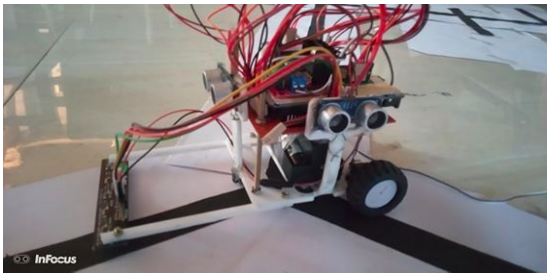
**MECHANICAL DESIGN:**

The whole of the bot was made from 3mm acrylic. We have used laser cutting for creating accurate manufacturing of the bot according to the CAD model proposed by the members of our mechanical team.

While making the CAD model, care was taken for the placements of sensors, battery and actuators so as the have a perfectly balanced bot. The position of centre of mass of taken care of, to reduce toppling during initial accelerations. For this , the height of the bot was made as low as possible and the base area covered by the wheels were made maximum.

We have used 2 wheels at the back with motors and a freely rotating castor wheel at the centre of the front end. This makes sure free, easy movement of the bot during turns.

Placement of IR sensors were also perfectly thought about in order to balance the reaction time of our bot to the arena so that there is no lag between the reaction of the bot and the instructions it get fron the sensors and microcontroller.



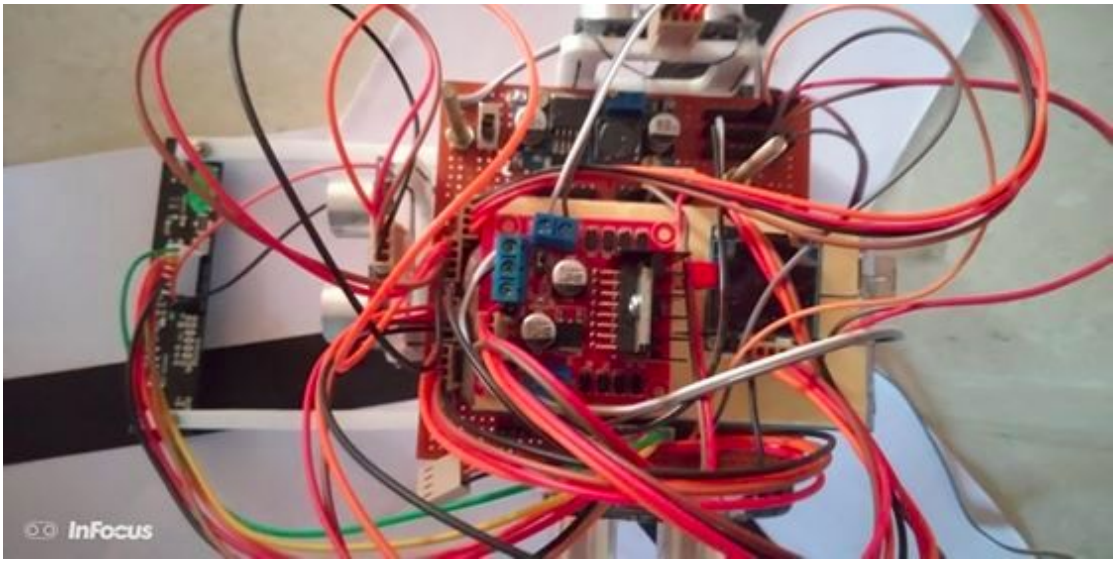

Design of our completed bot.

**ELECTRICAL DESIGN:**

Components used:

1. Grey robotics 6 array IR sensors
2. Ultrasonic sensors HC-SR04
3. Dual bridge L293D motor drivers
4. Arduino Mega
5. 12v DC geared motors
6. Multicolour oled screen SSD-1331
7. Buck converter step down (12v - 5v)
8. LI-ion cells
9. General Purpose Board (GPB)
10. connector wires

The whole of the electrical circuit was made on the GPB with perfect placement of components so as to make it condense. PCB headers were soldered to the GPB for fixing arduino on board, and for giving connections, using jumper connectors, to the sensors.




Circuit made on general purpose board.

# WORKING PRINCIPLE

(Describe the working of your robot also describe about the control systems, algorithms used. Also include your INNOVATION (if used) i.e., how is your robot different from a conventional one Also Describe your PROBLEM SOLVING APPROACH. Also include images, references etc., in not more than 800 words)

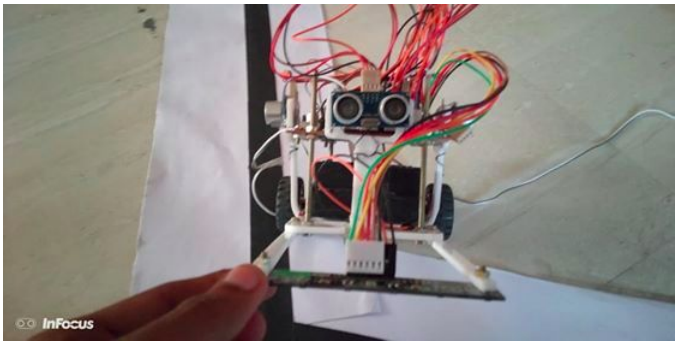
**LINE FOLLOWING:**

For accomplishing line following, we have used a array of 6 IR sensors. We have coded in such a way that the bot is always maintained on the line with the line below the middle two sensors.

For reducing the deviation of the bot from the line, various conditions of position of line, with respect to the sensors, have been used and accordingly motors speed have been changed to position it perfectly.

To coordinate the reaction time of the bot with the sensor values received, we have placed the sensor more front from the bot's main body. This balances the bot's turning on the lines.

For intersection and branches, we have gone with left hand rule of line following. This helps in tracing the line from the start till the end, without leaving any part or node undetected.



**NODE DETECTION:**

For detecting the nodes that occur in the middle of the line, the patterns have been wisely used. As the bot runs over the nodes, it can diffrentiate the two nodes and display it on the oled screen. It also keeps track of number of each type of nodes encountered.

**WALL FOLLOWING:**

For wall following, ultrasonic sensors have been used on three sides of the bot (front, left and right). It measures the distance from the wall lying close to it and positions the bot in order to follow it.

The circular patch that comes before and after wall following part have been used to switch between different codes. This switching helps in reducing computational time.

As the problem statement says walls occur on both sides separately, we have used both left hand following and right hand following separately (correspondingly).

**DISTANCE MEASUREMENT:**

For calculating the distance between the two true nodes that occur at the later part of the competition, we have planned to use the millis (timer) function in arduino. Using this function, we have planned to calculate the time taken by the bot the travel from one node to the another, and using the average speed of the bot, we can find the approximate distance between the nodes.

## References

(Video links, Github link etc)

## Any Information you would like to share

(E.g. discuss any other tournament/competition you have participated/win in any institute, etc.)