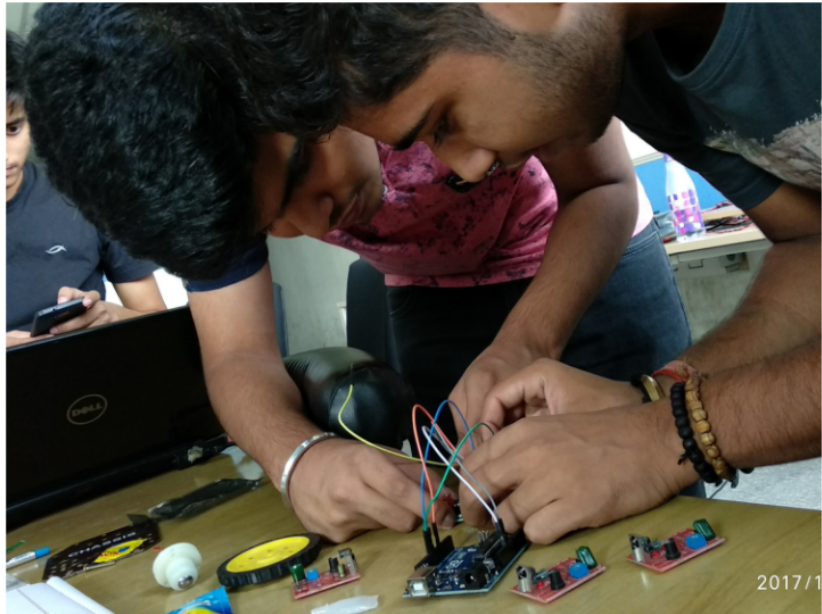Cluster
Innovation
Centre
University of Delhi

AUTONOMI

THE ROBOTICS SOCIETY

Autonomi is a student driven society which gives freedom to every member to break the shackles of stereotype thought process and dwell a sense of "out of box thinking". It provides a platform to automate and solve real life problems and deliver solutions via robotics. With freedom to develop, passion to equip and strategy to learn, Autonomians have created a congenial learning environment. A hunger to automate and innovate anything and everything around has been the driving force.

30+

Organised 30+
Workshops and Talks
in past three years

7+

Won 7 competitions
in past two years

PROJECTS

1. Line Follower Robot

LFR is more of a competition driven project so our immediate goals keep changing based on the upcoming competitions. We have built several line following robots of varying complexities. These robots have won us prizes at many competitions nationwide.

2. eYIC 2016

In this project, students developed a mobile robot capable of autonomous navigation with the help of sensors including Ultrasonic sensor, Raspberry Pi Camera, and IR sensors. It could recognize objects around it and store their precise location so that if something has been moved from its required location, it would know. An arm had also been attached so that the misplaced objects could be kept back at their required position.
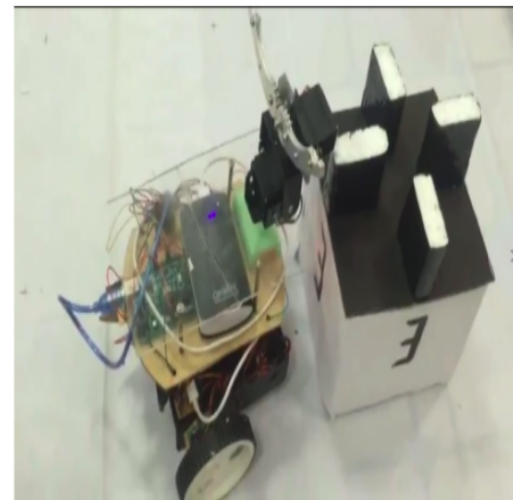
3. Quadcopter

A quadcopter is being developed at CIC which would be able to carry a payload of upto 500 gms, give information about its surroundings via a telemetry system.The key feature of this project was to develop a custom made flight controller used to control the drone. The students have designed and programmed the flight controller which is made by integrating different sensors with the help of Arduino which is an open-source electronic prototyping platform.

4. Transporter Bot

The aim of this project was to make the transporter bot which will collect the crates from the Agricultural fields and deposits them in the truck. We need to make the model depicting the same situation. And running the same as the simulation in software 'Blender' .We need to make communication possible between the bot, the rotating part(depicted truck) and the pc(blender).

5. Belt for Blind

We built a belt which will help a blind person in navigating through their surroundings. This will help them to know the objects around them and also the distance from that object. It uses a an ultrasonic sensor that helps in finding the distance, we also made a mobile application that will help them to know the distance. We observed that ultrasonic sensors are not measuring the distance as accurately as required, so we shifted to RGBD KINECT 3D camera that could do this task in a far better way. This part is also now complete.

6. Humanoid

The aim of this project is to develop an effective ZMP/Hybrid based control scheme for robots to achieve accurate tracking of the desired motion. The project is currently in the research phase. The team is working on understanding the kinematics and dynamics model of the humanoid. We are also working on understanding the properties of other successful humanoid robots.
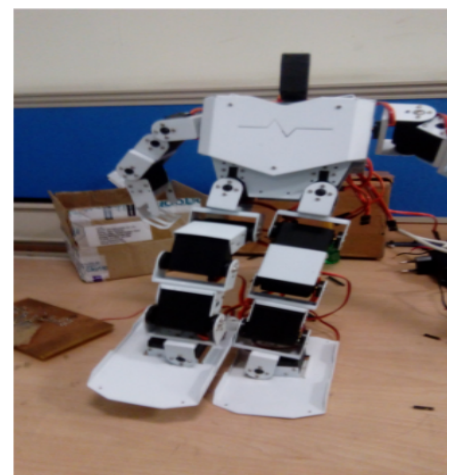
7. Multi-robot Musical Notes Playing team

In this project we aim to make robots (for prototyping we used 2 robots) produce musical notes given to them in an audio file. We used python modules such as numpy, scipy, and pyserial to extract the musical notes from the audio file. Then using USB serial communication we send those notes to our master bot, which then divides the notes into 2 sets. One set is played by a master robot and other is played by slave robot. Playing of notes: We have a flex on which aluminum pipe of different length is placed at different locations. These pipes will produce a different musical note (from C6 to B8) when struck by another pipe. Robots will use a black line drawn on the flex to reach the correct note and strike them with a mounted aluminum pipe on them using servo motors. The movement of robots is controlled by d-star algorithm. During their movement robots communicate with each other to play the notes in right order. Additionally, some obstacles were also placed on the flex. The robots have to skip the path on which there is an obstacle while reaching the correct notes to strike.

8. Self Balancing Skateboard

The main motive to do this project was to give a daily transporter vehicle which is easy to useandreduces the risk of an accident. The Mechanical design of the board consists of two dc gear motor, one motor driver, one Arduino microcontroller, one MPU-6050, one 24V battery. It is prevented from falling by giving acceleration to the wheels in the direction of declination according to its angle of declination from the horizontal.

9. Spotter Snake

It is a remote-controlled snake-like structure which rolls to form a ring-shaped structure. We present a novel approach for an artificial snake which can fold, unfold, locomote and even turn sideways without taking much space or time. The chassis has been 3D printed and its movement is controlled by a number of servos. The communication between the snake and the joystick has been handled through NRF wireless communication.
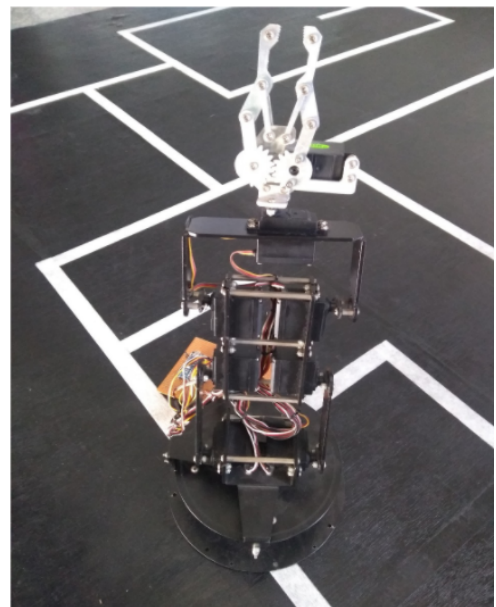
10. Home Automation System

The aim of this project is to completely automate a home. It is being done in collaboration with the two societies at CIC: Autonomi, the Robotics society and HashInclude, the IT society. Currently, the robotics lab at CIC is being used as the testing field. This project is being done in two phases. Phase 1 is remote control of all the appliances. This includes replacement of all hardware switches with Arduino based switches and development of software application to remotely control the appliances. This part is now at its final stages. Phase 2 involves automating these systems using all the sensors incorporated in Phase 1 for machine learning and image processing so as to analyse the behavioural patterns of users visiting Robolab so that a personalized experience may be provided to them.
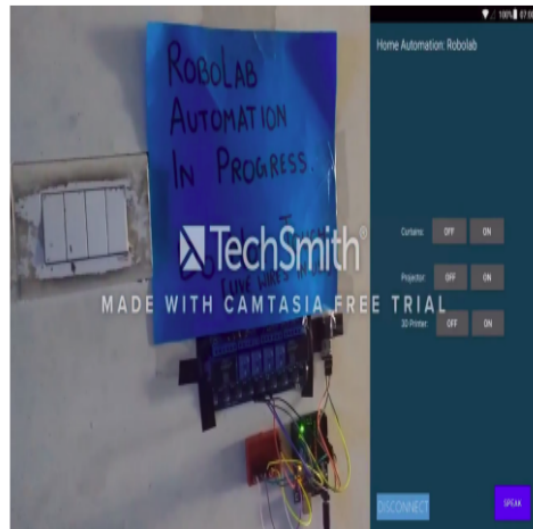
11. Gesture Controlled Robotic Arm

The aim of this project was to control a robotic arm through human gestures. The robotic arm should mimic the motion of the user's arm. For this, we used **a) Dexter ER-2 Arm** by **Nex Robotics** which has 5 DOF and **b) Microsoft Kinect** for tracing the gestures of the human arm. On software front, we have used an open source package **OpenNI Tracker** based on **ROS** for tracking human skeleton and **Arduino IDE** for controlling Dexter Arm.

12. Automated Irrigation System

In this project we have built a system which irrigates the soil according to its requirement. For this, we have used a **Soil Moisture Sensor** and **Arduino Nano.** The prototype is like a jar in which water is stored. On one end we have a tap which is controlled by a servo motor. Now when the moisture sensor is placed in soil, it gives readings of the moisture content of the soil on the Serial Monitor of the Arduino IDE. When the readings are close to zero or less than the threshold value, it shows that the water content is low. And since the Sensor is connected with the Arduino, it sends signals to the servo motor, and the tap turns on for the water to flow. Once the readings are stabilized the tap closes automatically.

13. Maze Solver Bot

It is an LFR using specific Algorithms to traverse across a maze with loops and dead ends. It uses the left hand algorithm to traverse across a maze and reach its destination. Further enhancements will allow the bot to Map the whole maze and find the shortest path from A to B.
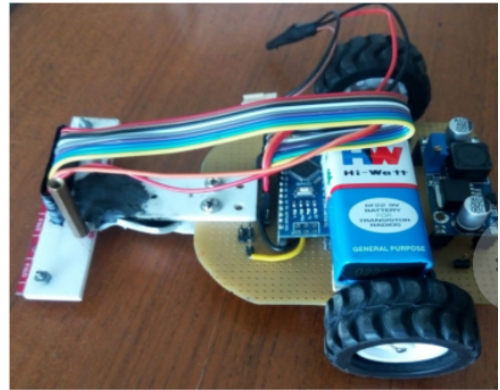
14. SWARM Robot

Our aim is to coordinate multiple robots to do the same task which a single robot cannot do. It helps us to complete a task faster as compared to other individual robots. The key component of this projects is communication and continuous feedback to our control system.
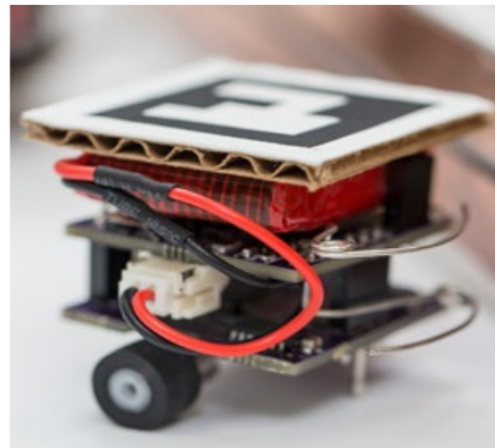
15. eYRC 2017-18

This project is the part of Track 3: Swarm Robotics in e-yantra. It involves multiple robots cooperating to fertilize the plants and remove the weeds in a farm. Two robots carrying different fertilizers and one robot whose primary function is to remove weeds traverse an arena representing a farm. Each Fertilizer Robot identifies and fertilizes the crop that requires the fertilizer that it is carrying; the Weeding Robot identifies and removes weeds from the field. The challenge is to collaborate and complete the fertilization and de-weeding in the most efficient manner.

16. Capacitive Touch Piano

The motive of this project was to create a touch-based piano, which works when we touch its keys. The main task was to generate touch sensitive keys and use laptop speakers for sound.
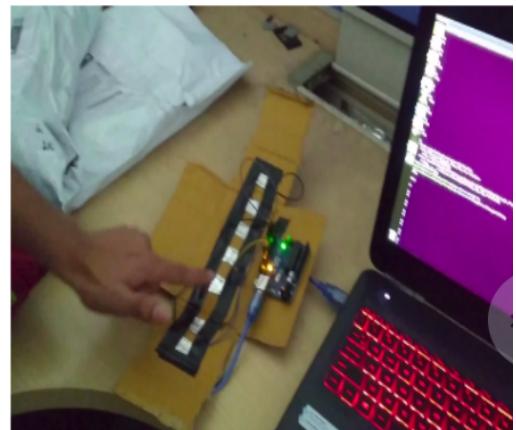
17. Face Tracker

The aim of the project was to build a personal recorder that can follow your movements to make sure that it covers you correctly. It involved 2 servos attacked perpendicularly allowing left-right and up-down motion. On the servo, a camera was mounted. Raspberry Pi was used to run a computer vision based face tracker and a PID algorithm was applied to use the servos to follow the face.

WORKSHOPS

A lot of workshops have been conducted by Autonomi throughout the year for students and teachers. Nature of the workshops are introductory as well as advanced robotics.

1. BOOTCAMP

A series of Introductory and Hands on workshops on robotics conducted every year during fall semester for new students to generate interest and get familiar with basic technologies in robotics.

2. Fire Bird V Workshop

Workshops for teachers on FireBird V Robot platform. These workshops are supported by e-yantra, an initiative by IIT-Bombay.

3. Workshop for Teachers

Hands on workshops for teachers(from various schools all over the India) teach them physics behind robotics and how to involve new students towards robotics, under the "God Gifted Children Project" by M.M.E., CIC.

4. Wall Follower Workshop

Workshop for Ramanujan College Students on "Make your first robot - Wall Following Robot". Aim of this workshop was to introduce students how computer science is integrated with robotics, who are already familiar with beginner/intermediate computer science.

EVENTS

A lot of workshops have been conducted by Autonomi throughout the year for students and teachers. Nature of the workshops are introductory as well as advanced robotics.

1. Blitzkreig 1.0

In the March of 2016, Autonomi conducted its first annual Robotics competition, Blitzkreig where students from various college across India participated in three competitions including RoboCup(Football match between Robots), LFC(Line following competition) etc.

2. eYIC-2016 Regional Finals

eYantra, IIT Bombay's biggest robotics event had its regional finals held at various nodal centres across the nation in the end March of 2017. CIC was one of these nodal centres. So, Autonomi was given the task to manage and organize the event which had participants from various cities compete against each other for the national finals. Incidentally, a team from CIC was one of the participants and was selected for the finals. Judging was managed by IIT-Bombay.

3. Blitzkreig 2.0

This time, the event was taken to the next level with HashInclude, the IT society of CIC collaborated with Autonomi to make Blitzkreig a Technical event with events both from IT and Robotics. It was a big success and the event witnessed much bigger crowd participating in the events. The events within Blitkreig included:

1. HashHacks: 24 hour software development hackathon.
2. RoboLineae: Line following competition with an exciting mystery level.
3. RoboCup: One-on-one football match between robots.

4. Convoke 2.0

The events included in this fest:

1. HashHacks: 24 hour software development hackathon.
2. RoboRace: RC robot to traverse a difficult and uneven terrain with a high sprint.
3. RoboLineae: Line following competition with an exciting mystery level.
4. RoboCup: One-on-one football match between robots.
5. Data Jam
6. #define
7. Gaming events: CS GO, Mini Militia, FIFA, Treasure Hunt
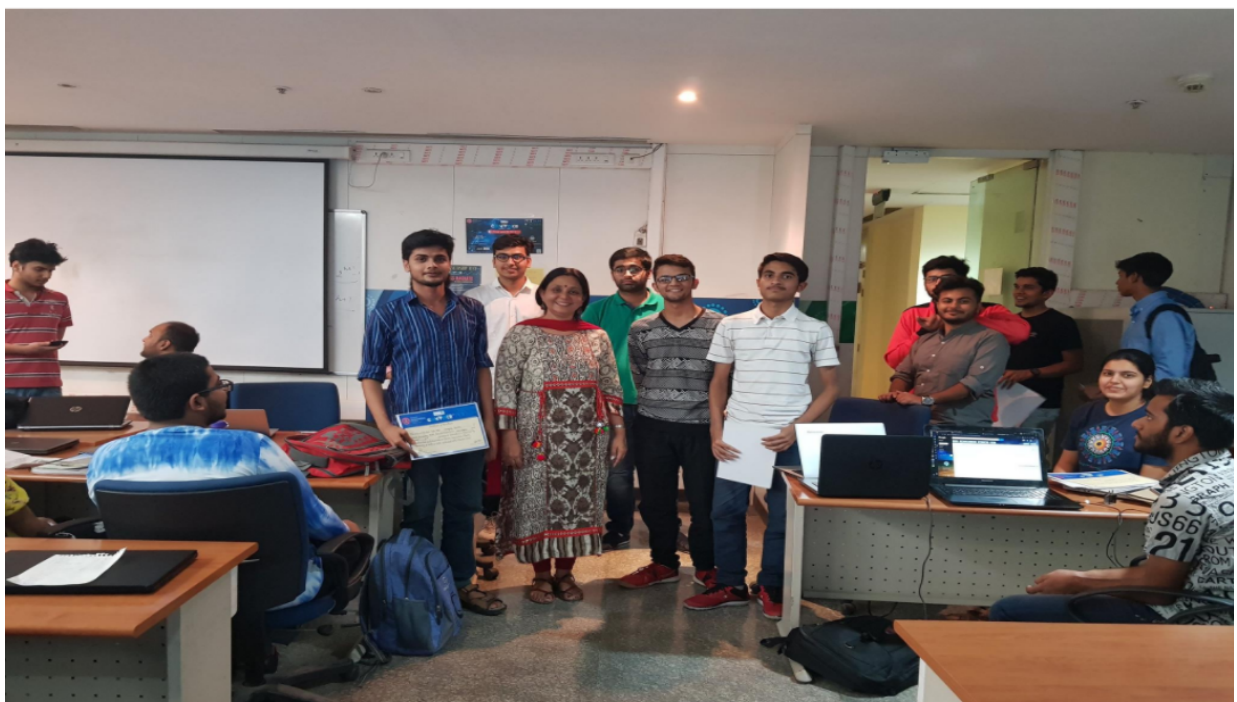
Governing Body Members

Tarun Khajuria (Founder)
Anurag Singh (Founder)
Mayank Jain (Founder)
Akshat Bhattarjee (Founder)
Vikas Balwada
Mayank Malhotra
Divyanshu Srivastava
Pragya Agarwal
Yatharth Aggarwal
Ankit Pathak
Prashant Sinha
Parul Sethi
Gourav Kalbalia
Pragya Jaiswal
Vivek Patle
Ridhwan Luthra
Sanjeev Dubey
Shobhit Maheshwari
Niraj Kumar
Anustha Kalia
Vivek Kumar
Pankaj Baranwal
Lakshay Juneja
Vivek Kumar
Vaibhav Jain
Vikas Kamboj
Shashwat Yashaswi
Shreyas Sachan
Mayank Sood
Sudhanjali Sethi