
Robo- Tricks Takneek '16

— Robotics Club, SnT Council —

August 27th, 2016

What goes behind making a *robot*?

1. **Defining the Problem** i.e. the purpose of construction and identifying the specific requirements
2. **Researching and Designing** i.e. planning and designing appropriate solutions
3. **Creating a Prototype** i.e. testing and troubleshooting the design
4. **Building** the robot
5. **Evaluating** the Robot i.e. outlining the strengths and weaknesses in the robot



Mechanical



Electrical



Problem Statement



The participating teams have to build a remote operated robot that shall be able to do a variety of tricks such as grab and place objects, detect colored strips and maneuver over the play field.

Rules and Point System:

<http://students.iitk.ac.in/takneek/2016/problems/RoboTricks.pdf>



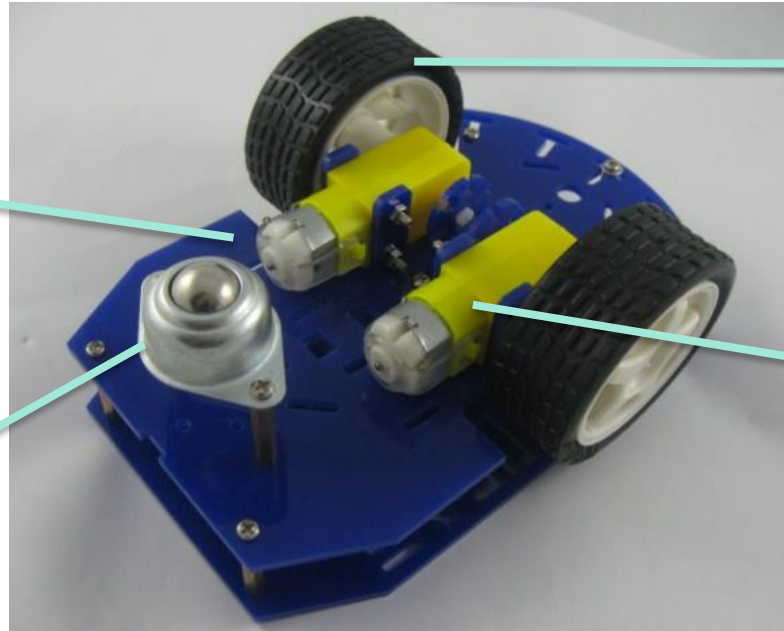
Recap: 2W Differential Drive Robot



Chassis



Castor



100 mm Dia.
Robot Wheel

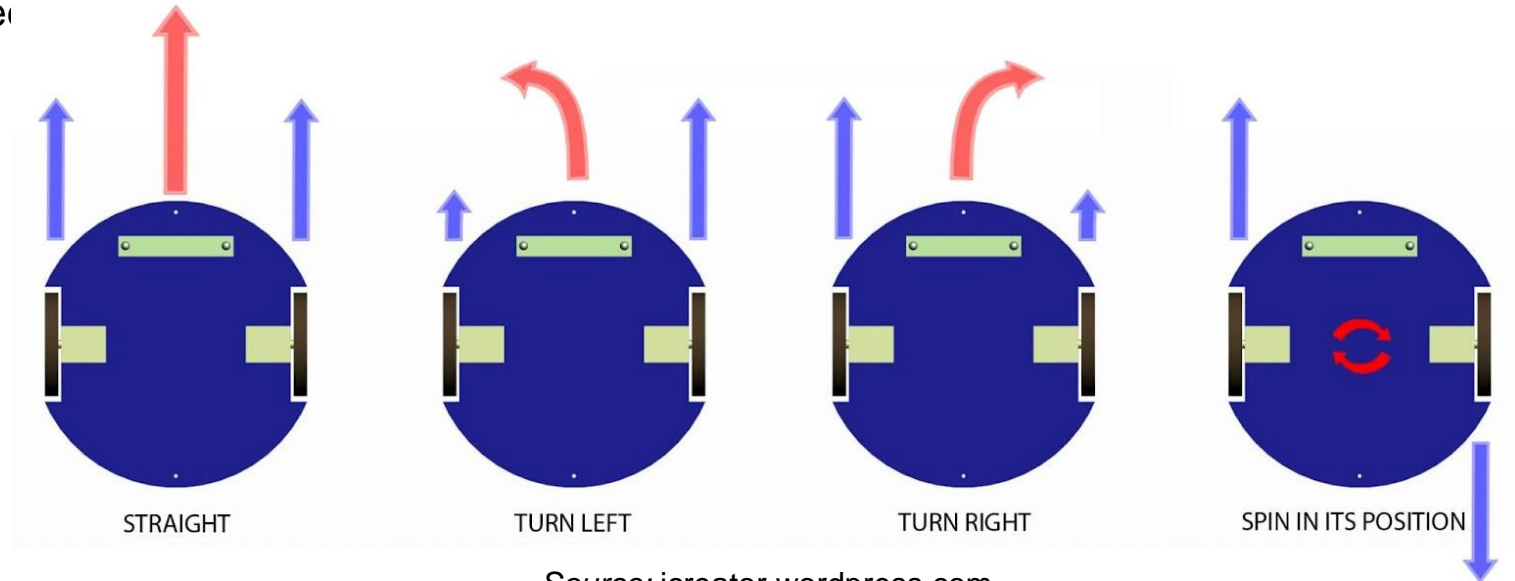


6V, 180 rpm Micro DC
Geared Motor



Differential Drive

'Differential' means that robot turning speed is determined by the speed difference between drive wheels



Source: icreator.wordpress.com



DC Motors

- Generally operated at +12V. Negative supply make shaft rotate in opposite direction
- Speed reduces as voltage supplied decreases
- Torque and speed are inter-related

A 10rpm motor has relatively higher torque than 100rpm or 300rpm motor.



6V, 180 rpm Micro DC Geared Motor



12V, 10-500 rpm DC Geared Motor



300 RPM Side Shaft DC Gear Motor



Mechanical

Other DC Motors

High
Torque
Motor



Servo
Motor



Geared
Motor



Stepper
Motor



Heavy Duty
Geared Motor





Castor

It is type of wheel mounted at the bottom of the chassis for easy rolling movement.



Swivel Castor



Castor Wheel in robot

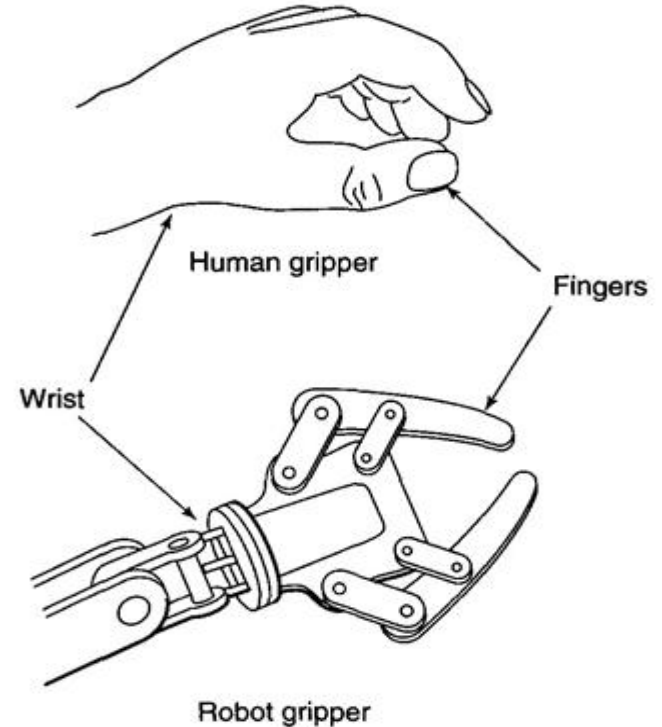


Arm Manipulator

Robot manipulators are created from a sequence of link and joint combinations.

For the given problem statement, a gripper and a lifting mechanism is required.

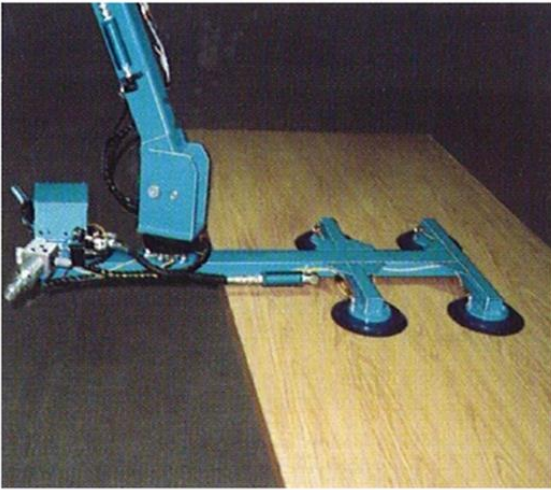
As intuitive as it may seem, designing an arm manipulator requires significant geometrical and spatial analysis.



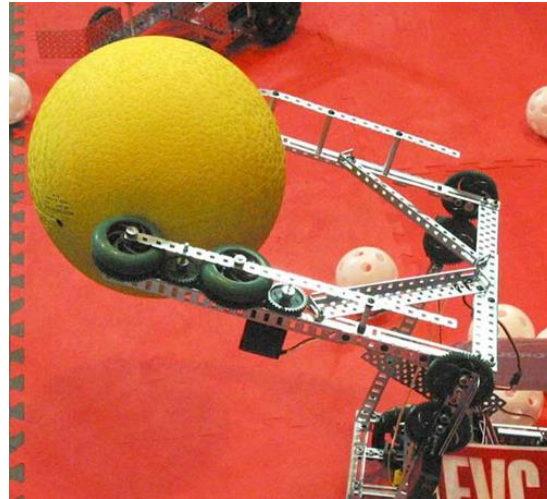


Types of grippers

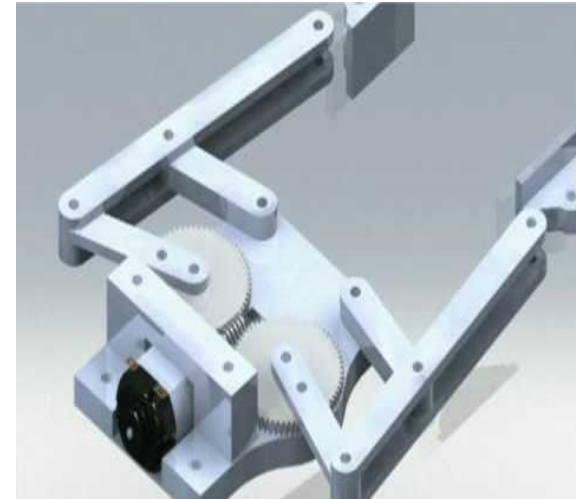
Vacuum Gripper



Roller Gripper



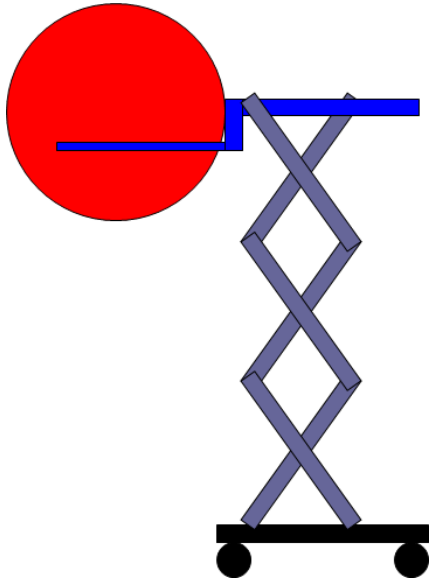
Four- Bars Linkage



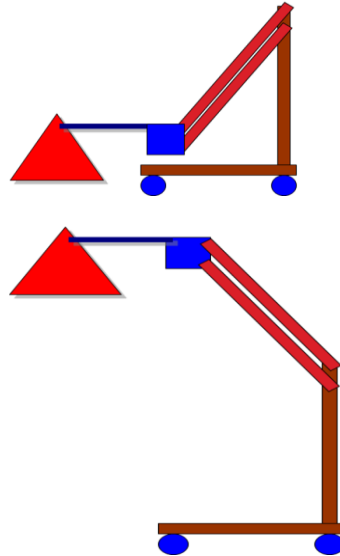


Lifting Mechanisms

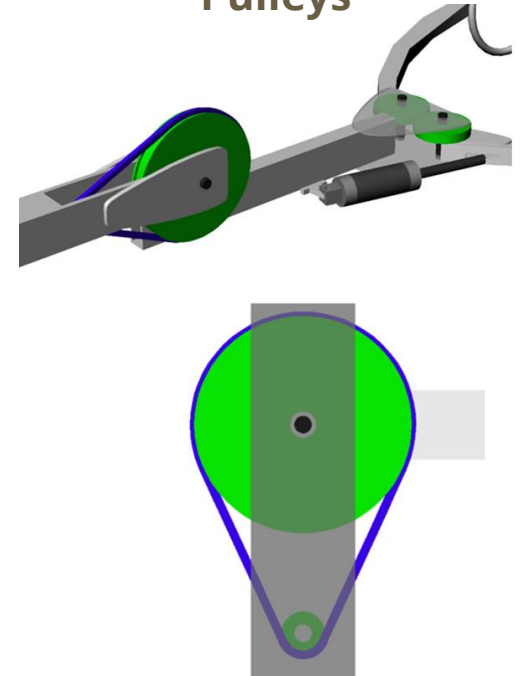
Scissor



Parallelogram



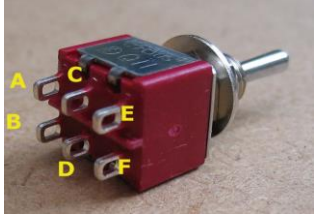
Pulleys





Electrical

Switches



DPDT



SPDT



DPST



SPST

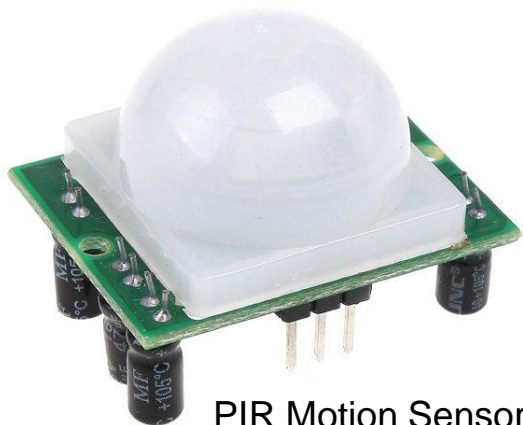
Type	Symbol
SPST (Single pole single throw)	
SPDT (single pole double throw)	
DPST (Double pole single throw)	
DPDT (Double pole single throw)	



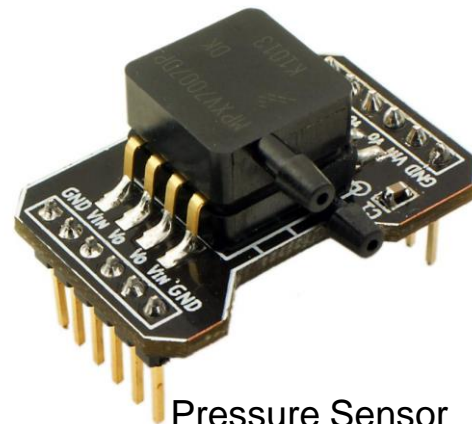
Electrical

Sensors

A sensor is a device that measures a physical quantity and converts it into a signal which can be read and later used upon for a variety of purposes



PIR Motion Sensor



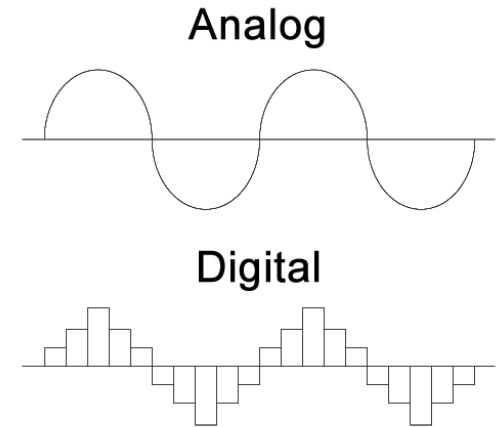
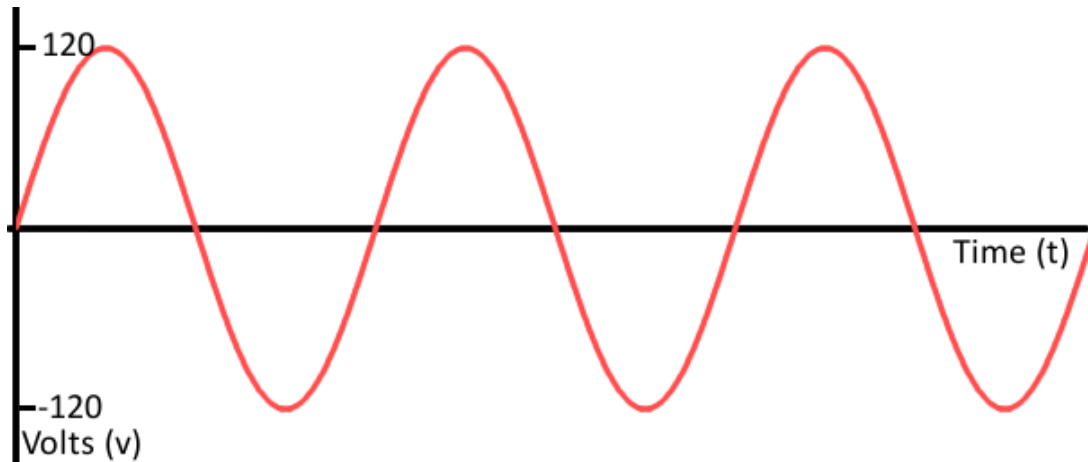
Pressure Sensor



Electrical

Analog Input Sensors

Sensors which are capable of giving continuous output data, with every possible values in the output range. e.g.- Proximity sensor, Flex sensor

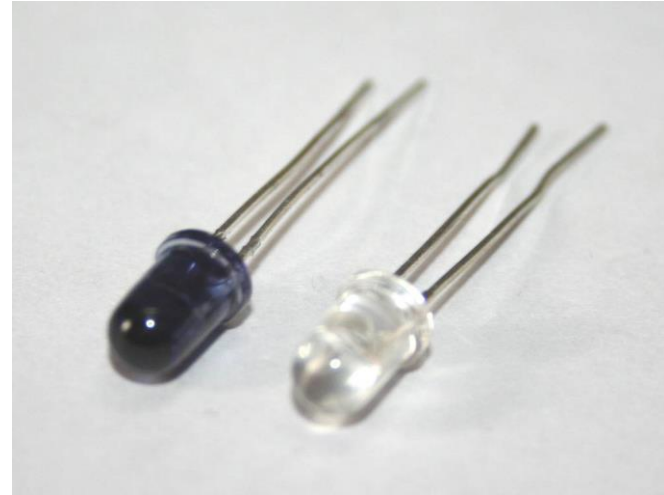
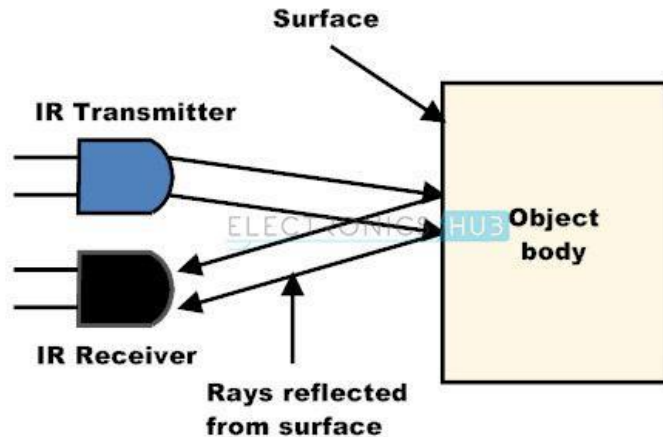




Electrical

IR Analog Sensor

It gives output in the range of 0V to 5V, depending on the amount of IR light falling on the photodiode.

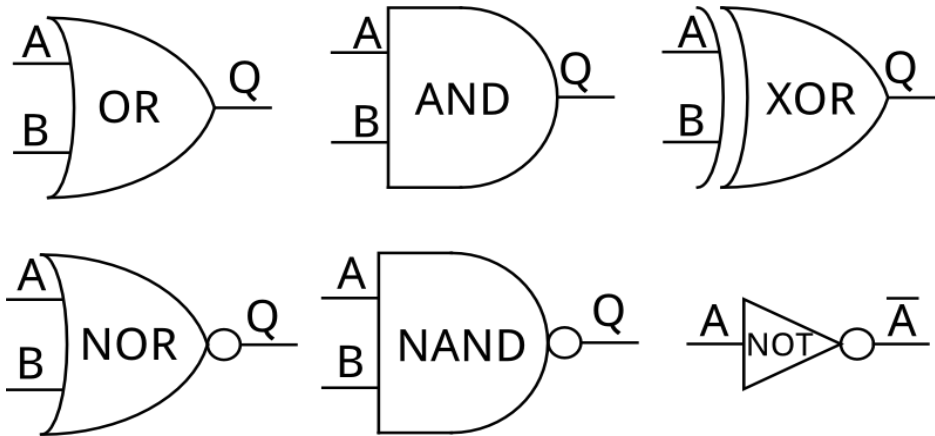




Logic Gates

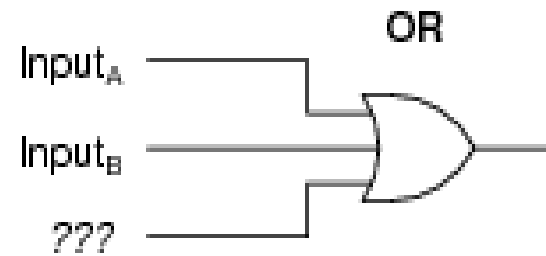
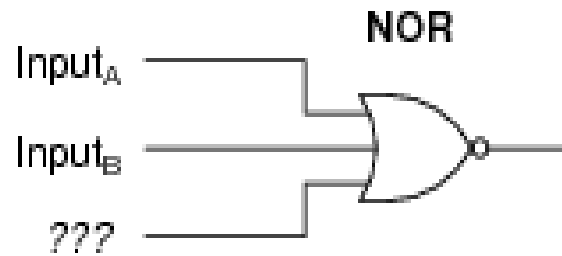
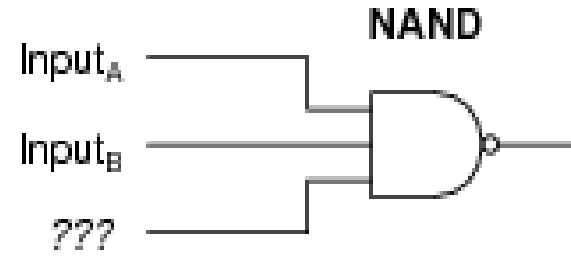
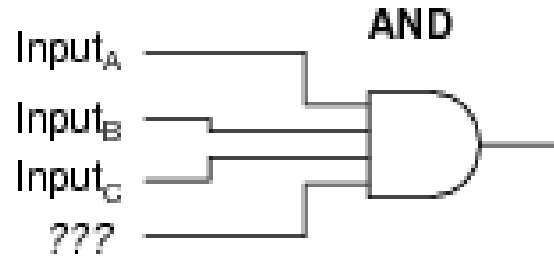
“In electronics, logic gates are physical devices that can perform logical operations on basis of one or more input.” - *Wikipedia*

In short, they allow your system to think!





Multiple Inputs Gate





Truth tables

Truth tables are mathematical tables used in logic to compute functional value of logical expression.

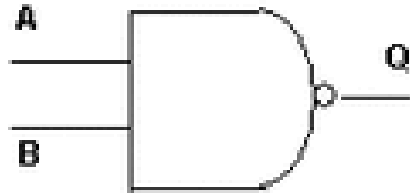
2 Input AND gate		
A	B	A.B
0	0	0
0	1	0
1	0	0
1	1	1

2 Input OR gate		
A	B	A+B
0	0	0
0	1	1
1	0	1
1	1	1



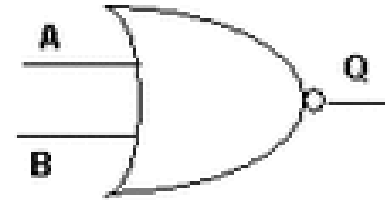
NAND NOR Gate

These are negation of the AND and OR gates.



NAND

A	B	Q
0	0	1
0	1	1
1	0	1
1	1	0



NOR

A	B	Q
0	0	1
0	1	0
1	0	0
1	1	0

Takeaway Points to Remember

- Design is a mixture of analysis and creative thought.
- Good designs are based on excellent concepts and meticulous detailing.
- **Occam' Razor:** 'Keep things simple to start and add details as design develops.'
- **Independent Functions:** 'Keep the functions of a design independent from one another.'
- **Abbe's Principle:** 'Small angular deflections are amplified by distance to create large linear displacements.'

Participation Pre-Requisites

- Create a team of atmost 6 members, and define the roles of each member.
- Contact the secretaries at your respective halls, and discuss with them **your ideas** regarding the design of the robot.
- Submit a **detailed abstract** on 29th August, 2016 at Robotics Club, Hall-2
- At the time of abstract submission, deposit Rs.1,200 as participation fees per team. A part of this fees is for the caution money **refundable against the return of components.**

For any queries, contact:

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