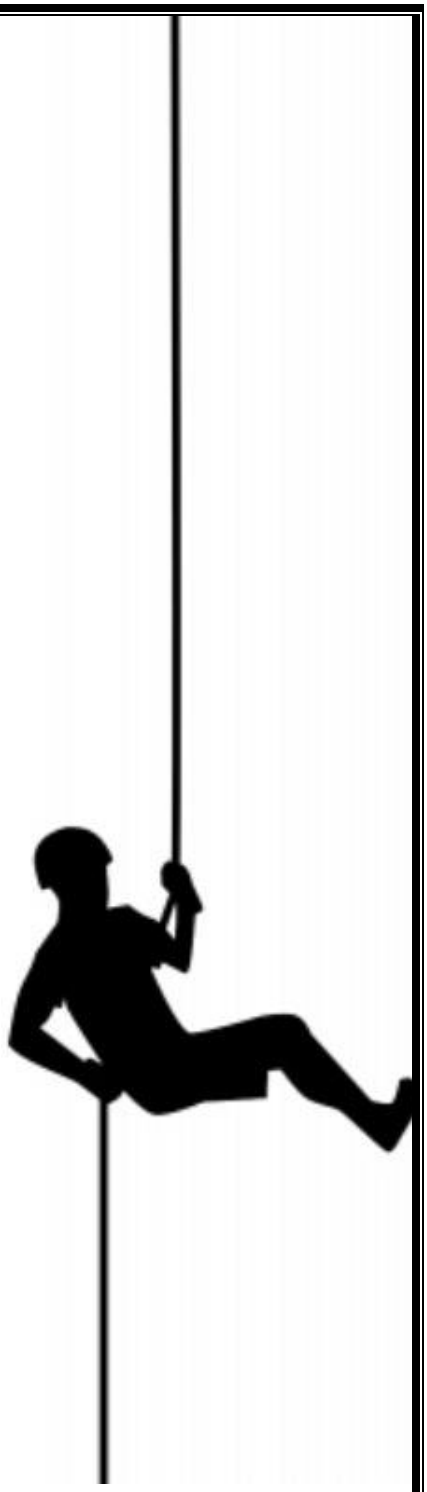
Robotics Club IIT Kanpur



ROPE TRAVERSING BOT

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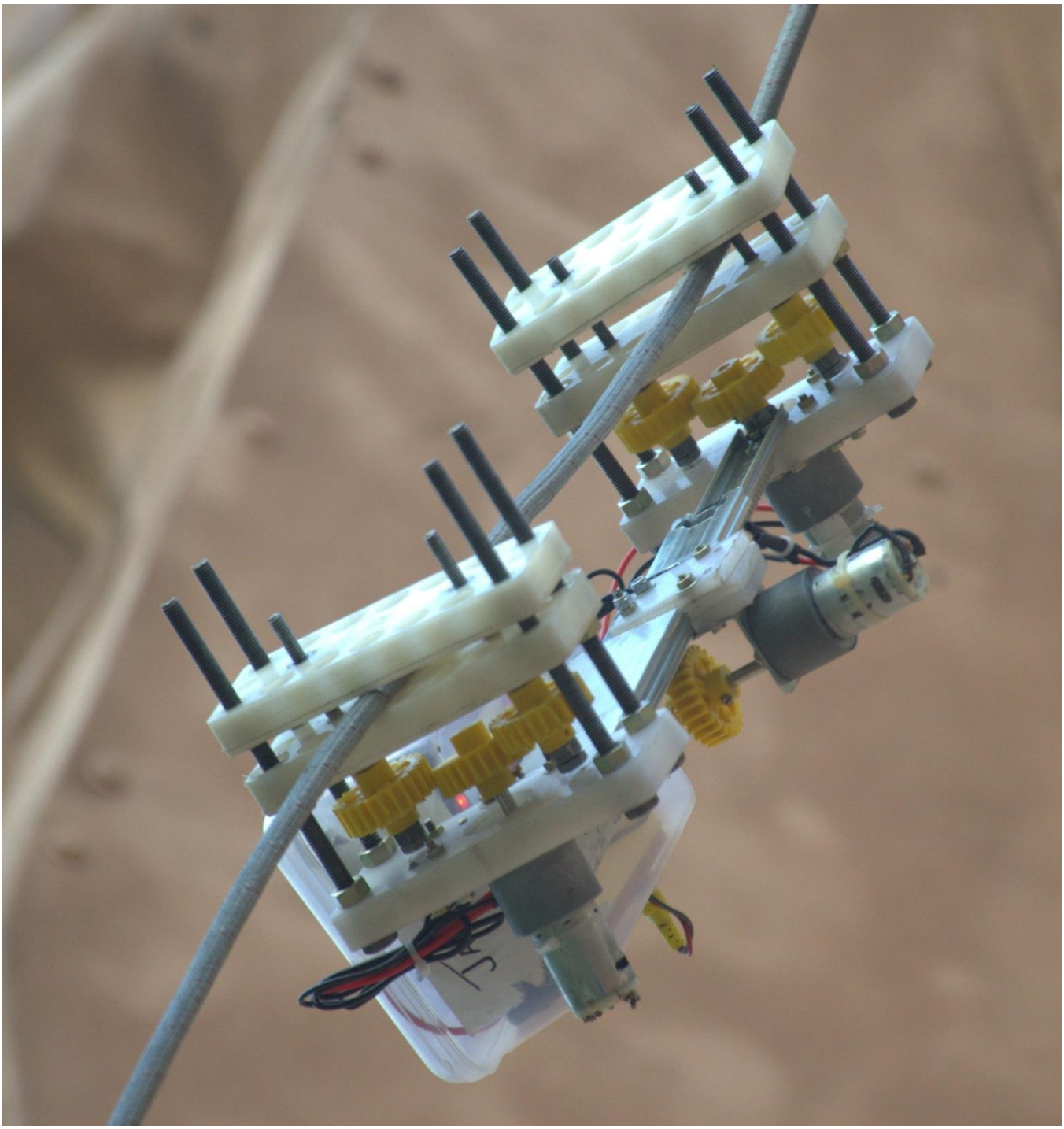

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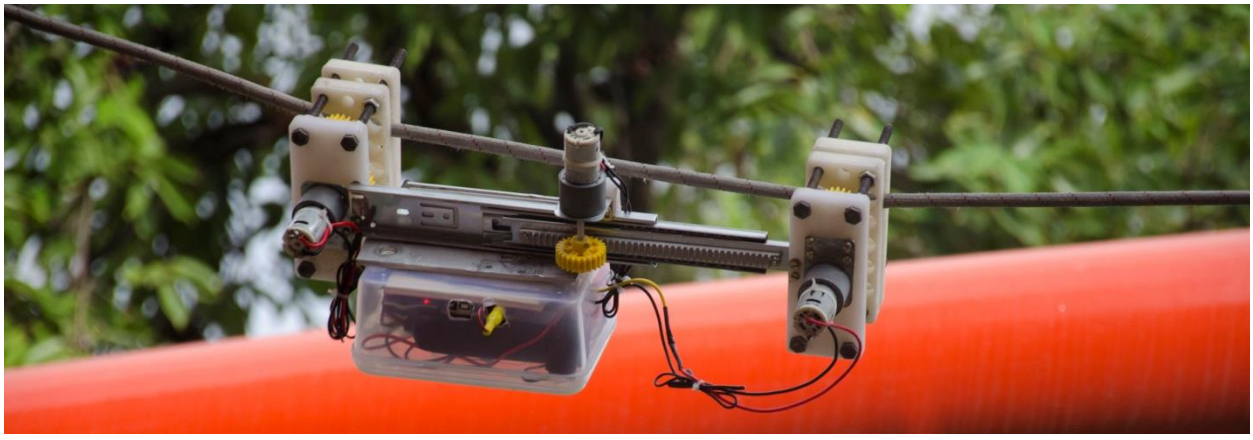
ABSTRACT

This paper presents motion analysis of a rope traversing bot. The bot comprises of three units – two grippers and a slider for translational motion. We have used three motors (1 for each gripper and 1 for the slider), plastic gears, and nylon sheets. Arduino UNO is used for programming and making the bot autonomous.

OBJECTIVE

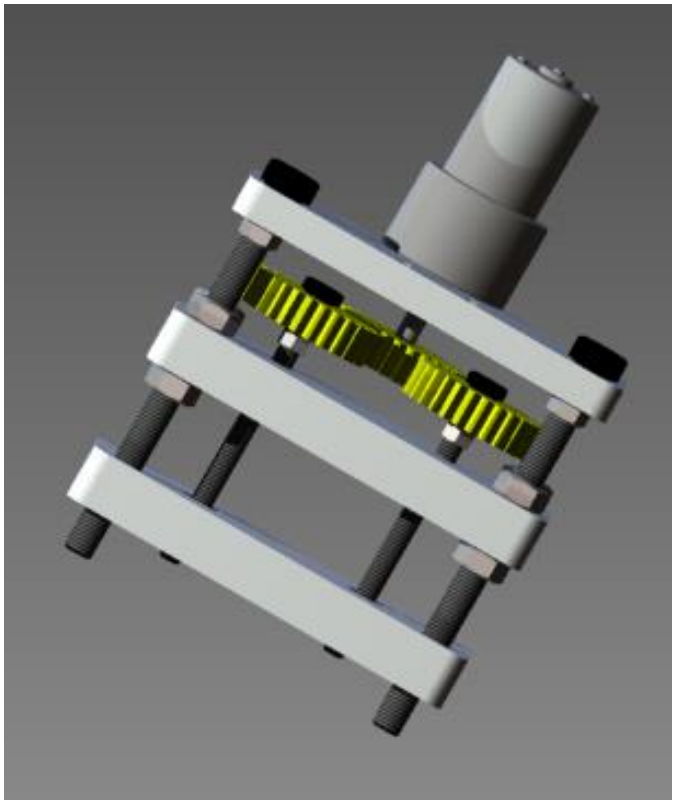
- To make an autonomous bot which could traverse along a rope which can have any orientation (vertical, horizontal or oblique).
- To make a bot which could climb on ropes of any diameter.



MECHANICAL DESIGN:

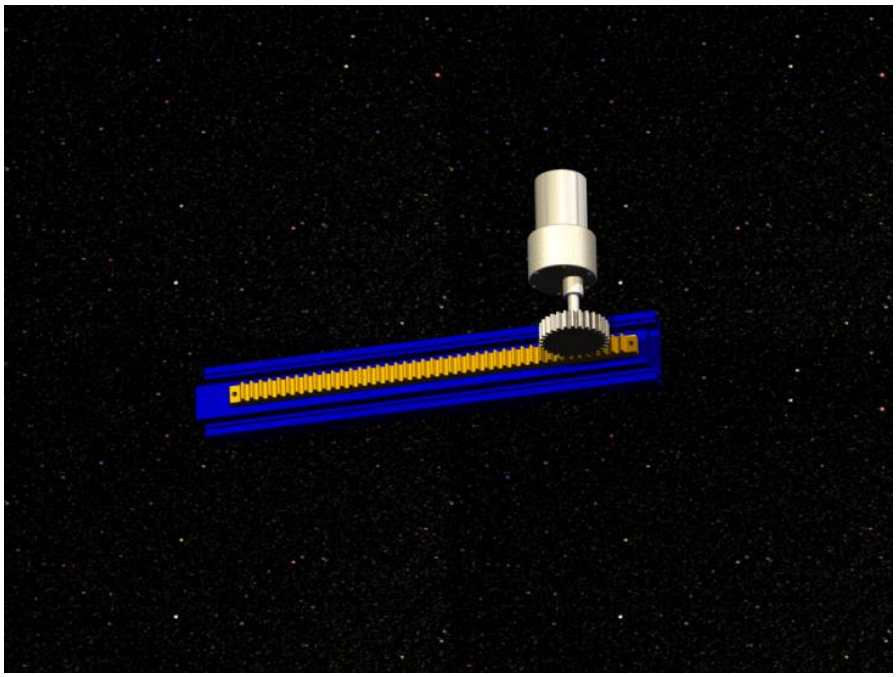
➢ Gripping Mechanism:

It works on ‘Lead-Screw Mechanism’ which efficiently converts rotational motion into linear motion. Each gripper consists of three nylon plates, a 300 rpm dc motor, nut and bolt. Out of the three plates, two are fixed and the third plate moves parallel to the others. The rotation of the motor is used to move the plate. The beauty of this mechanism is that the movable plate won’t move on its own and hence the rope can’t slip.



Translational Mechanism:

It works on ‘rack and pinion’ mechanism. It consists of a slider on which a rack is fixed and a gear mounted to a high torque dc motor is used to move the slider.

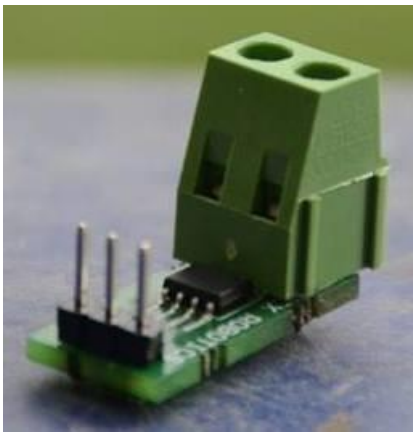


ELECTRONICS:

Components:

- Arduino

- Current Sensor



- Motor drivers

- 12V LiPo battery

Use of current sensor:

Current sensors are used to measure the current through the motor in the grippers. Once the gripper starts to grip the rope, the current through the motor increases. As this current exceeds a particular value (a value at which the rope could not slip), the motor stops and the rope is firmly held.

APPLICATION AND FUTURE ASPECTS:

Preferably under suitable camouflaging packaging, the bot can be effectively work as a spy, monitor buildings. It already has a good payload capacity; therefore it may carry the power supply and a camera onboard. Hostage situations in large buildings could use such a monitoring device. Maintenance of high tension power lines could be another application.

Maintenance of lift shafts and cable could also be done through such climbers.