

# **CUBLI**

## **Motivation**

Every idea has a motivation behind it. For this idea, it was more of passion for robotics and mechanics rather than motivation. The beauty of physics and its laws can be used efficiently to build many huge machines and even small things like Cubli.

## **Broad Vision**

This can be used to make self stabilizing bots. The main use of it is for locomotion in places where the gravitational force is low i.e. other planets. The motion of this cube will not be heavily dependent on the frictional force, which is very less in places of low gravity.

## **Theory of Implementation**

The cube can balance on its edge or its side using the principles of conservation of angular momentum. Once balanced, it will remain at the stable equilibrium position even in presence of external forces. This happens by producing torques to cancel out the external torques about the balance point. There will be wheels which will rotate with the required angular velocity. With the help of sensors, we will be able to analyze the real time position of the object and thus calculate the torque required to be given to the wheels to balance the body.

## **Demonstration**

At the end of the project, our Cubli should be able to stand on its edge and vertex without any external support. If time permits and if we are equipped with sufficient knowledge, we will try and make the Cubli move from one point to other. But our main aim will be to make the Cubli stand on its own. We will also try to make it rotate about the vertical body diagonal once it stands on the vertex.

## **Timeline**

### **Week 1:**

- Understanding properly the functioning and dynamics of the Cubli
- Designing the Cubli on SolidWorks
- Making the 2-D prototype

### **Week 2:**

- Rectifying designing mistakes (if any)

- Making the 3-D prototype that stands on the edge

#### **Week 3:**

- Making the 3-D prototype that stands on the vertex and rotates

#### **Week 4:**

- Understanding the process of locomotion of the Cubli
- Implementing locomotion into the Cubli

#### **Week 5:**

- Implementing locomotion into the Cubli
- Controlling the motion of the Cubli

#### **Week 6:**

- Buffer week

## **Requirements**

We will require the following parts:

- Metallic frame for both the 2-D prototype and the 3-D prototype
- High angular velocity motors
- Wheels
- Sensors to detect the position of the body (Gyroscopes)
- Immediate brakes for the wheels
- A few basic electrical components (Including a microprocessor)
- A few basic mechanical parts
- Batteries
- Gear boxes

We will also require mentorship in understanding the functioning of the sensors and a few other things.

## Estimated Cost

Depends mainly upon the cost of sensors, motors, batteries, gear boxes, etc.

## References

[https://www.youtube.com/watch?v=n\\_6p-1J551Y](https://www.youtube.com/watch?v=n_6p-1J551Y)

<http://robohub.org/swiss-robots-cubli-a-cube-that-can-jump-up-balance-and-walk-across-your-desk/>

<https://www.youtube.com/watch?v=bMuCACqwl4s&feature=youtu.be>