ITSP ABSTRACT

TEAM NAME : IITB Heavyweights
TEAM ID: 96

Team members

1. Abhishek Patil 150100013
2. Anant Joshi 15D100005
3. Bhavesh Thakkar 150100007
4. Dhanvi Sreenivasan 15D100009

Motivation

Motivation includes a chance to learn more about PID, embedded systems and control systems. Also, our passion for robotics and mechanics trumped utility.

Demonstration

Our final model should be able to bring back a ball to the centre of the table if displaced, at the very least. If time permits, we hope to be able to change the equilibrium position. If there's more time, we would like to make the ball trace a curve of choice.Here is the Youtube link of what we aim to achieve. It would be similar to the enclosed video.
This idea can be used to make self-balancing food trays, or anti-spill drink holders.

Theory of Implementation

BALL-ON-PLATE BALANCING CONTROL SYSTEM

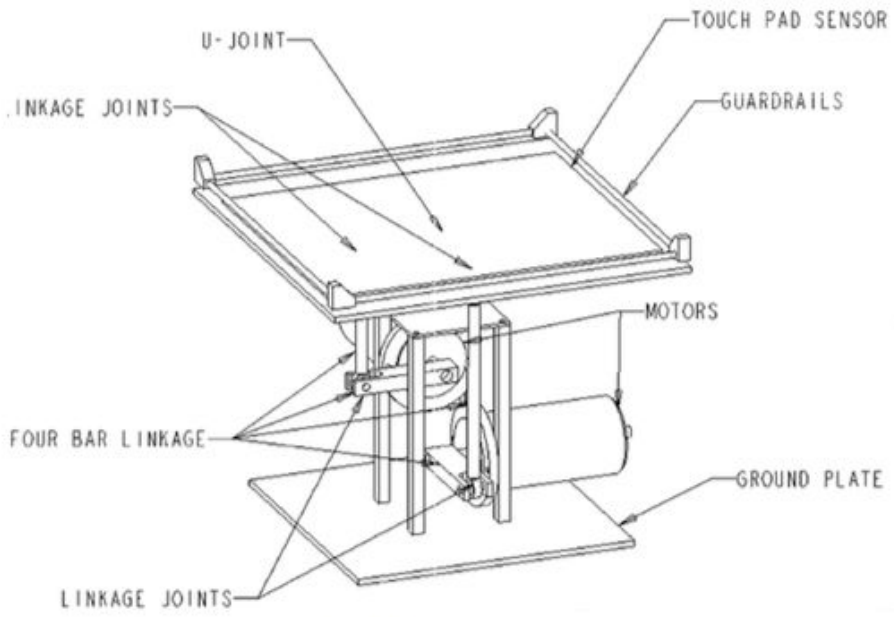

Fig. 2. Ball-on-plate system assembly.

We plan to implement the mechanics according to the theory enclosed in the following paper. It basically is a ball on an inclined plane, which is constrained not to slip. (Limiting the degrees of freedom of system, and making for an easier model)
Paper 1- Description of Mechanical system
Paper 2- Description of Electrical system.

Implementation

1)The ball's position will be obtained either by:

a) A touch screen used as the table top.(First preference)

b) Image processing by mounting a camera on top.

2)Mechanical aspects:

a) Use two servo motors,one for the motion about each axis.

3)PID implementation:

a) We would estimate position using (1) , and then based on displacement from centre, add an appropriate correction term to the rotation of the motors. We would be implementing Pulse Width Modulation (PWM) to control the rotation of the motors.

4)Embedded Systems

a) We shall first try it on Raspberry Pi as we already know Arduino.

b) Once we've achieved it on R-Pi we shall try to implement it on AVR which is more reliable, cheaper and faster. (@Kunal, We have not put much thought into this, and this is only if we have extra time).

Timeline

We propose a team meeting every 2 days, and a meeting with our mentor twice a week (if he/she is available). We start on 25th April and plan to finish by 10th June.

Week 1

Research the algorithm

Decide the make, model of and order the components needed.

Week 2 & 3

Construction of the body

Testing of mechanical components

First implementation of code.

Week 4 & 5

Calibration for PID.

Conducting tests, making fine adjustments and debugging our code.

Week 6

Buffer

Requirements (with individual estimated cost)

Touch screen + Controller ~	**Rs 8000**	**(Excludes Shipping)**
Camera (If above fails)	**Rs 4000**	
Servo Motors (x2)	**Rs 2200**	
Motor driver (L293D)	**Rs 250**	
Raspberry Pi -	**Rs 2200**	
AVR -	**Rs 200**	
Aluminum linkages and braces-	**Rs 3000**	

Total Estimated Cost

Case I - With Touchscreen: **Rs. 16000**

Case II- With Camera: **Rs. 12000**