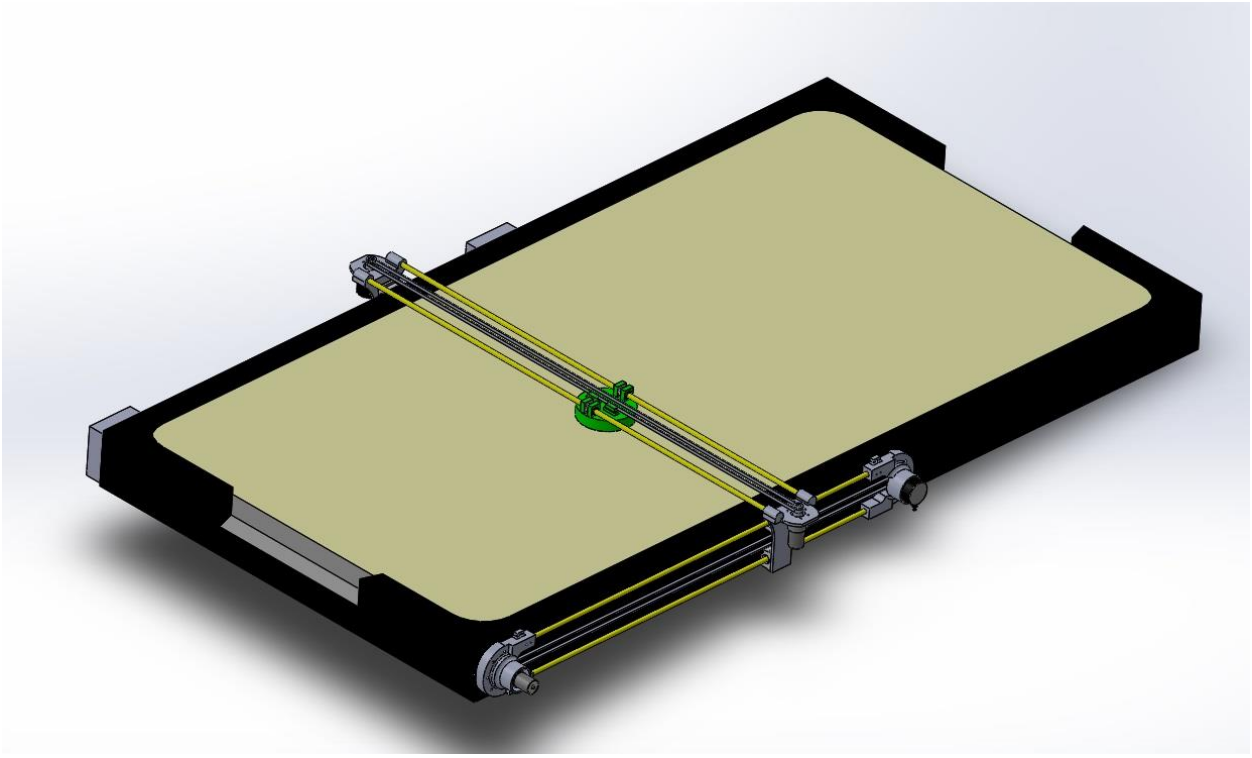
AIR HOCKEY ROBOT

SRISHTI ’20 IITR

PROJECT REPORT



Introduction

This project aims at improving the gaming experience of people. Its main objective is to provide a completely manual game of Air Hockey, a touch of robotics and automation where one player will be human and the other end will be played by the bot.

Features

- The bot can function autonomously on the air hockey table.
- It can perform tasks like defending and hitting.
- It can move across the width of the table as well as cover half the table length.
- To locate the moving puck at every instant Light Dependent Resistors(LDRs) are used which signals whenever the former passes over.

Acknowledgement

We would like to express our special thanks and gratitude to **Models And Robotics Section, IITR** and our mentors **Tabish Madni** and **Yashutosh Bansal** who gave us the opportunity and fruitful guidance to do the project on 'Air Hockey Robot' for SHRISTI '20, IITR

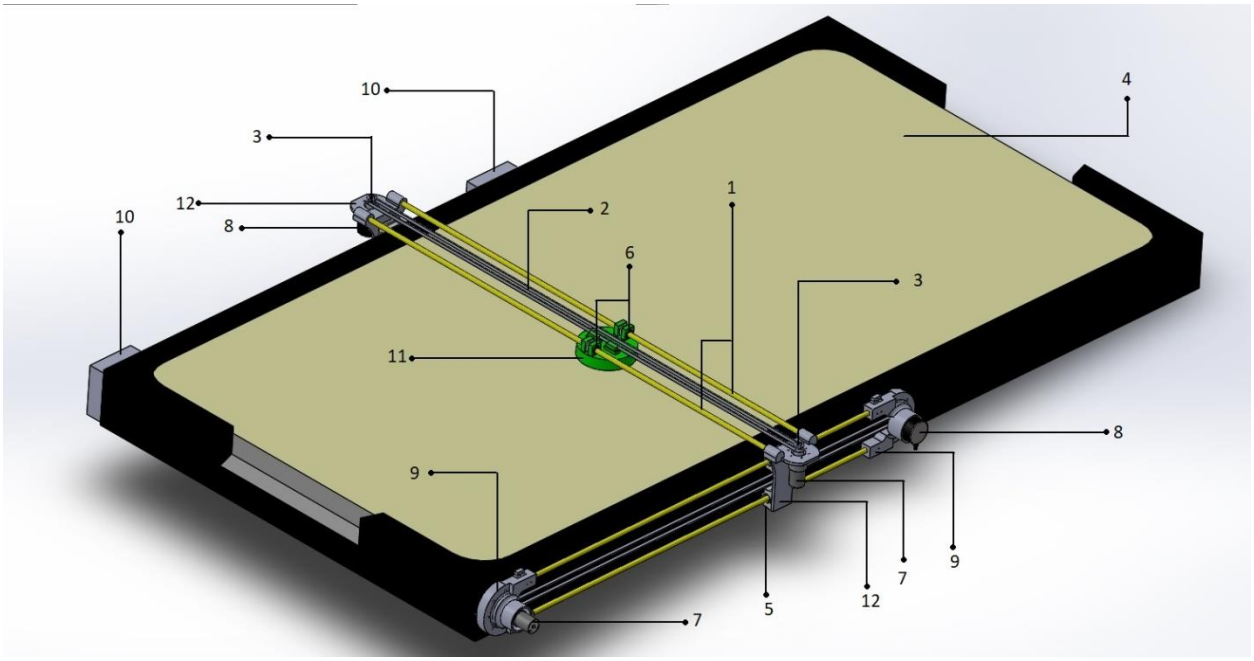
Components

- MS rods X6
- Timing belts and gears
- MDF board (6x8 feet)
- Linear bearings 8mm
- Light Dependent Resistors (LDRs)
- Johnson DC motor X2
- Rotary Encoder X2
- Arduino MEGA
- Cytron motor driver
- 12V power adapter
- Electrical wires
- Breadboard
- 3D printed frames

Mechanical aspects of the design

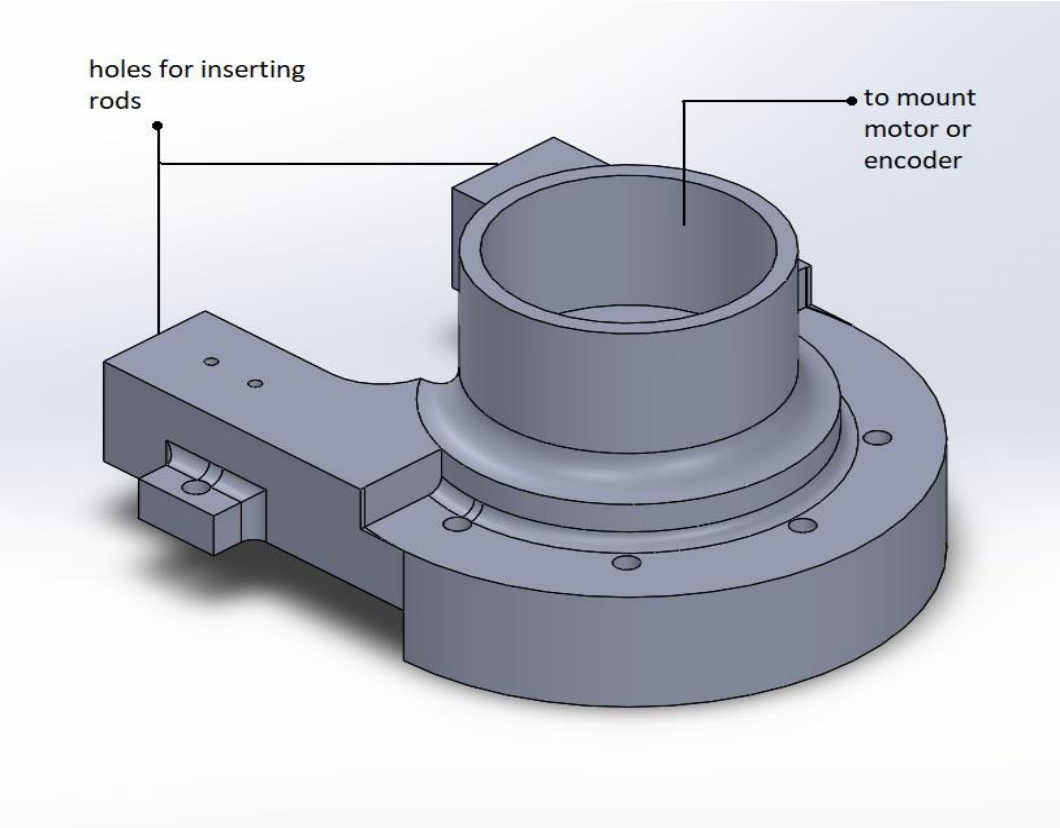
Structure

*all the numberings below are subject to this figure

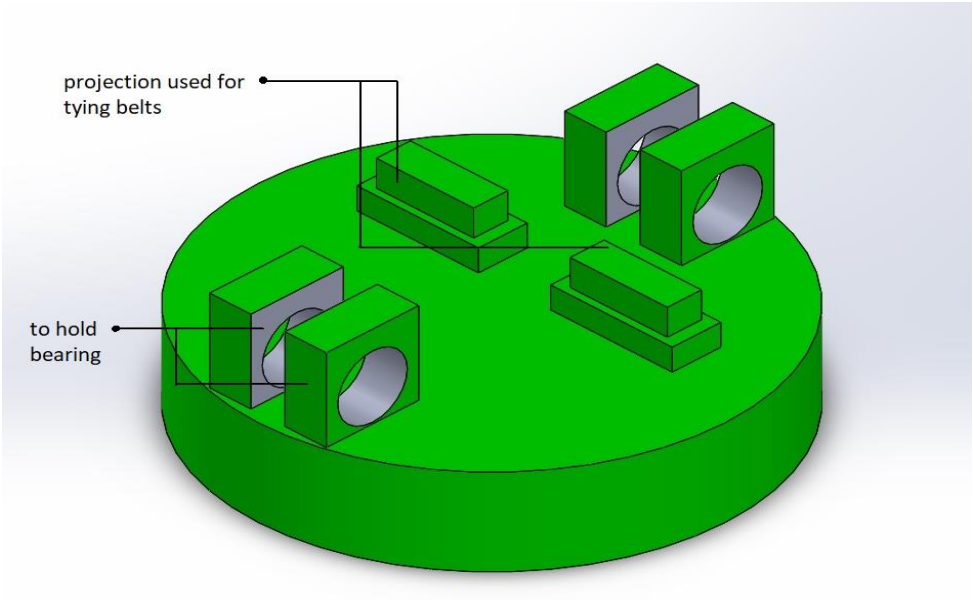


1. MS rods (8mm) which is connected to the defender(11) through cylindrical linear bearings(6) for smooth sliding.
2. Timing belts (6mm) are used for power transmission.

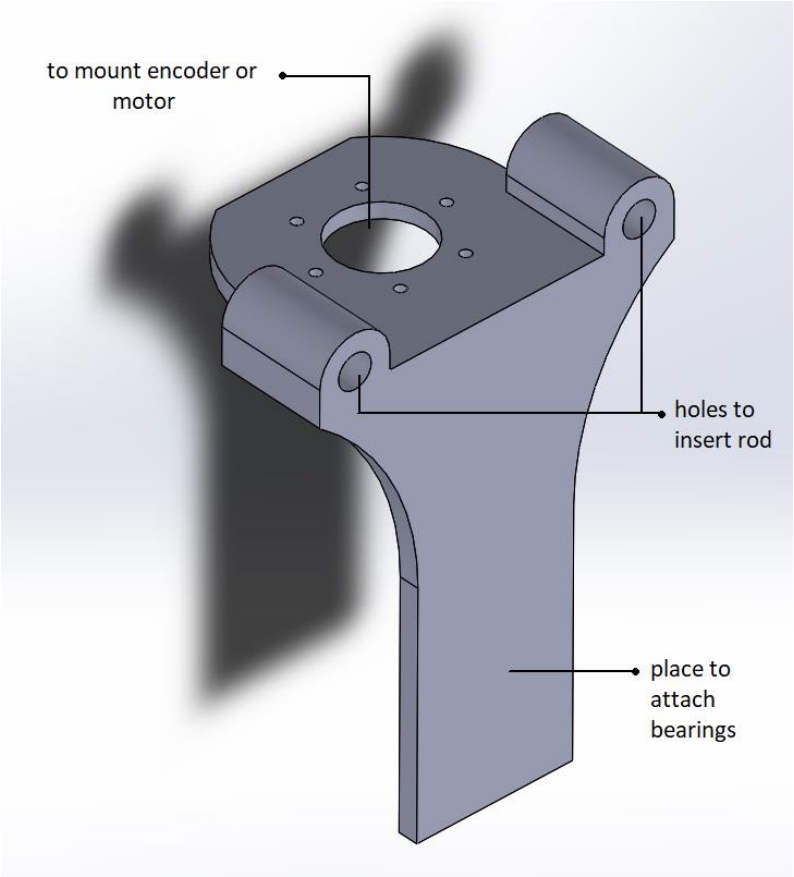
3. Timing belt gears
4. MDF board is used to make the table top on which holes are drilled to fix LDR sensors.
5. Linear bearings rectangular (8mm).
6. Linear bearings cylindrical (8mm).
7. Johnson DC motors.
8. Rotary encoders.
9. 3D printed frame(design below) connected through 2 rods for holding encoders and DC motors.



10. 3D printed frame only for holding rods.
11. Defender(design below) which actually plays the game and does the job of hitting the puck.



12. 3D printed L frame(design below) which slides over side rods, holds encoder and DC motor and is used to connect the two transversal rods on which defender slides.



Movements

The defender traverses distances on metal rods with the help of linear bearings of size 8mm.

- **Transversal Movement :** The defender is directly attached to a 6mm timing belt(2) which in turn is attached to a DC motor with the help of a gear(3). It moves the defender on two rods, firmly attached to a L shaped frame(12).
- **Longitudinal Movement :** The whole two rod frame moves on another pair of two rod frame attached on both sides of the table till half its length. This frame is also attached to a DC motor through a timing belt from one side which ensures the longitudinal movement of the bot.

Electronic aspect of the design

Power

The motor driver is directly powered by a 12V DC power adapter.

Sensors

- The table top is snared with a LDR grid consisting of 4 rows, each row consisting of different no. of LDR. The sensors are placed in determined order.
- Rotary encoders are synchronized with each motor. It is used to get the coordinate feedback of defender at every instant.

Actuators

Johnson DC motors are used for traversal of the defender on the rods.

Controllers

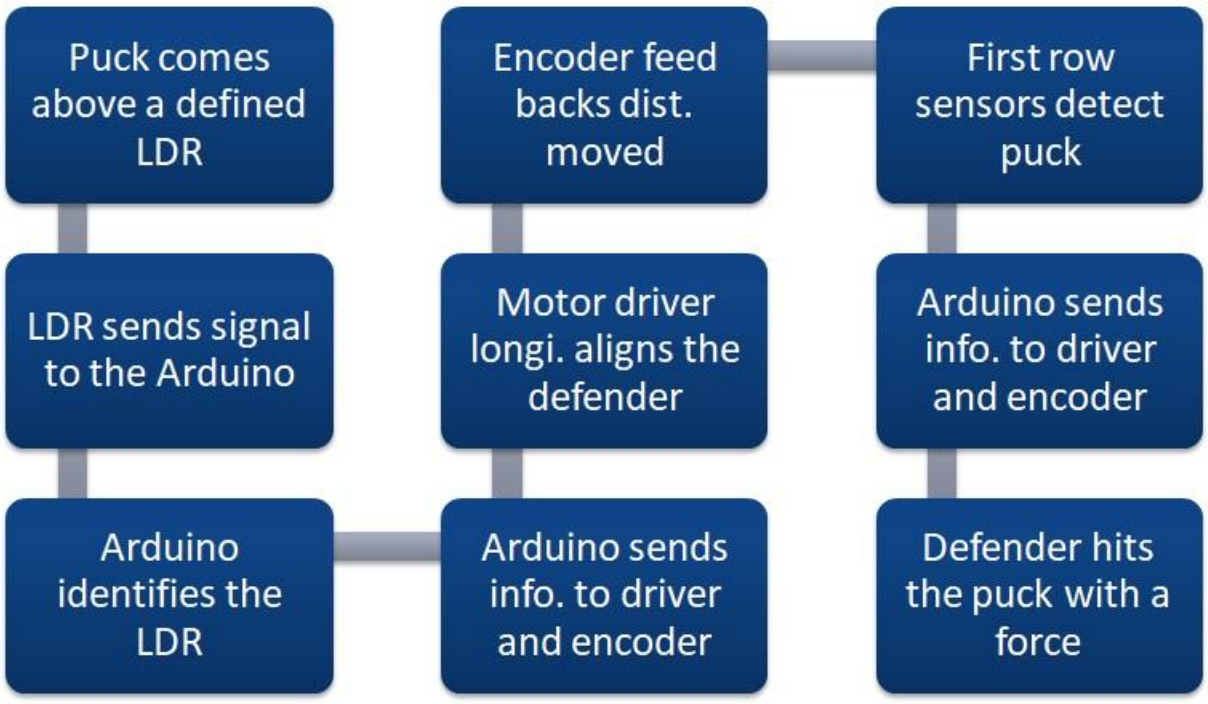
- Arduino MEGA is used as a microcontroller board.
- Cytron motor driver is used to control DC motors.

Functionality

As soon as a LDR sensor is devoid of room light which means the puck is directly above it, it sends a signal to the microcontroller.

Arduino MEGA is so programmed to identify that particular sensor and instruct the motor driver to start the DC motors to bring the defender in longitudinal alignment with the puck while staying back and hit it with a force as soon as it crosses the first row of sensors.

Workflow Chart



Cost Structure

Components	Cost (INR.)
1. DC motors X 2	600
2. Arduino MEGA	500
3. Cytron motor driver	1700
4. Rotary encoders X 2	3000
5. Metal rods	500
6. Timing belts and gears X 3	1200
7. Linear bearings X 6	1340
8. MDF board	1000
9. 12V power adapter	400
10. LDR sensors	400
11. Breadboard	180
12. Miscellaneous	500
TOTAL	11320

Application

- Gaming parlors
- Shopping malls: can be installed as quick game challenges
- Hostels: enjoyment for students
- Houses: as a personal gaming machine

Project status: **Incomplete** due to Covid'19 pandemic.

Future improvements

- LCD display module can be installed to interact with the bot like setting up difficulty level, counting scores etc.
- Image processing can be incorporated to contemplate trajectories.

Team Members

1. Mohit Singh
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4. Ojus Thool
5. Pranav Kumar
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Mentors

1. Tabish madni
2. Yashutosh Bansal

References

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