A Report on the Course Project of

Engineering Exploration (15ECRP101)

titled

ARYABHATIYA

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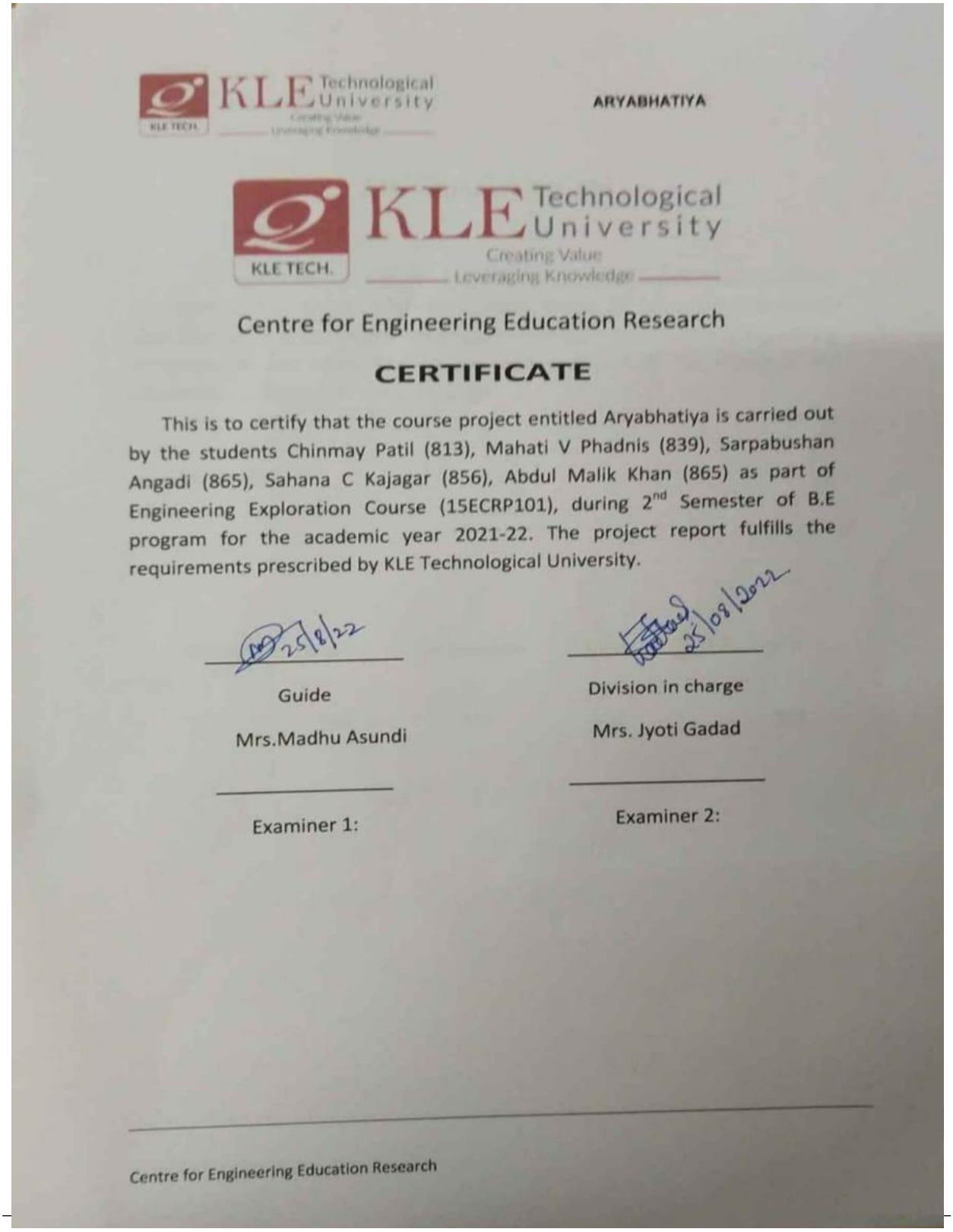
Centre for Engineering Education Research

Academic Year 2021-2022, Even Semester



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CERTIFICATE

This is to certify that the course project entitled Aryabhatiya is carried out by the students Chinmay Patil (813), Mahati V Phadnis (839), Sarpabushan Angadi (865), Sahana C Kajagar (856), Abdul Malik Khan (865) as part of Engineering Exploration Course (15ECRP101), during 2nd Semester of B.E program for the academic year 2021-22. The project report fulfills the requirements prescribed by KLE Technological University.

25/8/22

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DECLARATION

We hereby declare that the project work entitled Aryabhatiya submitted as a part of Engineering Exploration Course during 2nd semester of academic year 2021-2022, is a record of an original work done by us under the guidance of Madhu Asundi Mam. The project work and part of this report is not plagiarized to the best of our knowledge.

Date: 07/08/2022

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I consider it as a great privilege to express my gratitude and respect to all those who guided and inspired me in completion of this seminar. It is difficult for me to express sense of gratitude and appreciation for the help I have received in this endeavour. My effort here is a feeble attempt to do so.

First of all, I acknowledge for the provision of the required infrastructure by my esteemed institute KLE Technological University, Hubli.

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Thank you everyone for your warm support.

Abstract:

Education and developmental toys are known to boost your child's IQ level by better memory retention, coordination and increased literacy. Kids learning toys and games aid in challenging their minds. Brain games help stimulate the brain and make children think in unconventional ways to solve a problem. Just like physical exercise, the brain needs its own form of stimulation to improve upon areas like analytical thinking, creativity and problem-solving. The best part is that kids are likely to be open to the idea of a game as compared to, say, reading books. It has been observed that small children get attracted towards games very quickly. The main objective of the machine is to attract the kids towards game in a playful way and make them learn with interaction and enjoyment.

Maze, it helps in hand-eye coordination as your child needs to trace the path correctly. It improves their problem-solving abilities by forcing them to think out of the box. If one approach fails, they adapt and find other possible routes to get to the other side.

A maze requires that your child first scans his eyes throughout the page to try and figure out a solution. Scanning is a very important skill for reading and writing.

There is a problem – The Maze He needs to figure out a solution – Get into the maze and get out of it or reach the centre. How? – Find different paths Problem Solving Abilities are one of the most crucial skills required in everyday life.

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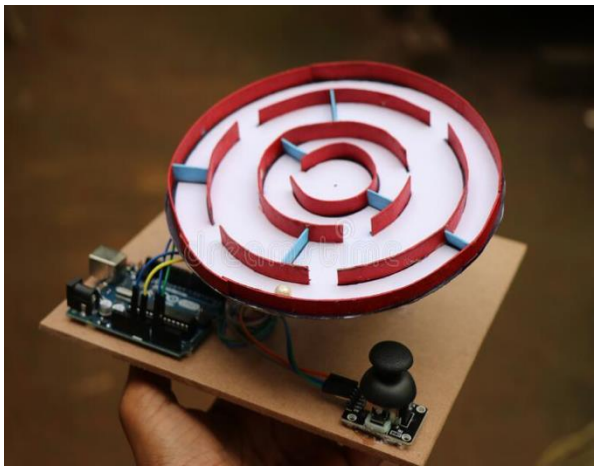


Fig.1.sample maze board.

Maze, it helps in hand-eye coordination as your child needs to trace the path correctly. It improves their problem-solving abilities by forcing them to think out of the box. If one approach fails, they adapt and find other possible routes to get to the other side.

Advantages of playing this game

A maze requires that your child first scans his eyes throughout the page to try and figure out a solution. Scanning is a very important skill for reading and writing.

There is a problem – The Maze He needs to figure out a solution – Get into the maze and get out of it or reach the centre. How? – Find different paths Problem Solving Abilities are one of the most crucial skills required in everyday life.

Citation

https://r.search.yahoo.com/_ylt=AwrKA1uL8e9iJf8E.UTGHAx.;_ylu=c2VjA2ZwLWF0dHJpYgRzbGsDcnVybA--/RV=2/RE=1659920907/RO=11/RU=https%3a%2f%2fwww.instructables.com%2fMaze-Game-Using-Arduino%2f/RK=2/RS=Yj.niv2VHIwpAcMW8K4tdhC0Me4

1.2. Gathering Pertinent Information

- Enhance cognitive skills. Mazes improve the cognitive skills of children.
- Fine tune motor skills.
- Strengthen visual skills
- Hand eye coordination
- Find effective solutions
- Virtue of patience
- Build confidence

Maze, improves their problem-solving abilities by forcing them to think out of the box. if one approach fails, they adapt and find routes to get to the other side.

1.3. Questions asked to client / users for arriving at Objectives, Functions and Constraints

Sl. No.	Questions	Answers	O	F	C
1	What should be the dimensions of the machine	2ft2*ft2*ft			Yes
2	What should be the age of the machine	1-18 years			Yes
3	Do we need a backup battery for our project	yes we need a backup battery	Yes		
4	What should be the budget of the machine	3000			Yes
5	What should be the weight of the machine	1-2kg			Yes
6	Should it be portable	yes, it should be portable			Yes
7	Should it have a voice command	it should not have a voice command		Yes	
8	At what time should the model be delivered	Within 3 and half months			Yes
9	What should be the durability of the machine	lifetime, battery set up has to be done	Yes		

10	Do we need a buzzer in it	no we need an alarm in it		Yes	
11	What kind of feature do you expect	working on backup battery	Yes		
12	Do you prefer any design or shape	design	Yes		
13	Should it be challenging	yes with a lot of challenge	Yes		

1.4. Objectives

SI.NO.	OBJECTIVES
1	Aesthetically pleasing
2	solving the maze
3	The machine should be semi-automatic
4	Machine should be portable
5	User-controlled
6	Machine should be User-friendly.
7	Interactive

Problem definition 1.1

Design an educational machine with the dimensions 2ft3ft2ft. This type of machine is suitable for kids of age groups between 1 to 18this type of machine is mainly focused on the concentration, interest, and mental ability of a particular kid.

1.5. Constraints

SI.NO.	CONSTRAINTS
1	The machine should not exceed 2ft x 4ft x 3ft
2	The machine should not exceed Rs 4000-5000/-
3	The machine should be less than 5kg
4	Below 18yrs of age
5	The delivery of the machine within 3 months.
6	The machine should work for 3hrs continuously
7	It should be made up of non-toxic materials

Problem definition 1.2

Design an Educational Machine having the Dimensions 2ft X 4ft X 3ft, Which is best suitable for the age group below 18 years, having a battery backup, with an estimated budget of 4000-5000/-. The machine must weigh around 5-6 KG, adding the portability and voice command(buzzer). It must be delivered within 3 and half months, the machine must be durable life-time, and also work for 3hrs continously & obviously it has to be built with a buzzer in it and must include interesting challenges for the complete involvement of customers (kids).

1.6. Functions

SI.NO.	FUNCTIONS
1	Ensuring balancing of the board using a gyroscope
2	Movement of maze board with help servo motor
3	Ensuring movement of ball from starting to end using gloves with gyro sensor
4	Movement of servo motor according to input given by user
5	Movement of maze board according to given commands

Problem definition 1.3

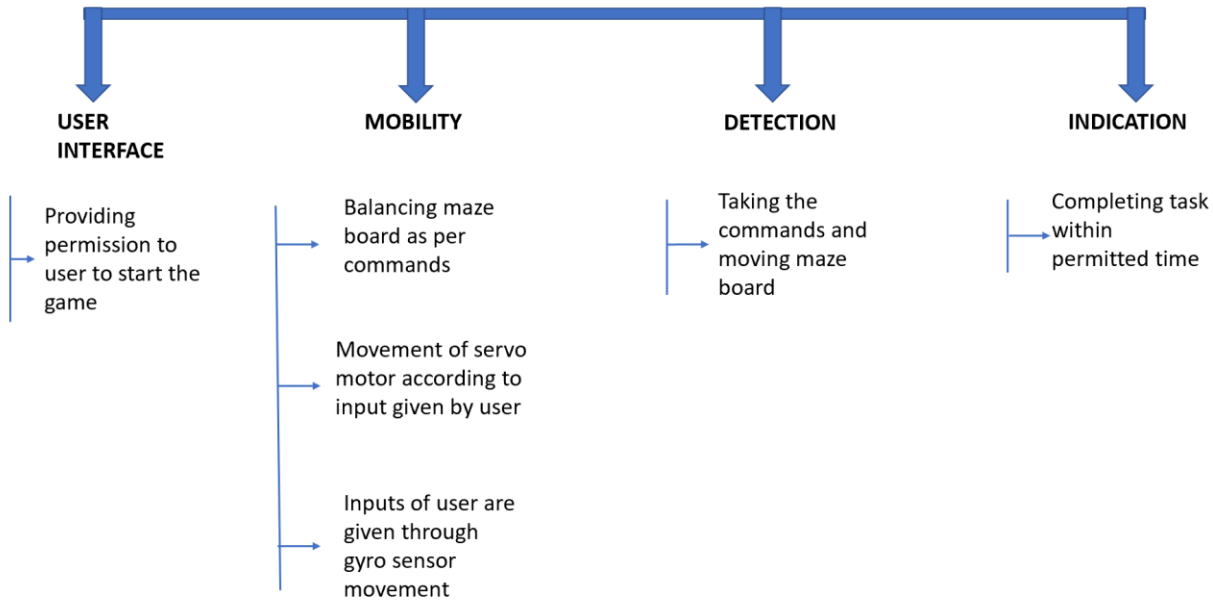
Design an Educational Machine having the Dimensions 2ft X 2ft X 2ft, Which is best suitable for the age group below 18 years, having a battery backup, with an estimated budget of 1000-3000/-. The machine must weigh around 1-2 KG, adding the portability and voice command(buzzer). It must be delivered within 3 and half months, and must include interesting challenges for the complete involvement of customers (kids).

2. Conceptual Design

2.1. Establishing Functions

SI.NO	Functions from User Perspective	Functions from the Designer perspective
1	controlling maze board	movement of maze board according to given commands
2	movement with hand	movement of maze board with help of servo motor
3	bringing ball from stating to finishing point	providing gloves with gyro sensor for use to move ball from starting to end
4	completing the challenge and deserving a reward	indicating when there is a glitch in the machine

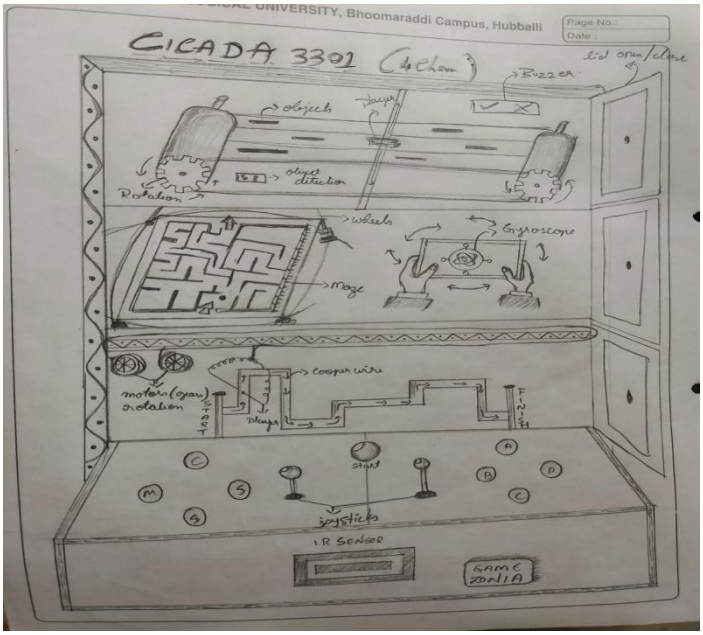
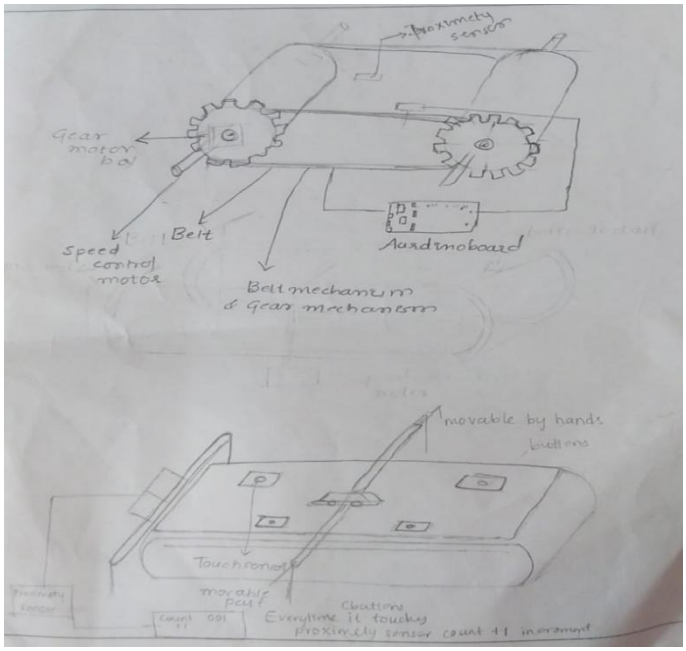
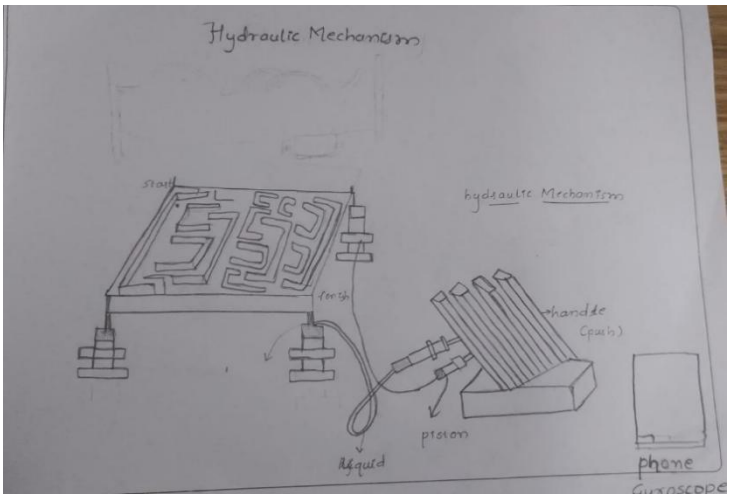
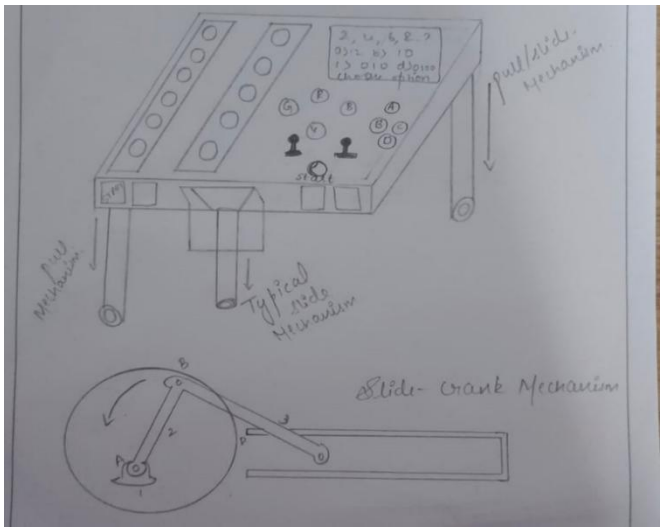
2.2. Functions Tree



2.3. Morphological Chart

Serial No.	Subfunctions	Means 1	Means 2	Means 3	Means 4
1	Rotating Shaft	DC Motor 	Stepper Motor 	Servo motor 	Gear System 
2	Inputs	Touch Controller 	Game Controller 	Joystick 	Mouse & Keyboard 
3	Involvement	Lighting 	Voice Message 	Buzzer 	VR speaker 
5	Visual Indication	LCD 	LED 	Plasma screen 	Broadcast 
6	Process Signal	Photoshop 	HTML 	PHP 	Hosting 

2.4. Generated Concepts

Concept 1	Concept 2
	
Concept 3	**Concept 4**
	

3. Conceptual Evaluation and Product Architecture

3.1. Pugh Chart

Design objectives	Weights	Design 1	Design 2	Design 3	Design 4
Safety	5	-	+	+	Datum
Ease of use	6	+	+	+	Datum
Portability	8	+	-	-	Datum
Use of standard parts	9	--	-	-	Datum
Cost	9	0	-	-	Datum
Score (+)		14	11	11	0
Score (-)		23	26	26	0
Total		-9	-13	-13	0

3.2. Justification for the Scores

Design No.	Objective	Score Allocated	Justification for the Score
1	Safety	9	Safety of the machine is reliable
	Ease of Use	8	No high complexities to handle the machine and interact with.
	Portability	9	machine should be portable
	Use of Standard Parts	9	Machine is quite a big
	Cost	9	Cost is economical and feasible
2	Safety	9	safety is noted
	Ease of Use	8	it is easily usable
	Portability	5	portable
	Use of Standard Parts	5	The machine is simple and there is no complexity in operation
	Cost	9	6000/-
3	Safety	9	promisingly safe machine

	Ease of Use	9	it is easily usable
	Portability	9	machine is portable
	Use of Standard Parts	6	Minimal use of standard parts in the machine
	Cost	9	1000-3000/-
4	Safety	9	Realiable
	Ease of Use	8	The is handy and have no complexity
	Portability	8	Its is easily portable
	Use of Standard Parts	5	Minimal use of standard parts in the machine
	Cost	8	Cost is feasible

3.3 Selected Design

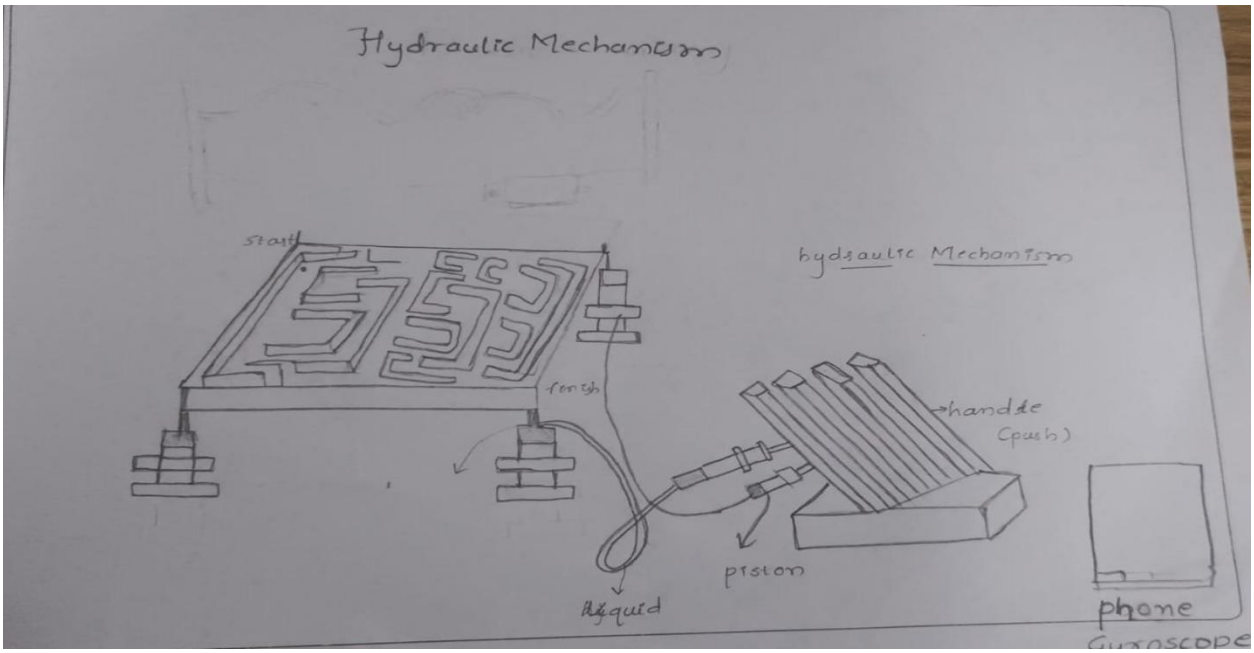
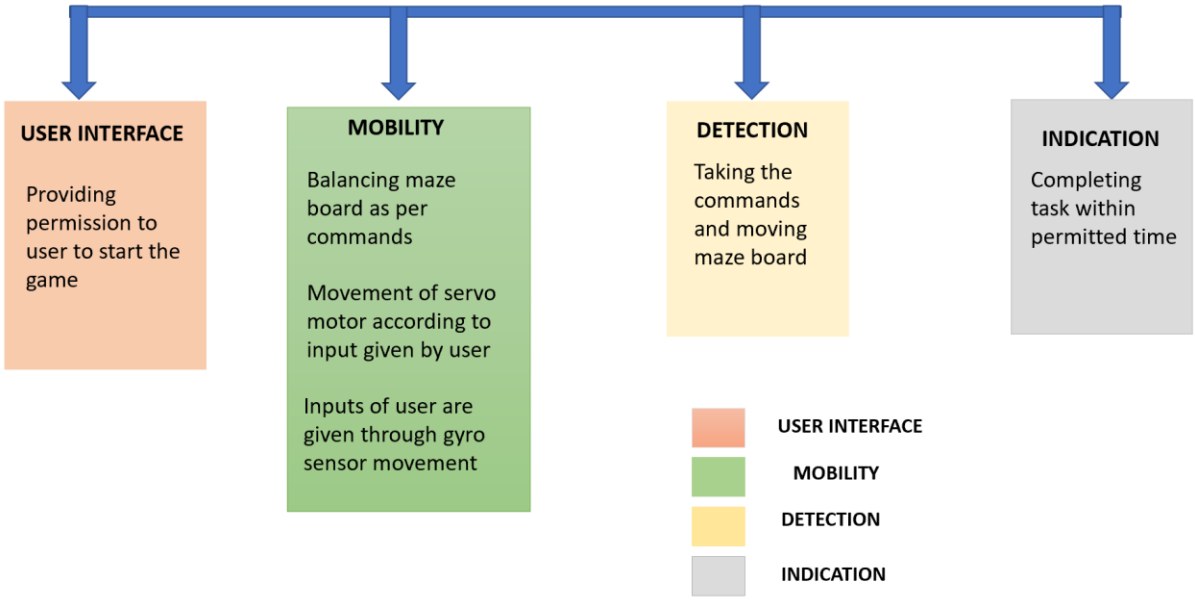


Fig.2.Selected design of maze board

3.4 Product Architecture

3.4.1 Function Clustering



3.4.2 Interaction between subsystems

		Sub System 2	Sub System 3	Sub System 4
Sub System	Energy	✓	X	X
	Data	X	X	X
	Material	✓	X	X

		Sub System 1	Sub System 3	Sub System 4
Sub System 2	Energy	✓	X	X
	Data	✓	✓	X
	Material	X	X	X

		Sub System 1	Sub System 2	Sub System 4
Sub System 3	Energy	X	✓	✓
	Data	X	✓	✓
	Material	X	X	X

4. Implementation

4.1. Sprint 1 Implementation

4.1.1. 3D model of the sprint 1 subsystem

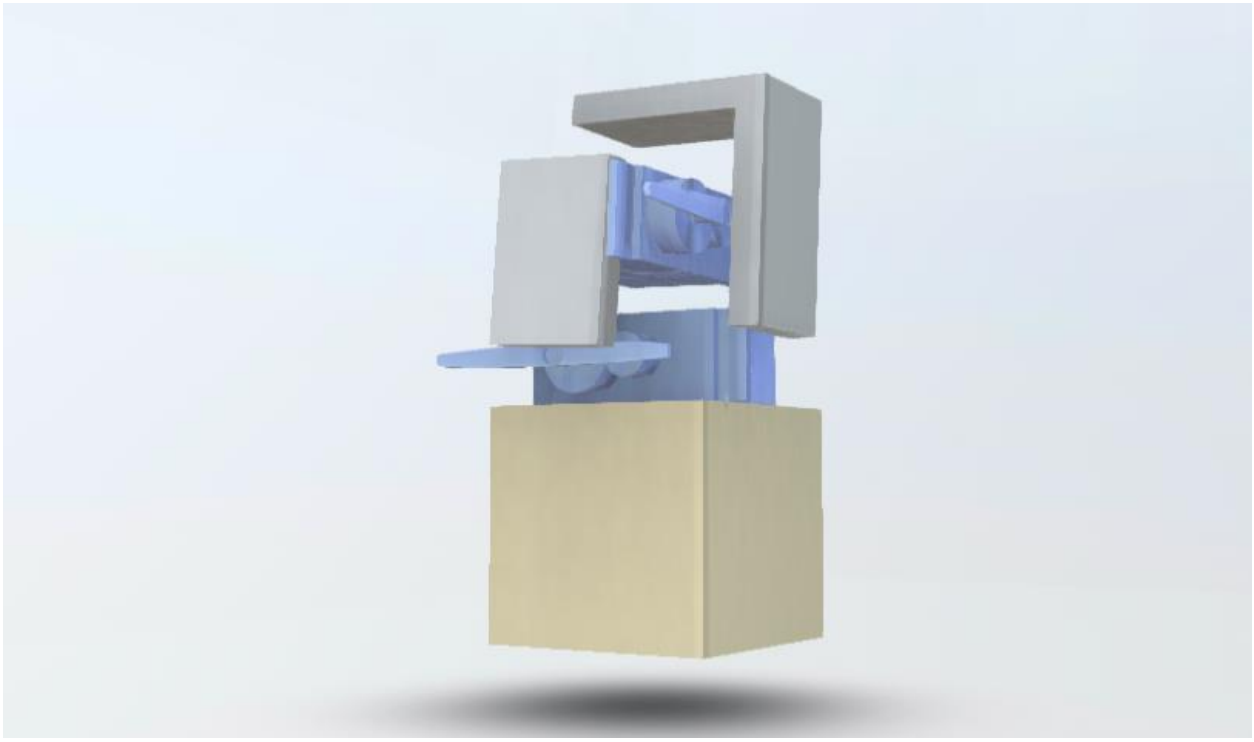
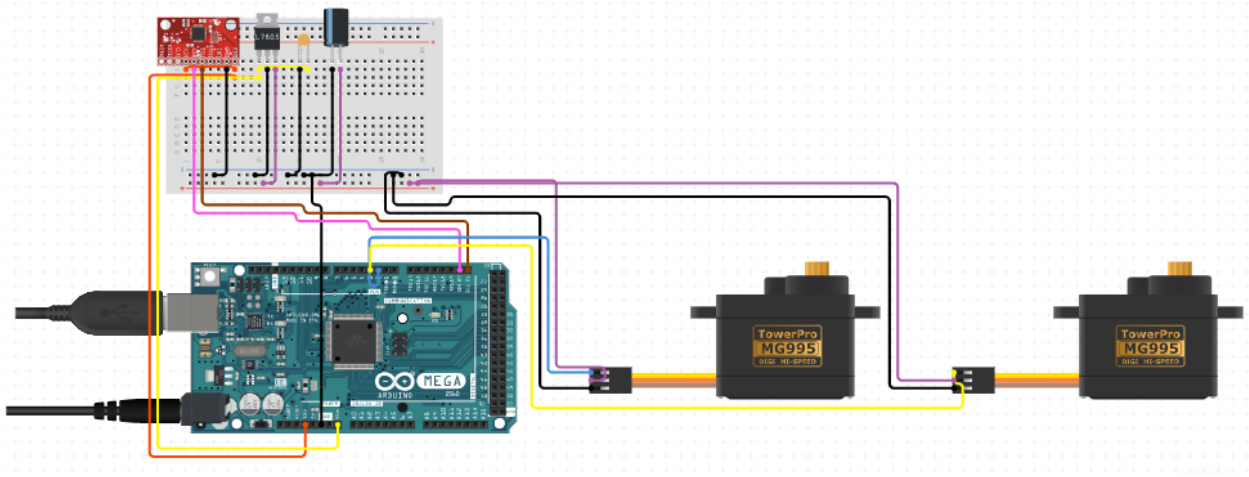


Fig.3.Placement of servo motor

4.1.2. Bill of Materials (BOM) of the sprint 1

Nuts and bolts of 4mm diameter

4.1.3. Circuit diagram of the sprint 1



4.1.4. Algorithm

Step1: Start.

Step2: if servo motor moves in x direction

The maze board moves towards right.

Step3: if servo motor in y direction the maze board moves front back

Step4: The maze board moves in direction in which how the player moves his hand

Step5: if player moves ball from start to finishing point then game ends

Otherwise player lose in the game.

Step8: stop.

4.1.5. Physical implementation image of the sprint 1

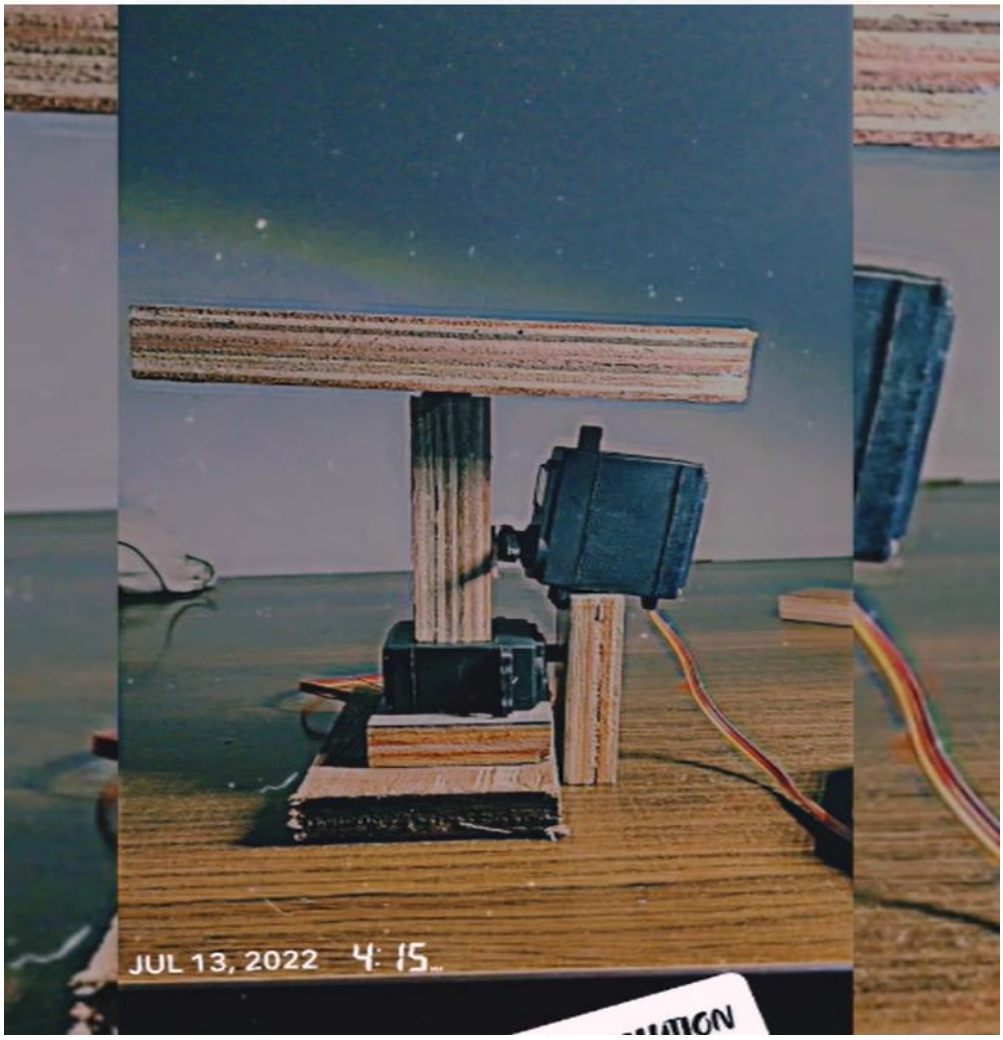


Fig.4.Base of maze board

4.2. Sprint 2 Implementation

4.2.1. 3D model of the sprint 2

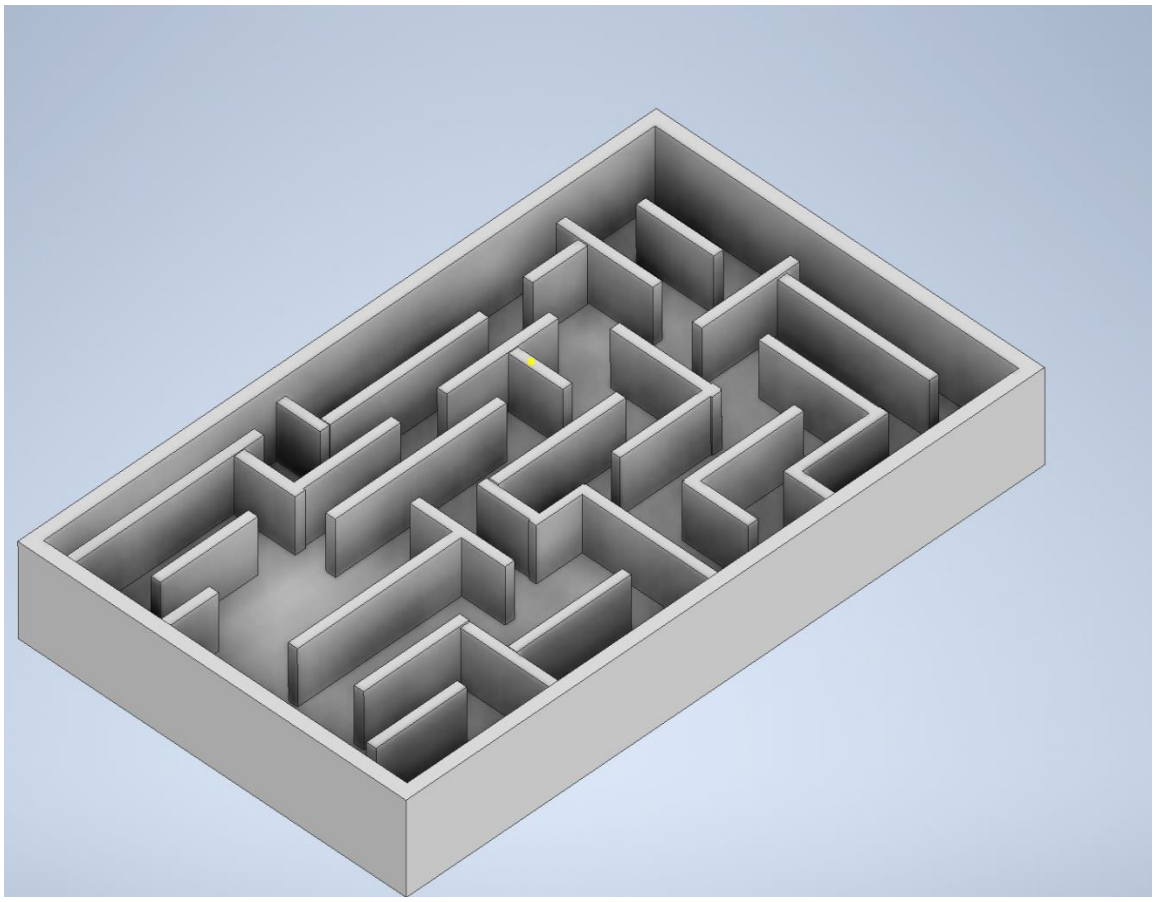


Fig.5.3D model of maze board.

4.2.5. Physical implementation image of the sprint 2

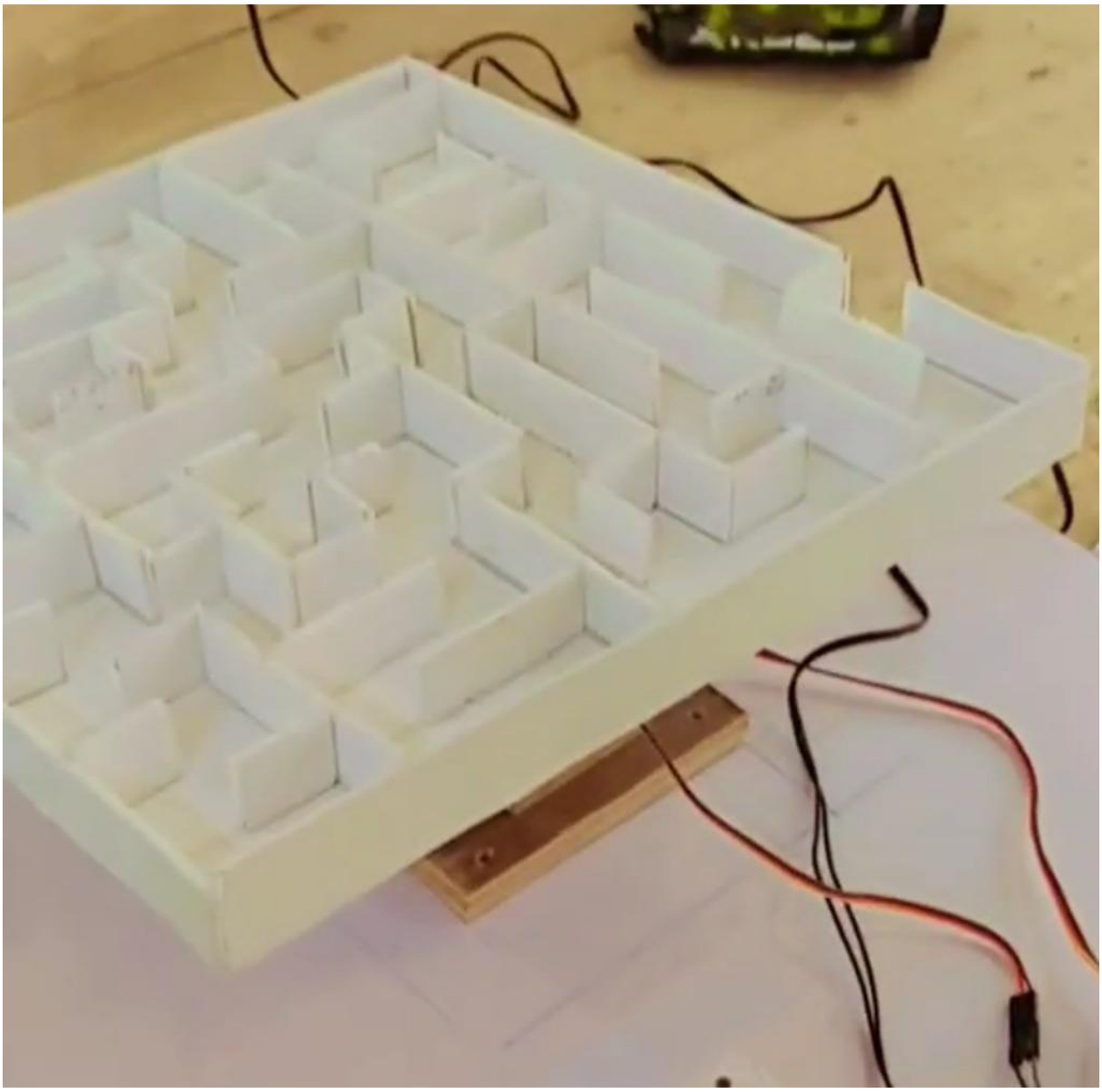


Fig.6.Maze board connections.

4.3. Sprint 3 Implementation

4.3.1. 3D model of the sprint 3 subsystem

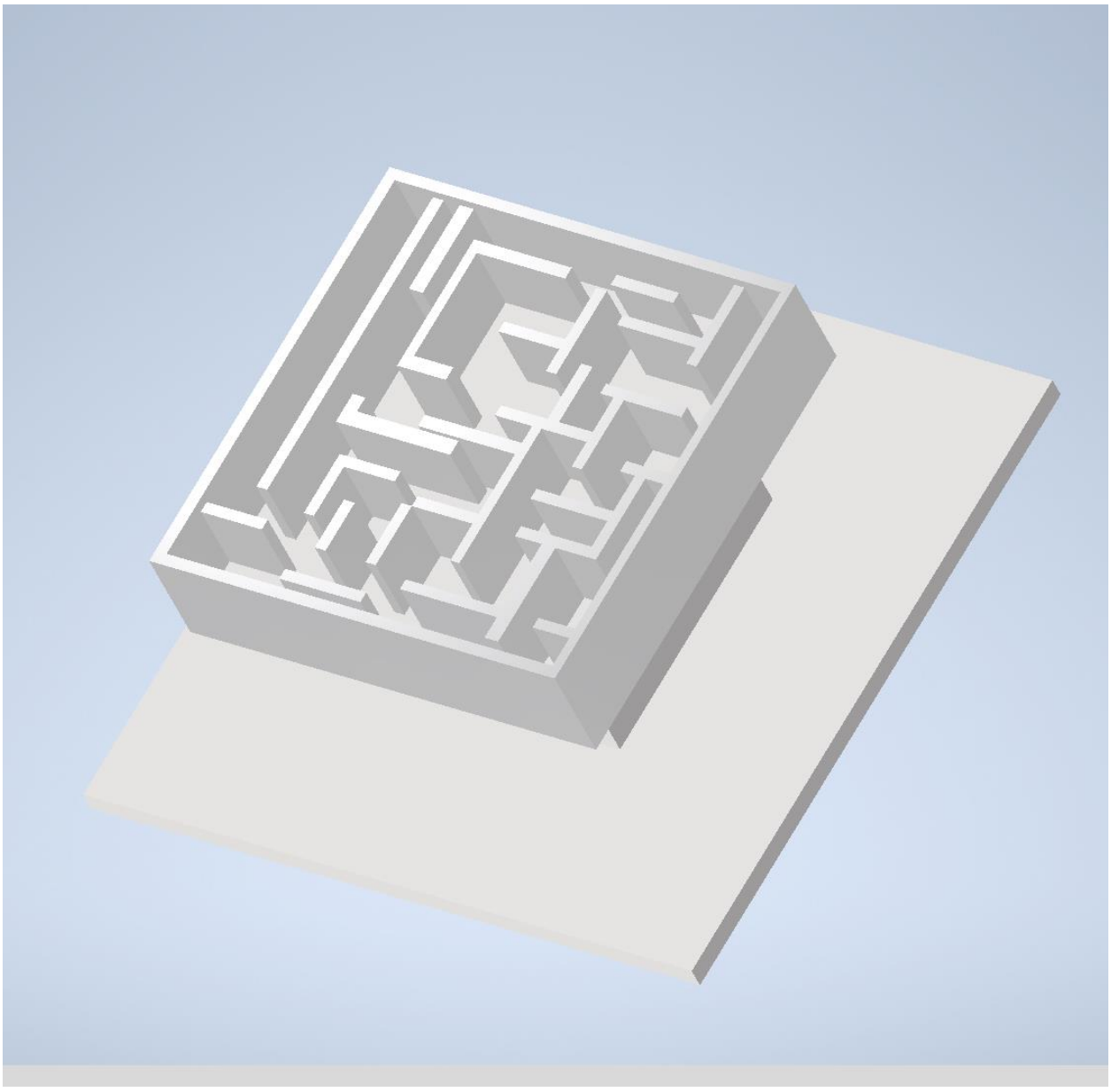


Fig.7.3D model of entire maze board.

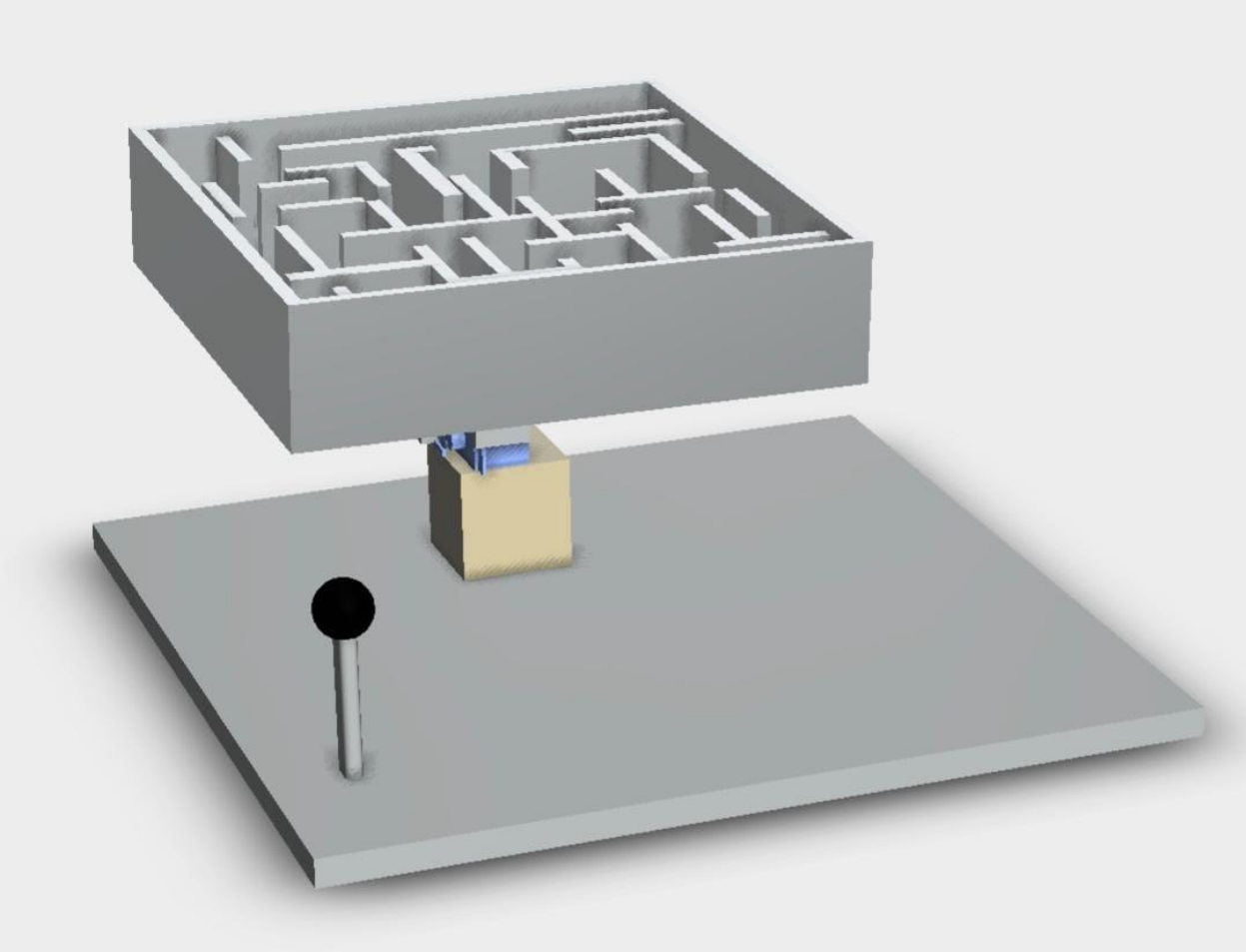
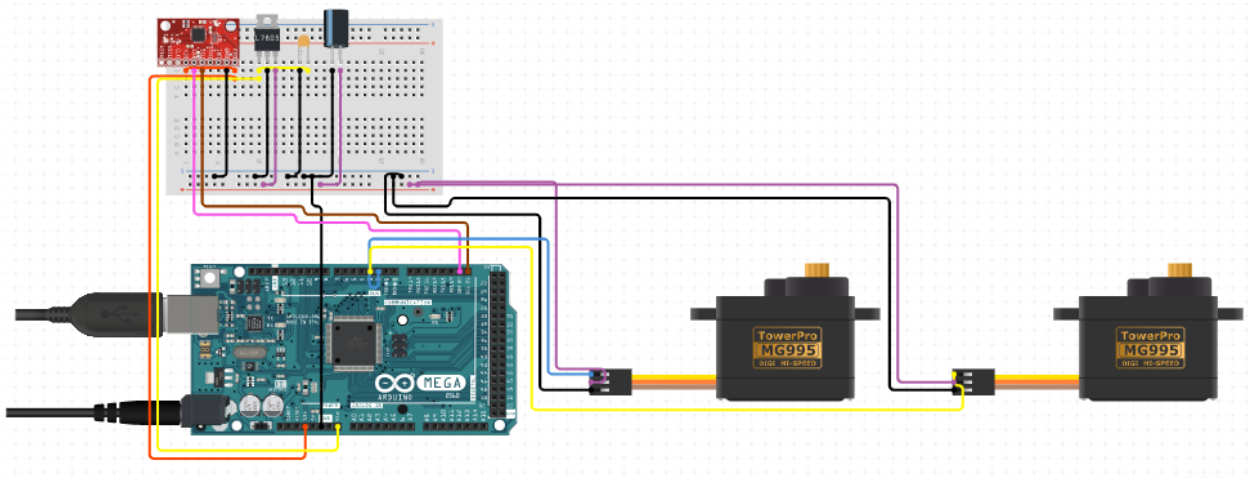


Fig.8.3D model of entire maze board.

4.3.3. Circuit diagram of the sprint 3



4.3.5. Physical implementation image of the sprint 3

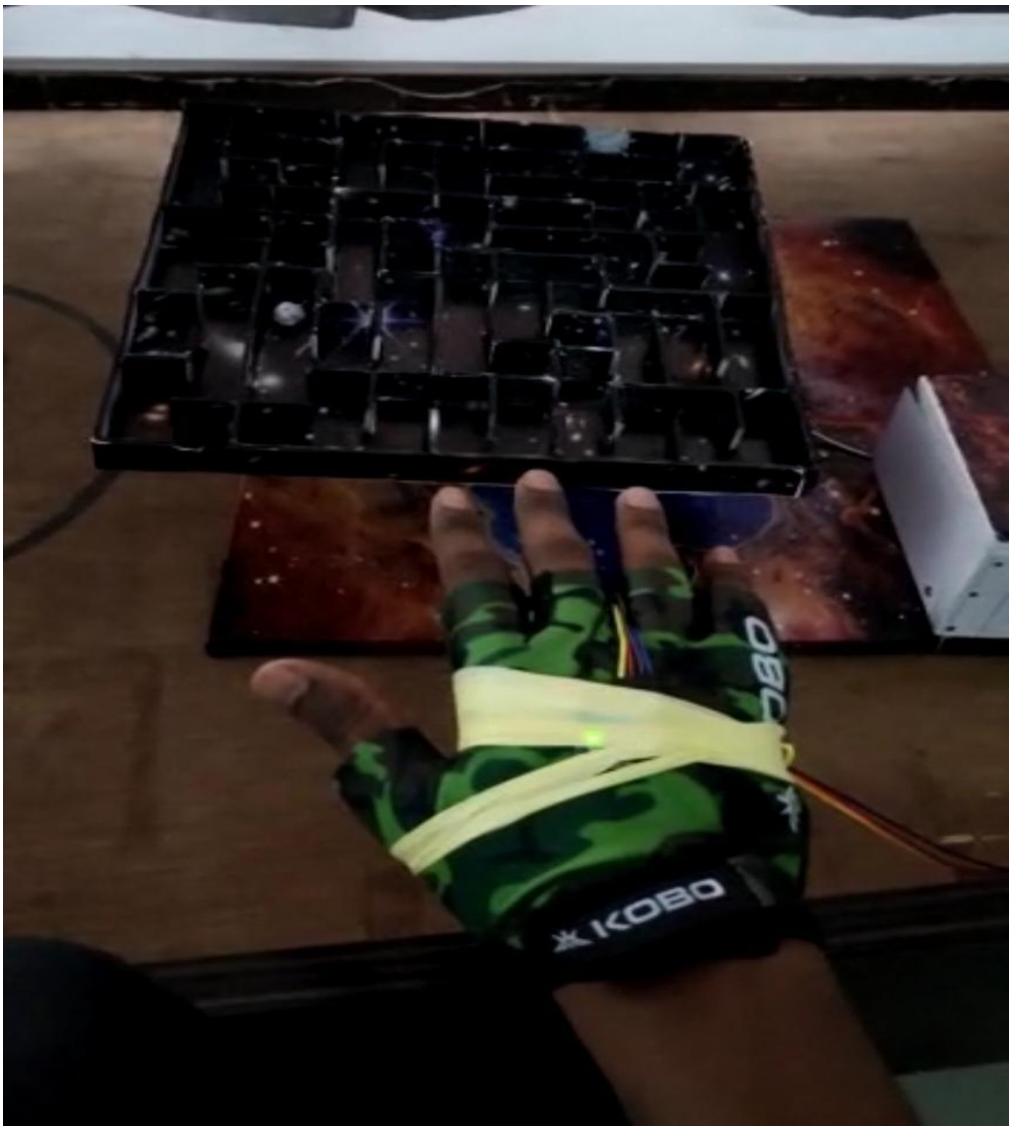


Fig.9 Gyroscope testing in milky way theme

5. Statement of Expenditure

Sl. No	Item with description	Quantity	Price in Rs.
1	Servo motor Mg995	2	870
2	Gyroscope sensor	1	250\-
3	Arduino Mega	1	1500\-
5	Designing materials	2	100\–
		Total	2720/-

6. Limitations of Present work and Future Scope

Drawbacks of our project was, we couldn't place the maze board on the servo motor due to weight.

In the starting gyroscope sensor was working but due to high voltage the sensor got heated up and stopped working.

We were searching for strong base so that we could place maze board on the servo motor.

Our main focus is on the project, our project is maze board. Well this sound very simple but while playing the maze game it requires complete concentration and focus and our main strategy is on focus of each and every student.

Right now, we have used only gyroscope sensor for the movement of servo motor upon which we have placed the maze board.

Gyroscope sensor, also known as angular rate sensors or angular velocity sensors, are devices that sense angular velocity. In simple terms, angular velocity is the change in rotational angle per unit of time Angular velocity is generally expressed in deg/s.

In future we would like to carry our project in very different manner likewise we would want to control the maze board based on our body movements; almost similar to gyroscope sensor.

To make it more valuable we would use the sensor in which our based on our body control we can move the maze board.

References

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5. https://youtu.be/VA7BRqjwK98