A Minor Project Report on

"SMART SCARECROW"

Bachelor of Engineering in

Mechanical Engineering

Submitted by

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Under the Guidance of

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CERTIFICATE

This is to certify that Capstone Project entitled **"Smart Scarecrow"** submitted by **Team 10 to** the **KLE Technological University**, Hubli-580031, towards partial fulfillment for the award of the degree of Bachelor of Engineering is a bona-fide record of work carried out by him/her under our supervision. The contents of project report, in full or in parts, have not been submitted to any other institute or university for award of any degree or diploma.

Prof. Gururaj Fathepur	Dr. B. B. Kottursheettar
Guide	**Head of department**

ACKNOWLEDGEMENT

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Student signatures

(Team 10)

Phase wise Contents:

Course: Minor Project

Course code: 18EMEW303

Semester: Six

Credits: 6

Team size: Six in a team

Team criteria: Team members can be from different divisions, Minimum of one diploma student in a team and selection of one student from other branches is optional.

Theme: Precision Agriculture, Hospital Automation, Factory Automation, Social Issues or Any other Mechatronic Product.

Phase wise Contents:

1. Refined problem statement		*(Tick mark the cell once each activity is completed)*
1.1	Identifying end users (Customers)	
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Phase 1

1 **Refined problem statement**

1.1 Identifying end users (Customers)

- Determine who the customers are for your product

1.2 Identify customer needs

- Determine what information should be gathered from customers, their needs, expectations

1.3Analyzing the needs

- Determine how that information should be gathered

Sample Table to collect the customer need statement:

S

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses Mainly Farmers, Gardener's etcs	It should be portable and have all the required function.	To protect the crops from birds and animals.
	It must be easy to use and understand.	It should produce sufficient sound and cover large area.(around 2 acres)
	It should be affordable.	Easy interface
Likes-current methods followed(traditional techniques)	Keeping traps , nets and electric fencing for wild animals and birds	Electric fencing that do not harm any wild animals
Dislikes-current methods **followed(traditional techniques)**	Sometimes the traps and nets don't work and electric fencing is too dangerous	Electric fencing and flash lasers
Suggested Improvements	Fencing which do not harm anyone	Electric fencing that do not harm any wild animals and flash lasers

1.4 Requirements List

Customer	Requirements
Farmers	Electric Fencing which do not harm anyone
	Flash lasers

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses: Mainly Farmers, Gardener's etcs	It should be portable and have all the required function.	To protect the crops from birds and animals.
	It must be easy to use and understand.	It should produce sufficient sound and cover large area.(around 2 acres)
	It should be affordable.	Easy Interface.
Likes-current methods followed(traditional techniques)	Tieing old cloths and sarees around the fields .	Fencing the field and tieing vibrant color cloths around the field.
Dislikes-current methods followed(traditional techniques)	Animals enter the field when the clothes are torn	Fencing the field and alarming when the animals cross it
Followed traditional techniques	Fencing the field by clothes of vibrant colors.	Fencing the field with alarming system in it.
Suggested Improvements	To make loud noise with alarming system	Fencing the field with alarming system in it.

1.5 Requirements List

Customer	Requirements
Farmers	Fencing the field
	Alarming system

Question/Prompt	Customer Statement	Interpreted Need/ Expectations
Typical uses: Mainly Farmers, Gardener's etcs	It should be portable and have all the required function.	To protect the crops from birds and animals.
	It must be easy to use and understand.	It should produce sufficient sound and cover large area.(around 2 acres)
	It should be affordable.	Easy Interface.
Likes-current methods followed(traditional techniques)	Scarecrows.	Scarecrows that do some actions.
	Crackers	Continuously making loud noise.
Dislikes-current methods followed(traditional techniques)	Fire crackers do the job for a few minutes	To make continues sound
Followed traditional techniques	Placing scarecrows, beating drums and bursting fire crackers	Scarecrow that do some actions and make loud noise continuously
Suggested Improvements	To make continuous sounds that can reach wide range.	To make loud noise continuously using speakers

1.4 Requirements List

Customer	Requirements
Farmers	Making high decibel sounds continuously
	Operation during night time
	Scarecrow doing some actions

Phase 2

2. Product Benchmarking

2.1 Studying and exploring competitive products

Products (Images or name)	Specifications	Cost	Advantage	Limitations	Availability
1.  ScareCrow Outdoor Animal Deterrent.	Brand-Contech Style-Electric Trap Item Dimensions 32 x 18.5 x 9.1 Cm Item Weight - 1.35 Pounds Power source-DC Charge.	Rs.3500	It covers a range of 1200sq ft day and night. It has strong water sprayer as repellent.	It cant be used in big farms. Its not cost efficient. It doesnt have any warning buzzer in it. There is very less chance of animal being repelled. Doesn't have any natural power source.	This product is available on Online sites like amazon.
2  Solar Wild Boar Animal Repellent.	Brand-Prompt Battery-3.7V x 1200mAh lithium battery Dimension960 x 660 x 150 mm Effective Area 5-8m Power source-Solar and DC Charge.	Rs.2500	Has solar and D.C current as power source. Works in all weather conditions. It makes Night cyclic flash and sound every 10 minutes.	Restricted to certain Animals. Its range is small. Its not cost efficient. Not affordable by small land farmers.	Available to buy online by pre-ordering on websites like https://www.promptequipments.com

3  Zon gun mark 4 propane.	Blast volume – 100 to 125 decibles. Weight -20 pounds. Works on gas.		It has high and powerful noise. Adjustable sound levels. Its highly Effective. It covers large part of the area.	It can damage the animals organs. No renewable energy is used as power source. Needs High Maintainance. The cost is very high.	Available on all leading online marketplace.
4. 	Product Dimensions -11 x 11 x 12 inches Item Weight 1 (0.45 kg Manufacturer - Bird B Gone Country of Origin China Item model number- RFLT-1	Rs-5237	Uses wind, sunlight, and reflective flashes to scare Birds away Made of durable aluminum and plastic for outdoor use Angled design allows reflect-a-bird to be installed in various directions.	It doesn't have any buzzer as indicator. *Its cost is very high* *Its range capacity is very low.*	Available on websites like ubuy.com Indiamart.in

5.  **Izbie Z1 Solar Ultrasonic Animal Repeller.**	**Manufacturer – Izbie** **Product Dimensions - 129.54 x 129.54 x 134.62 cm; 454 Grams.** **Item Weight - 454 g** **Material- Is made of durable and lightweight ABS plastic that's IP44 waterproof certified.**	**Rs - 5748**	**It is made of waterproof material.** **It uses solar energy as a source of power.** **It is user friendly**	**It has a very low range.** **It is not preferred to use in fields.** **Cost wise it's a loss to the small land owners.**	**It is available in websites like Amazon.in Flipkart.in Indiamart.com Ebay.in**
6.  **Pigs Solar Animal Repelling For Animals.**	**Animal Breed - Pigs** **Brand – PNGR Evergreen Battery Li-iron prosperous.** **Dimension - 5 feet** **Effective Area - 1 acre to 2 acre.**	**Rs - 15000**	**It is solar powered.** **It has a good range.** **It has more than one function to repel animals.** **Cost effective.**	**It has only solar as its energy source.** **It can't be operated in rainy season.** **It can't be used high temperature areas.**	**It is available with local dealers.** **It is available online at Indiamart.com.**

7.  **Pigs Green Solar Elephant Repeller System**	**Material – Aluminium** **Energy Output -Sound system with LED flashing lights system** **Power - 5 watts solar panel automatic working** **Unique designed for elephant repealing in agricultural and forest department area to get rid of elephants.** **Colour – Green** **Height - 8 feet**	**Rs - 12000**	**It has a good range.** **It has multiple repelling functions.** **User friendly** **Cost Effective.** **Good for large areas.**	**It has only solar as power source.** **High Maintenance cost** **Not preferable in Rainy seasons.** **Not suitable for small farmers.**	**Available locally with selected traders and online at Indiamart.com.**

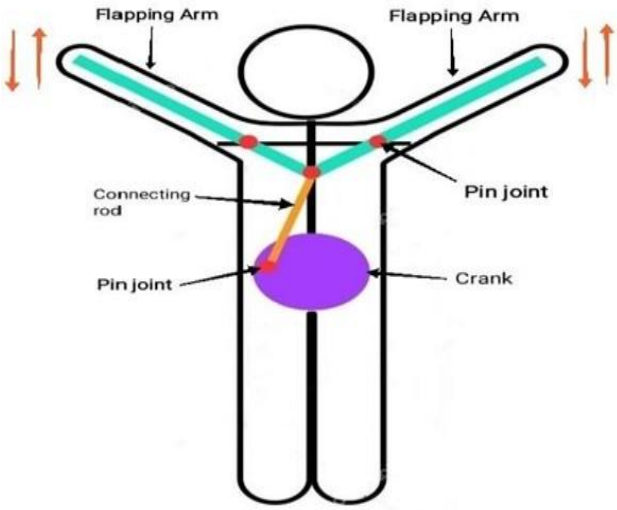
2.2 Patent search

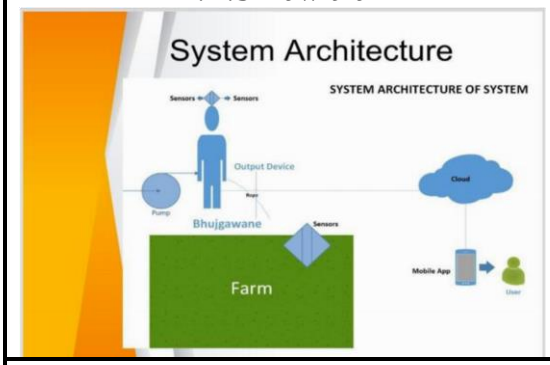
Patent Name/ Number/ Date	Information
Patent Name - Scarecrow with monitoring device in field. Patent number - CN217634866U Publication Date-2022-10-21	This model has the features of bird repelling mechanism and has a monitoring device, It has solar cell on the head part as a power source and has a camera for real time monitoring of the field with a sound producing element fitted in the middle part of the scarecrow which is covered by fixing covers and disks are used for rotation of the model by the movement of which the birds fly away from the field.
Patent Name - Intelligent scarecrow with infrared induction function. Patent number - CN213819551U Publication Date - 2021-07-30	This is a model used in fields for protecting the crops, the model consisting of a solar cell at the top of the model as a source of power, It also contains camera in the eyes of the model and infrared sensor in the hands and mainly a buzzer is present in the mouth of the model as an alarm indicator, as a heart of the module there is a cpu present in the mid-section of the model for controlling all the parts, This model is supported with an wireless controller (for movement of cameras, on/off of sensors).As a pillar a corrugated column is fixed in between when kept in field it always sways as wind blows, In case of no movement there is an alternative i.e. by rotating the motor it vibrates the rotating seat and the model keeps shaking and the birds and animals get repelled and maintains safety of crops in the field.
Patent Name – Light-emitting diode (LED) warning system integrated beast-dispelling scarecrow Patent Number - CN102144628A Publication Date - 2011-08-10	This is a model made by some Chinese people for the purpose of saving crops in the areas mainly of Jiangsu and Zhejiang of china where the birds and the beasts harm a lot, It is a model which is fitted with LED(Light emitting diode)in the eyes with the help of battery as a power supply and is made to stand with the help of a straw and the clothes are put on to it for a scary look, so that the beasts and birds get scared also works well at night as it has led's put on it it protects the crops at night also by giving a scary feel for birds and animals.

Patent Name-Bionic multifunctional scarecrow Patent Number-CN109430020A Publication Date-2019-03-08	This is a model of scarecrow which works on solar energy it repels harmful creatures by generating sound by ultrasonic sound generating device,It has an infrared sensing device which senses harmful creatures around the field and sends it to the micro computer which performs controlling actons on the functional part of the model according to the signal. The shoulder joint portion of the arm is mounted with a vertical crank rocker structure, and the elbow joint portion is provided with a translational crank rocker structure, so that the arm can swing up and down and back and forth.The abdomen and waist part of the body with a sticky insect board on which the harmful insect attractant is placed. the lower limb is a hollow tube, and the tube is filled with a slow release fertilizer. a warning pattern capable of visually alerting the pest is provided on the body chest and back position. a bionic tree replacement hole is provided in the middle of the solar panel, in the middle of the arm, and at the wrist of the arm for inserting the bionic branch.It can not only be used in fields but also in orchards,Airports etc.
Patent Name - Mechanical scarecrow Patent Number - CN209473449U Publication Date - 2019-10-11	This is a model where a simple mechanical structure is used to continuously rotate the rotating base with the use of motor,there is a photovoltaic panel which absorbs the solar energy and the energy is stored in the photovoltaic cells in the form of electricity,this energy is used for powering the insect killing lamp and rotating the motor,At night the lamp utilizes the phototaxis of the pest to act as a pest controller and protects the crops,The sealing is made of rubber which can act as waterproof material for the model,This is method by which the crops can be safeguarded under this model.
Patent Name - Movable intelligent bird repeller Patent Number - CN210445454U Publication Date - 2020-05-05	This scarecrow model is a movable model which moves on the axis of a slidebar with the help of the wheels provided which is connected to a motor which is further connected to a rotating shaft,The model has a cranial body and

	a radar detector with an antenna on the head and the wiring is done at the bottom end of the radar detector is connected with a connection line
Patent Name - Animal Repeller Patent Number - CN209824983U Publication Date - 2019-12-24	The utility model aims to overcome the above-mentioned shortcomings in the prior art, and provides an animal repellent device with flexible and convenient installation, various animal repellent methods, good environmental animal repellent effect, and long battery life.The model consists of two shells which are both connected together with the help of a ring about their top outer axis inside the shell there is a battery compartment and a circuit board.The battery at one side is connected to the circuit board and the side is a socket for connection which is waterproof. There are two units i.e the induction and eviction unit which are also connected to the circuit board and there are lights present as indicators.At the rear of the model we get a solar panel as a power source. The sensing unit includes a Fresnel lens, a fixed frame, and an infrared sensing probe. The led flashing light and the ultrasonic waves are here used to make animals repel from the field.
Patent Name - Semi-submersible type water area animal repeller Patent Number - CN210203083U Publication Date - 2019-04-17	The semi-submersible water animal repeller is characterized by including a tube structure, in which a sound generating device, a light emitting device, an integrated electric control board and a battery pack are provided,The sound generating device and the light emitting device are passed respectively through the integrated electric control board which is connected to a battery.The bottom is inserted in the soil layer at the bottom of the water body,When the aquatic animals come in the range of the sensor it detects and correspondingly the sound producing element and the light emitting device start working,By this means tis model helps in repelling the aqatic animals.

2.3 Literature survey

Literature details	Gathered Information
A Review of Smart Agri Scarecrow Authors : ANIKET SIRIYA  Fig 1: Flapping Mechanism	A Smart scarecrow is used to scare the birds and to the animals to save the crop in the fields. A farmer put the smart scarecrow within the middle of the sector to save lots of his crop from the birds and animals. We have seen that smart scarecrow has no movement when the birds are available field. A smart scarecrow is a decoy or mannequin, often in the shape of a human. Humanoid scarecrows are usually wearing old clothes and placed in open fields to discourage birds from disturbing and feeding on recently cast seed and growing crops. Scarecrows are used across the planet by farmers, and are a notable symbol of farms and therefore the countryside in popular culture. The common form of a smart scarecrow is a humanoid figure dressed in old clothes and placed in open fields to discourage birds such as crows or sparrows from disturbing and feeding on recently cast seed and growing crops. Machinery like windmills are employed as scarecrows, but the effectiveness lessens as animals become conversant in the structures. Farming contributes a major income to the Malaysian economy. It is an enormous concern to farmers once they are far away from their crops and exposing it to crops' threat like crow damaging the crops and theft. Farming has contributed to nearly up to 22% of a country's.
Journal Name- Author Agriculture Protection from Animals Using Smart Scarecrow Systems: Authors- Rahul Mapari Kishor Bhangale Laukik Deshmukh Prashant Gode	As our country's subsistence farmers continue to encroach on natural ecosystems, the interaction between farmers and animals grows, resulting in conflicts. We investigated how raiding patterns fluctuate with different seasons, farm land, and crop varieties. A smart scarecrow system has been proposed here to minimize crop raiding and man animal conflict from wild animals and birds. The scaring system works in three parts, such as object detection, message sending, and automatic height adjustment. Object detection is done by the PIR sensor and preventive action has been

	taken by initiating a servo, speaker, and blinking light. After object detection, alert will be sent by IoT cloud to the farm owner. Depending upon seasonal cropping, the pattern height of the system gets automatically adjusted by using motor, string pulley, and sliding drawer mechanism after the activation of ultrasonic sensor. The proposed study obtains the samples from different farms that are combined and observed how the object detection vary day and night in three seasons in order to provide the overall system efficiency. It is more convenient and cost effective than traditional scaring strategies like trapping, hunting, and wood fencing. The present system is made up of metal body, which does not require any manpower and at the same time, it can work under any worst climate conditions.
Journal- Smart Scarecrow Authors- Prof. N.Gondacharwar Dr.R.S Kawitkar  	The sensors and microcontroller of three nodes are successful interfaced with raspberry Pi and wireless communication is achieved between various nodes. All observations and experimental test proves that project is a complete solution to field activities, Irrigation problems and storage problem using remote control smart robot irrigation system and smart warehouse management system respectively. Implementation of such system in field can definitely help to improve the crops and overall production.
Journal Name- Calculation of Torque and Development of Smart Agri Scarecrow	Smart scarecrow is used to scare the birds and to the animals to store the crop within side the fields. A farmer positioned the clever scarecrow within side the center of the world to store plenty of his crop from the birds and animals. We have visible that clever scarecrow has no motion while the birds are to be had field. A clever scarecrow is a decay or mannequin, frequently within side the form of a human. Humanoid scarecrows are normally carrying antique garments and located in open fields to

	deter birds from worrying and feeding on lately forged seed and developing plants Scarecrows are used throughout the planet via way of means of farmers, and are a extraordinary image of forms and consequently the geographical region in famous culture. The not unusual place shape of a clever scarecrow is a humanoid determine wearing antique garments and located in open fields to deter birds along with crows or sparrows from worrying and feeding an lately forged seed and developing plants. Machinery like windmills are employed as scarecrows, but the effectiveness lessens as animals grow to be conversant within side the structures. Farming contributes a first-rate earnings to the Malaysian economy. It is an huge difficulty to farmers as soon as they're a long way furfar from their plants and exposing it to plants' chance like crow unfavourable the plants and theft. Farming has contributed to almost as much as 22% of a country's economy.
Article Name-Design & Development of Smart Scarecrow Review Authors- Dr. Arjapur Mr.Sahil Meshram	In our project we have used flapping mechanism to move the smart scarecrow hands in upward and downward direction. The details for flapping mechanism is given below. A smart scarecrow is used to scare the birds and to the animals to save the crops in the field. A farmer put the scarecrow in the middle of the of the field to save his crop from birds and animals. We have seen that scarecrow has no movement when the birds are come in the field. The flapping mechanism is used to convert the rotary motion of the motor into linear motion of flapping hands when the crank rotates, the connecting rods pushes the hands in up and down direction. The flapping consists of crank, connecting rod, flapping arm, support structure, nuts and bolts. Crank is join with one end of connecting rod and second end of connecting rod is

	join with flapping bar, when crank rotates the crank push the connecting rod connecting rod push the flapping arms ups and downs. Machinery such as windmills have been employed as scarecrow, but the effectiveness lessens as animals become familiar with structure. Farming contribute a major income to the Indian economy, it is a huge concern t0 the farmer when they are away from their crop and exposing it to crop threat such as crow damaging the crop and theft. farming has contributed to nearly up to 60% land of a country.
Article Name- Robotic laser scarecrows: A tool for controlling bird damage in sweet corn Authors- Rebecca Nelson Brown David H. Brown	Sweet corn (Zea mays L.) is an important direct retail and local wholesale crop in the United States. Birds have long been recognized as a pest of corn, which they damage by shredding the husks and eating the kernels. This study was performed to evaluate moving green laser beams as a bird control strategy in sweet corn. A portable, battery-powered robotic scarecrow was designed to continuously move a 14 mm diameter, 532 nm wavelength beam from a 50 mW laser. The scarecrow was tested in sweet corn fields in Rhode Island, USA over three years using a split-field design where half of each field was covered by the laser and the other half served as a control. . In 2017, the control sections averaged 48.4 ± 6.9 damaged ears per plot, while the sections covered by the laser averaged 14.6 ± 5.5 damaged ears (P = 0.0002). In 2018, the control sections averaged 23.8% ± 4.1% damaged ears while 13.7% ± 2.1% of ears were damaged in sections covered by the laser (P = 0.0046). In 2019, mean damage values across all planting blocks were 14.9% ± 4.1% for the protected plots and 20.3% ± 5.8% for the unprotected plots (P = 0.0332). The results of this study show that automated laser scarecrows can reduce bird damage to sweet corn under field conditions. Further research, including aviary studies with controlled populations of individually

	identified birds, are needed to measure efficacy and test for habituation.
Article name - Now an AI Scarecrow to shoo away pigeons. Authors- Meeta Ramani.	The paper proposes a system capable of autonomously detecting and deterring pigeons on building roofs using a drone. The presence and position of pigeons were detected in real-time by a neural network using images taken by a video camera located on the roof. A drone was used to deter the animals. The system consisted of three hardware modules: a camera, ground station, and drone. The ground station commands the camera to scan the environment and receive images. A neural object detector was trained using pigeon images to identify the bounding box in an image in which pigeons are present. Then, the position of the bounding box in the two-dimensional image space is translated into the three-dimensional global navigation satellite systems coordinates. The drone flies over the identified coordinates (i.e., detected pigeons) before returning to its home base. The team conducted field experiments in a real-world urban setting to assess the proposed system. They compared the number of animals and their stay durations for over five days against the 21-day-trial experiment without the drone. During the five days of experiments, the drone was automatically deployed 55 times and was significantly effective in reducing the number of birds and their stay durations without causing any harm to them. Though drones are already being used for bird control, it's with an active human pilot using a drone to scare flocks of birds at specific places and times: in many countries, it is illegal to fly autonomous drones. Switzerland also has strict drone regulations. However, the research involved a human supervisor on standby, ready to jump in and take if the fully autonomous system suffered any glitch. The study has proven the effectiveness of this system in deterring birds.

Phase 3

3.1 Brainstorming

Keywords	
1. Affordable	15. Infrared determination (Laser detection)
2. Safe	16. Eco-friendly
3. Product life good	17. Easy to place
4. Use friendly	18. Portable
5. Accuracy	19. Minimum components
6. Durability	20. Less complexity
7. Light weight	21. Less space accumulation
8. Renewable energy	22. Work at good range
9. Water proof	23. Loud noise
10.Easy to repair	24. Marketable
11. Low damage	25. Animal repellent noise
12. Strong	26. Adjustable
13. Fast	27. Compatible
14. Easy to navigate	28. Cost maintenance or Free maintenance

3.2 OFMC Chart

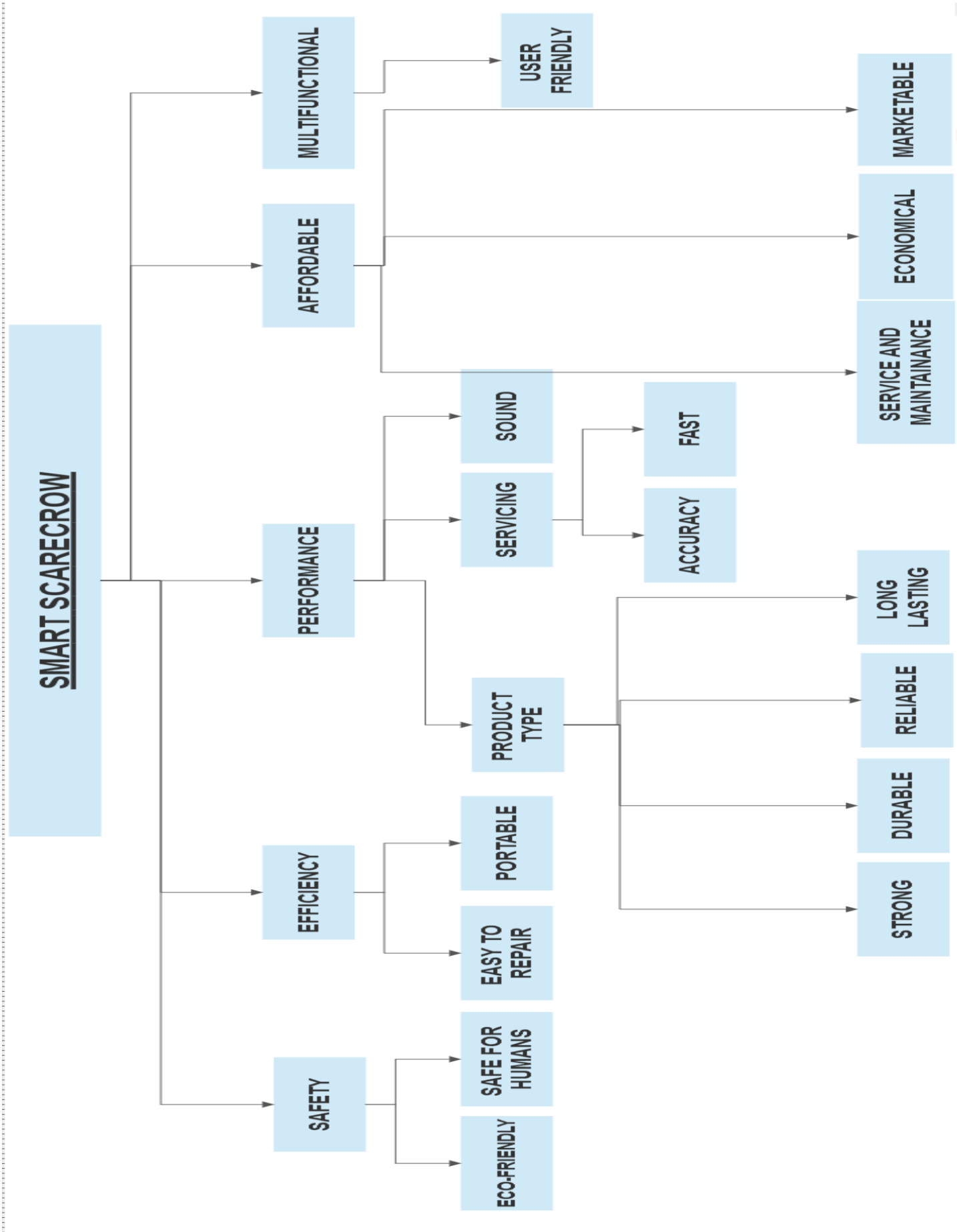
Keywords	Objectives	Functions	Means	Constraints
1. Affordable	✓			
2. Safe				✓
3. Product life good	✓			
4. Use friendly	✓			
5. Accuracy	✓			
6. Durability	✓			
7. Light weight				✓
8. Renewable energy	✓			
9. Water proof		✓		
10. Easy to repair		✓		
11. Low damage				✓
12. Strong	✓			
13. Fast	✓			
14. Easy to navigate		✓		
15. Infrared determination (Laser detection)			✓	
16. Eco-friendly	✓			
17. Easy to place		✓		
18. Portable	✓			
19. Minimum components				✓
20. Less complexity	✓			
21. Less space accumulation				✓
22. Work at good range		✓		
23. Loud noise			✓	
24. Marketable	✓			
25. Animal repellent noise			✓	
26. Adjustable		✓		
27. Compatible	✓			
28. Cost maintenance or Free maintenance	✓			

3.3 Objectives

Objectives	
Affordable	Eco-friendly
Product life	Multiple power source
Good Range	Repel different animals
User friendly	Accuracy
Safe	Durability
Strong	Fast
Portable	Simple
Marketable	Compatible
Cost maintenance	Works Effectively

O#	Objectives	First level objectives	Second level objectives	Third level objectives
1	Performance	1.Product Life 2.Servicing 3.Noise	1.Strong 2.Durable 3.Reliable	1.Accuracy 2.Fast
2	Safety	Eco-friendly	Safe for humans	Crops should not be disturbed.
3	Efficiency	Detect effectively	Efficiency should be more than 75%	
4	Affordable	Cost of product should be less	It should even be affordable by small or marginal farmers	Components price should be low.
5	Multifunctional	1.Emit noise 2.Locate animals Etc.	Does all the work	
6	Serviceable	Easy to Repair	Components should be available	
7	User friendly	Easy to access	Marketable	Understandable

Objective tree:



Constraints	
Safe Light weight	Less space accumulation
Low damage	
Components	

3.4 Constraints

3.6 Design Specifications:

Sl.no	Engineering Specifications	Units
1.	Sound	Decibels
2.	Sensors	Hertz
3.	Energy Source	Kilowatt
4.	Motor	R.P.M
5.	Water storage	Litres

3.7 Competitive Benchmarking:

Metric #	Metric	Units	Competitive Products		
			Product 1	Product 2	Product 3
1.	Cost	1NR	5000	5000	7000
2.	Noise during Operation	Db	87	110	101
3.	Max Weight	Kg	40 - 42	40 - 45	45
4.	Sensor Range	Metre	150 Metre	150 Metre	100 Metre
5.	Light Source	Watt	300	300	300
6.	Battery	Ah	10Ah	10Ah	12Ah

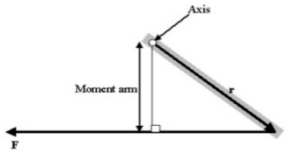
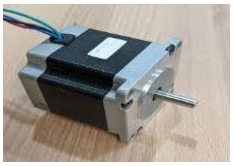
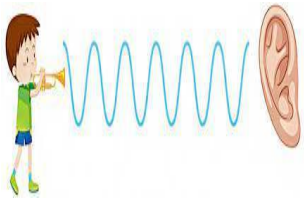
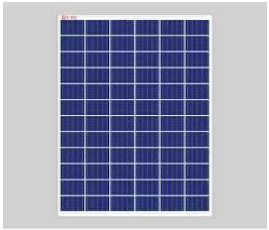
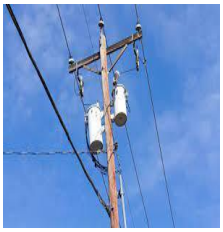
Phase 4

4.1 Concept Generation

Defining Functions

Sl.no	Functions
1	To scare away birds and animals
2	It should emit high intensity light
3	The aram attached should be rotatable
4	Loud sound
5	It should use non conventional source of energy
6	It should cover large area
7	It should be weather proof

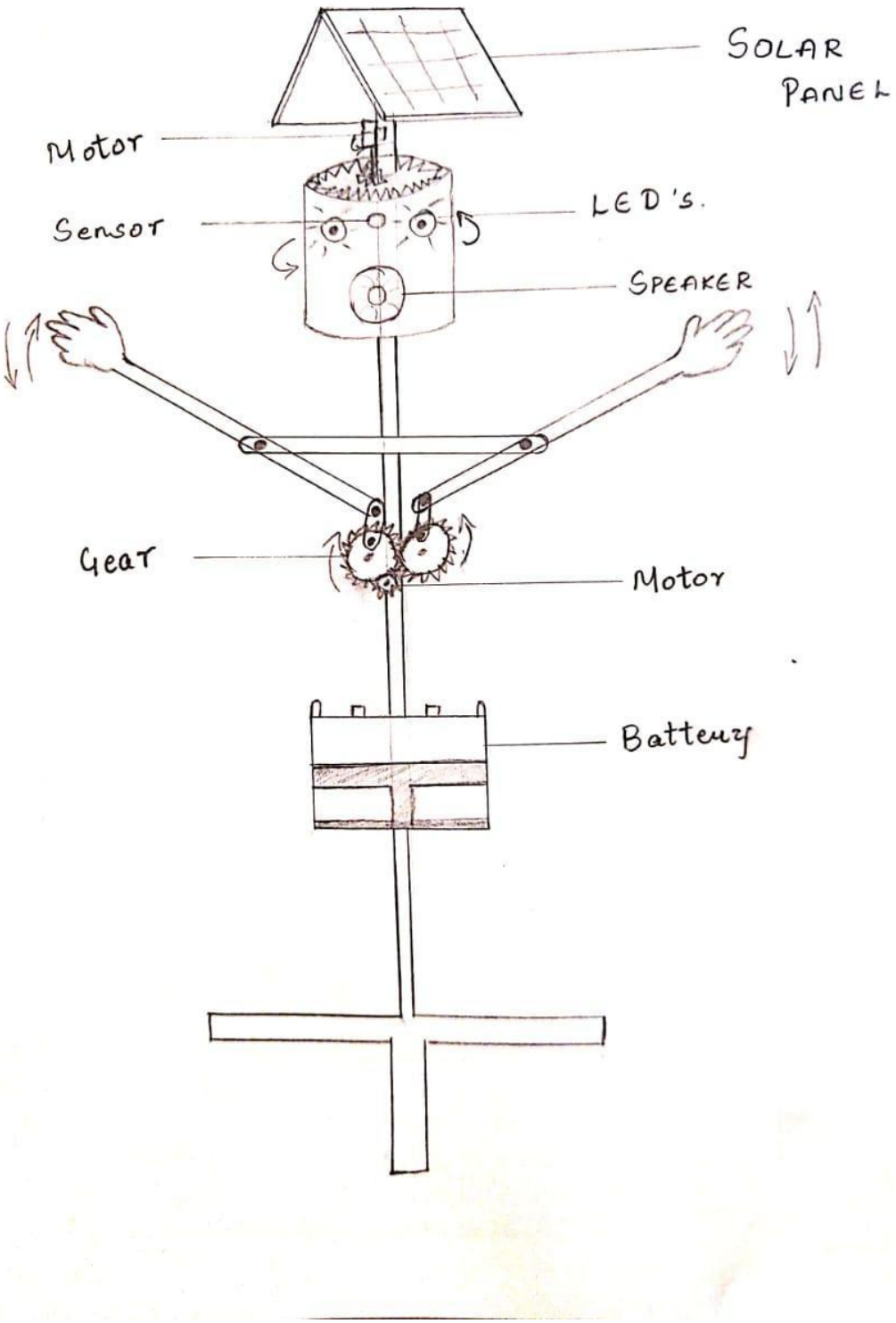
4.2 Morphological Chart

Functions ▼	Means ▶	**Means 1**	**Means 2**	**Means 3**	**Means 4**
Light 		*Tungsten Bulb* 	Led Lamp 	Focus Light 	Fluroscent Bulb 
Moment of Arm 		D.C.Motor 	Servo 	Stepper Motor 	
Sound 		Ring Bell 	Speaker Box 	Loud speaker 	Horns 
Source of energy 		Solar Panel 	Wind Turbine 	Power line 	RechargebleBatteries 

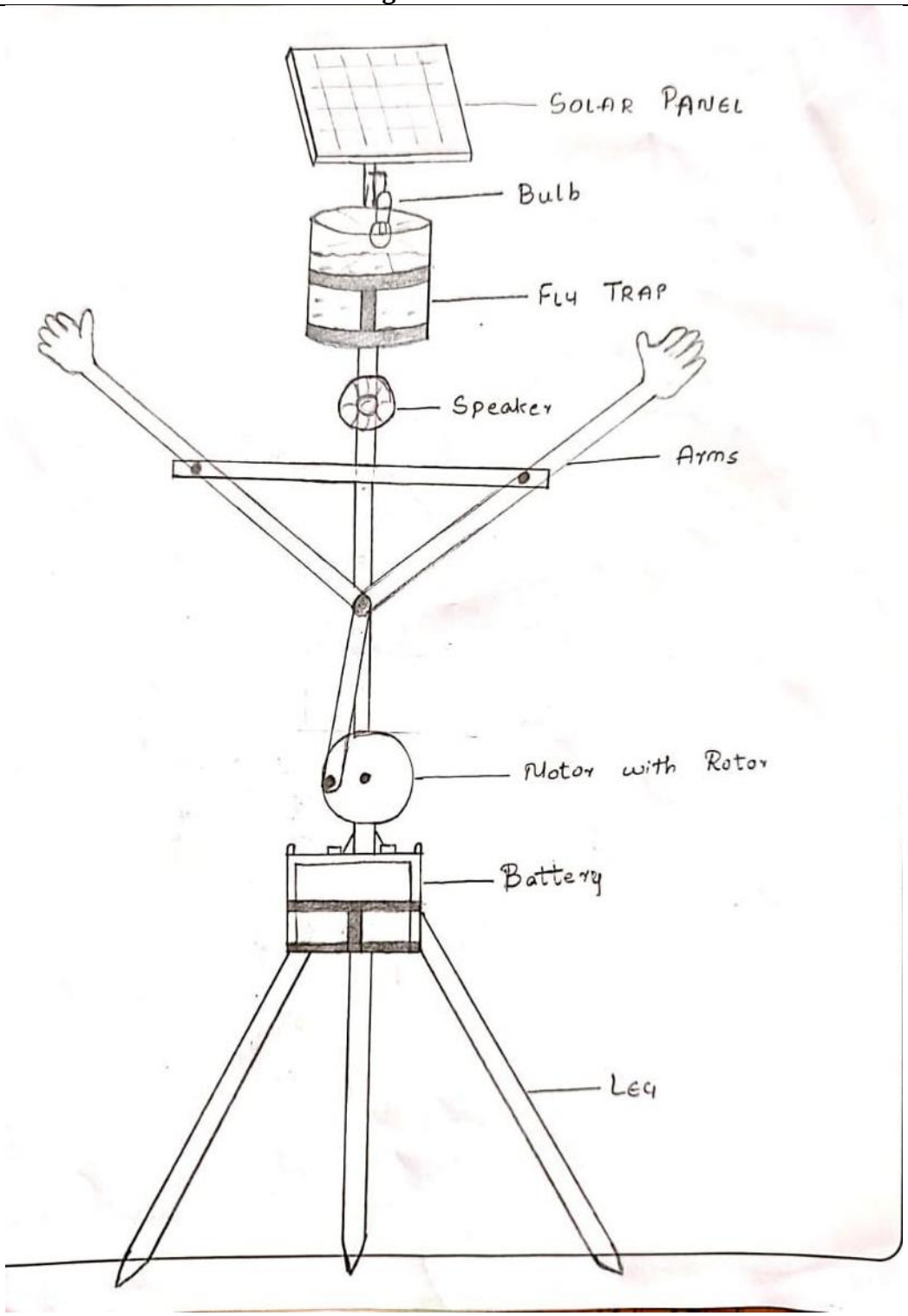
Materials	Steel	Aluminium	Wood	Plastic
				

Design Alternatives

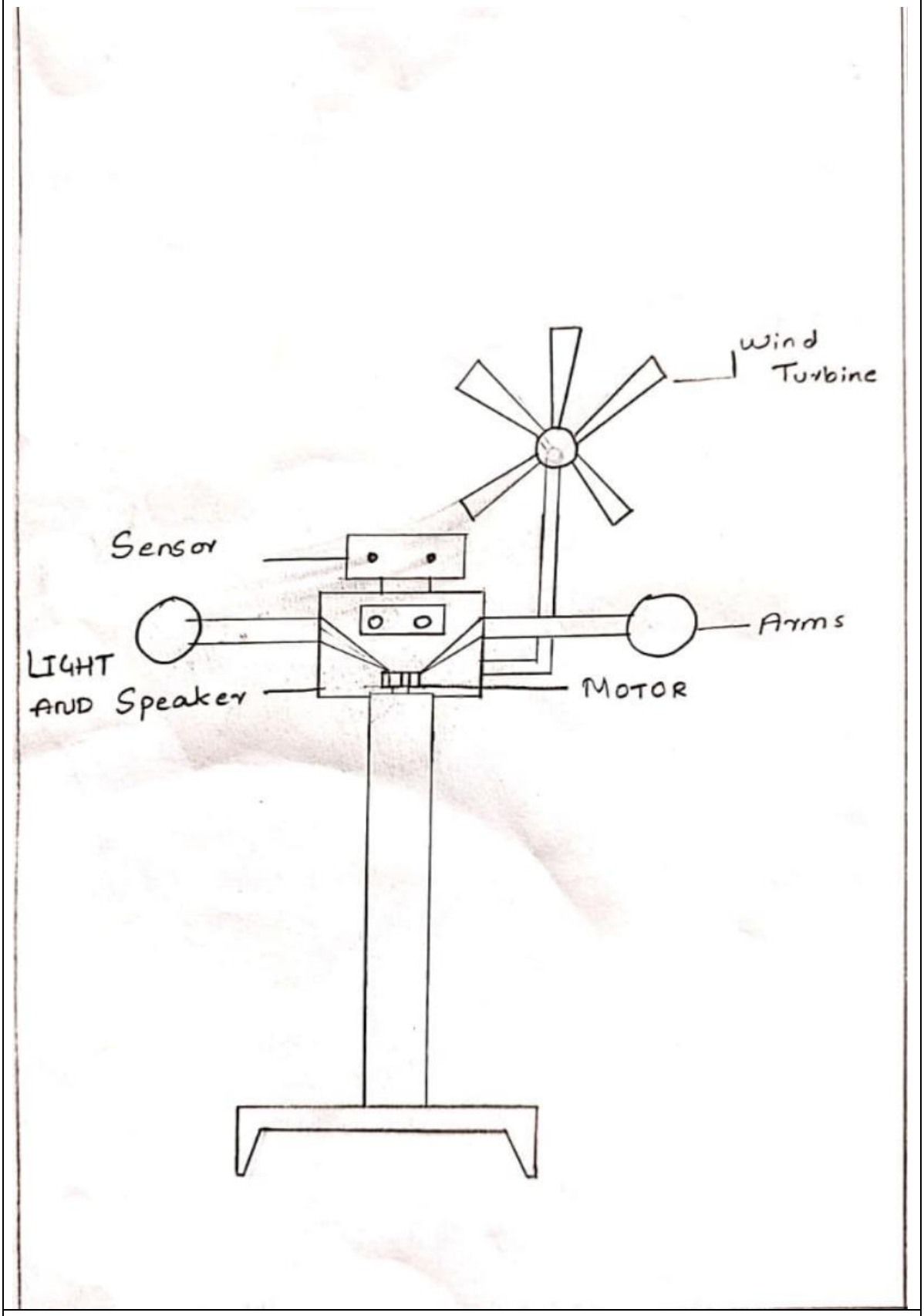
Design Alternative 1



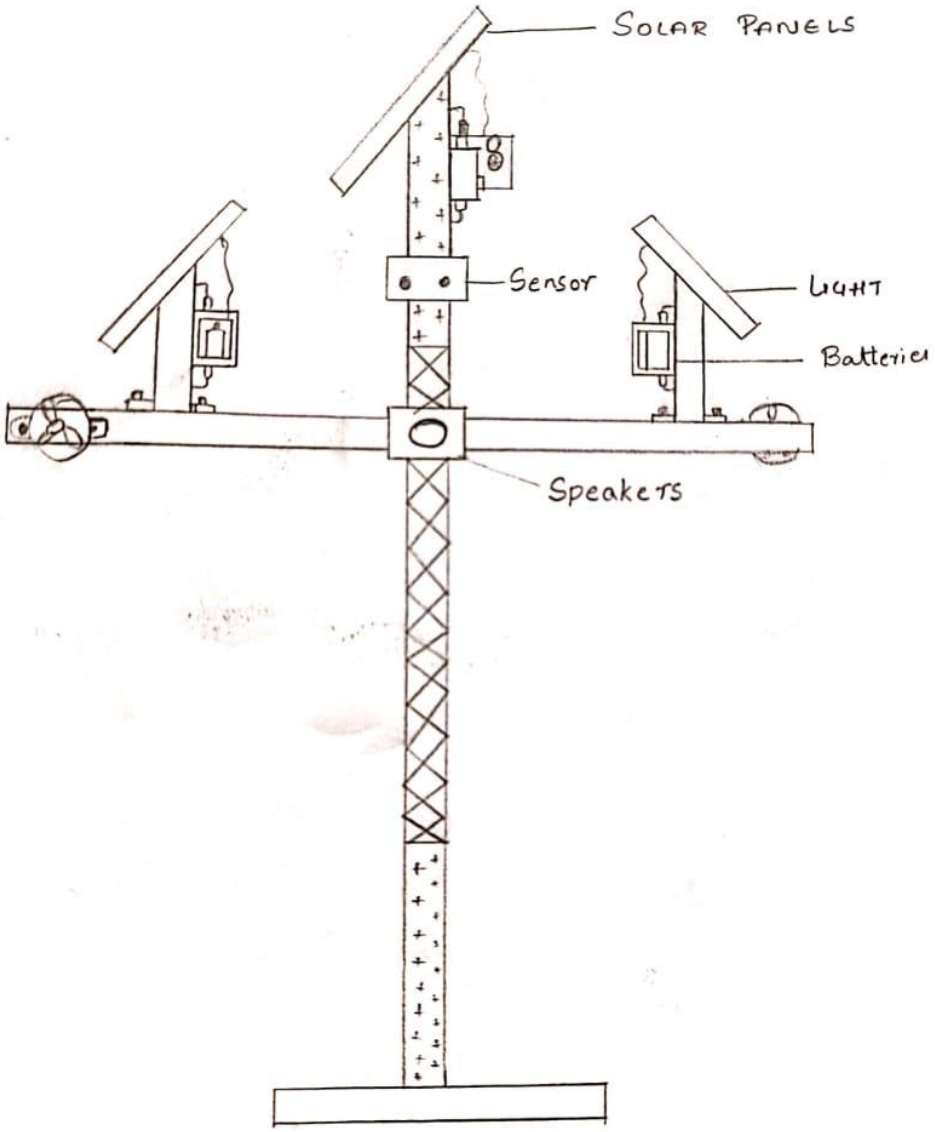
Design Alternative 2



Design Alternative 3



Design Alternative 4

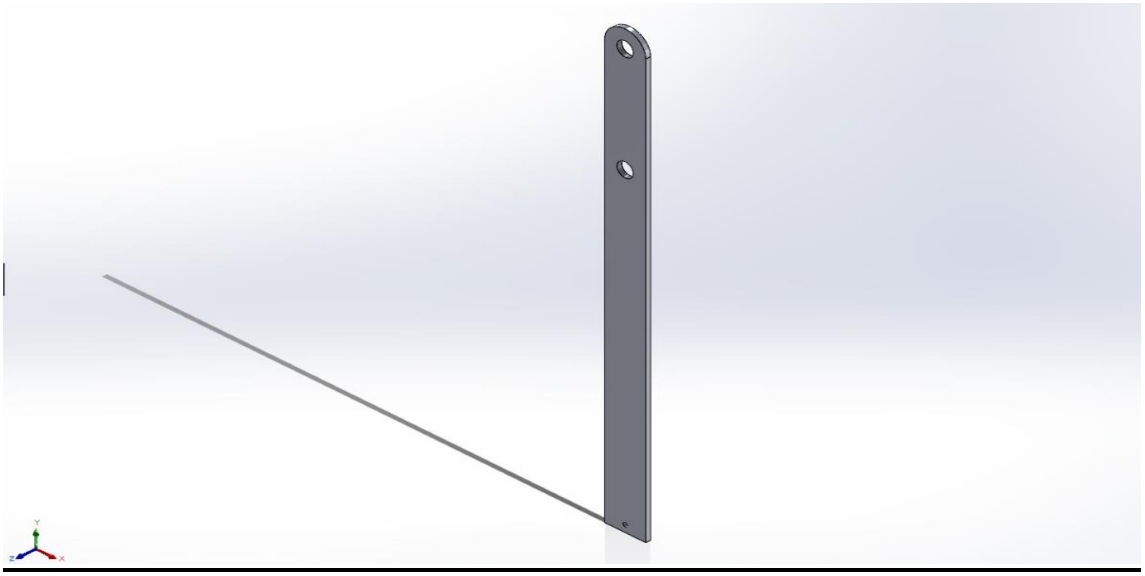
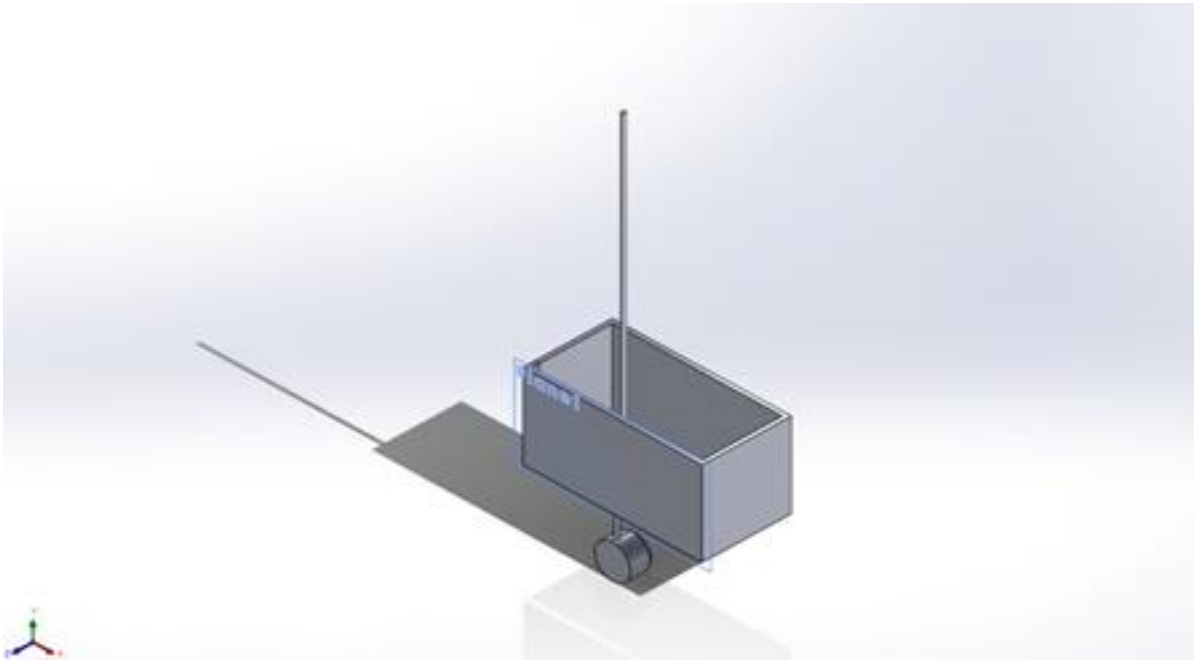


4.4 Selecting Design Alternative (Using Phugh Chart)

Requirements	Design1	Design2	Design3	Design4
Cost of Manufacturing	+	+	-	--
Ease of Operation	-	+	+	+
Availablity of Components	+	+	+	+
Safety	-	+	-	-
Weight of the Product	+	-	+	-
Durablity	-	-	-	+
Aesthetic Appeal	+	+	-	+
Pluses	4	5	3	4
Minuses	3	2	4	4
Overall Total	1	3	-1	0
Weighted Total	1	3	-1	0
Yes / No	No	Yes	No	No

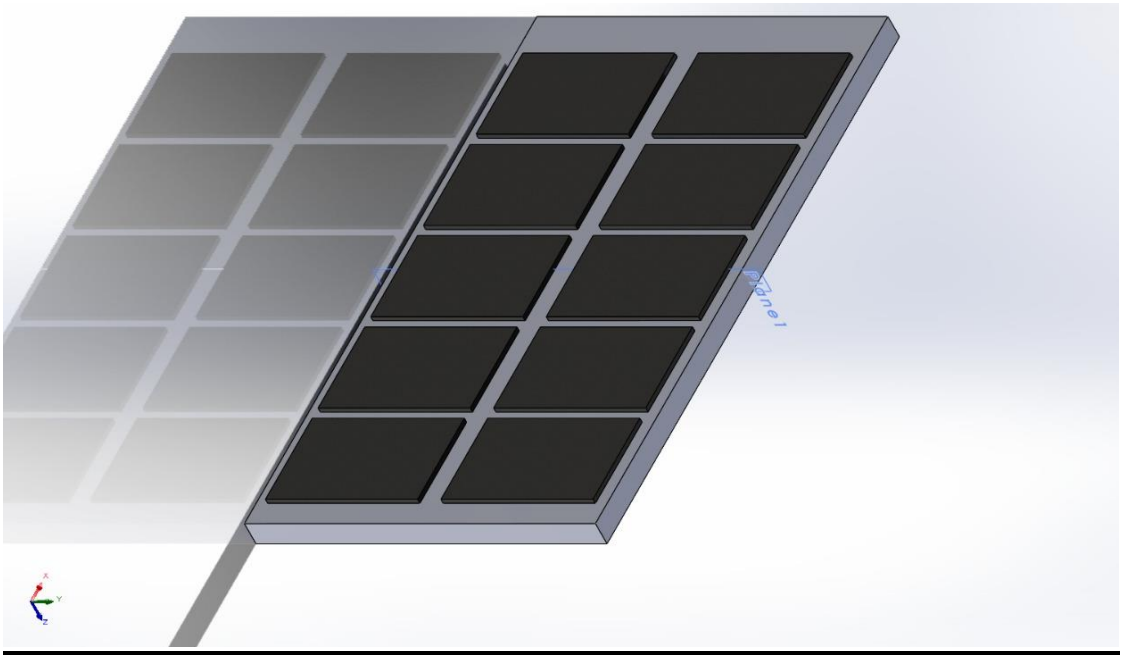
Selected Design Alternative:_____2_____

5.1 3D Model

Part Model 1
WINGS 
Part Model 2
SPEAKER WITH FLY TRAP 

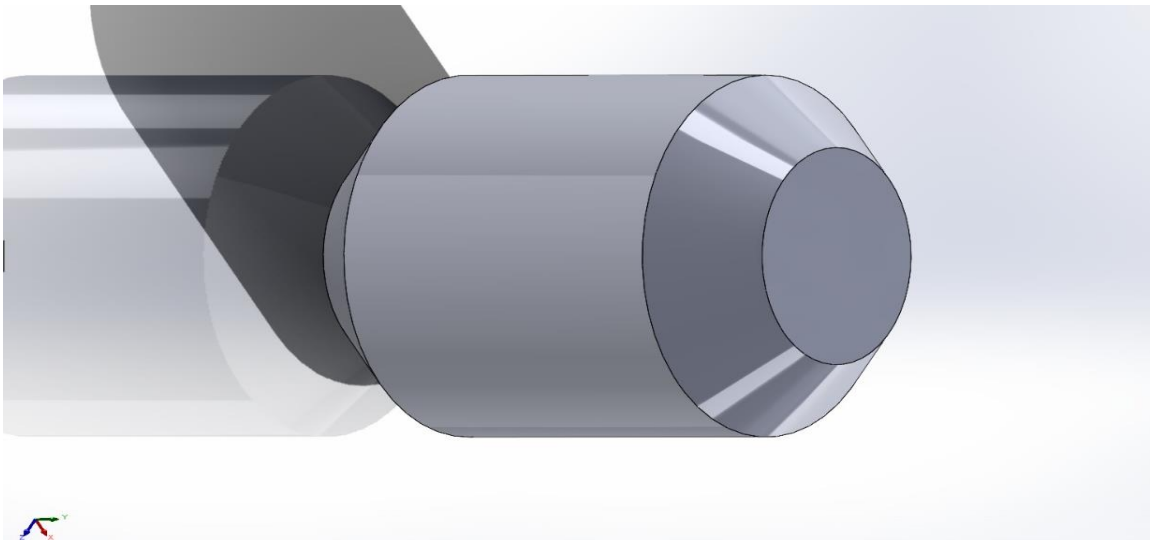
Part Model 3

SOLAR PANEL



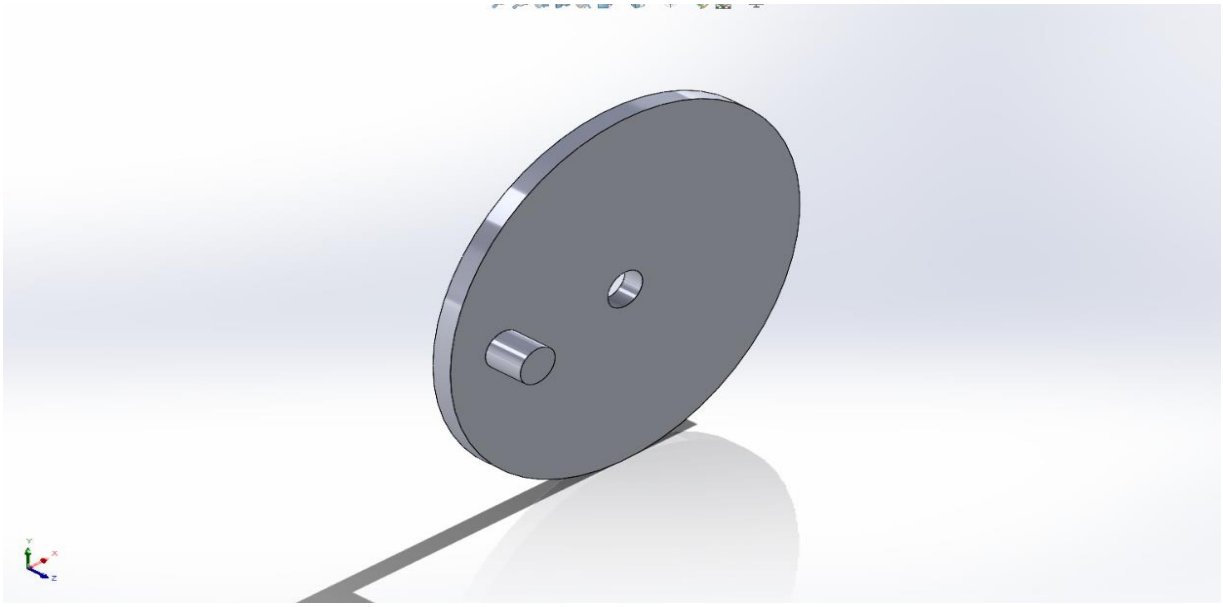
Part Model 4

SLIDING BUSH



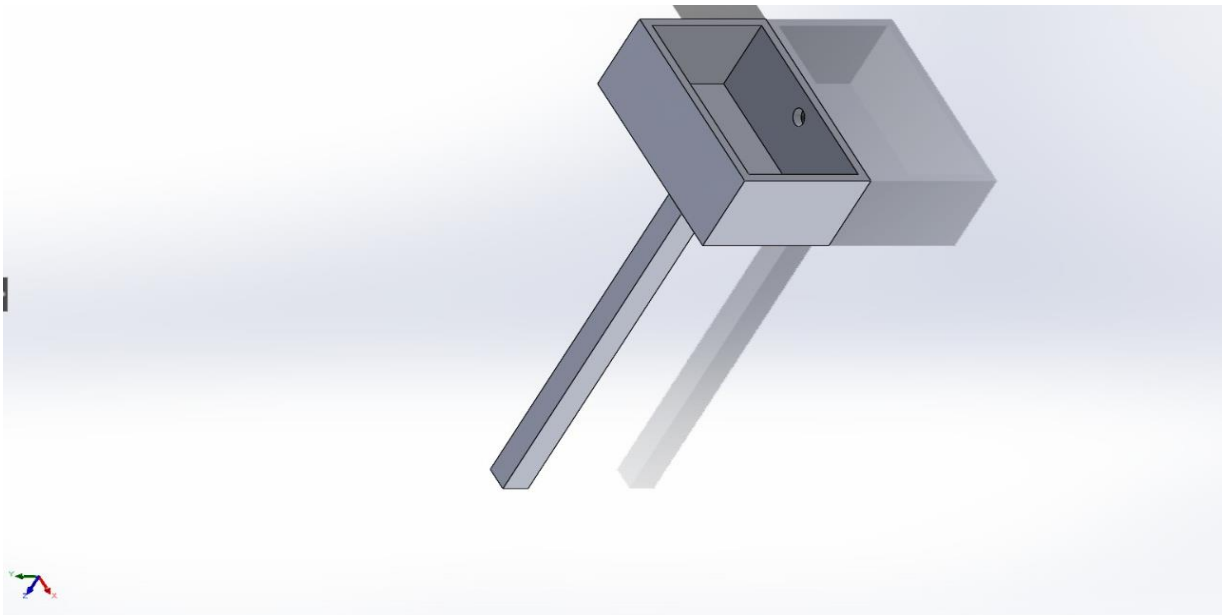
Part Model 5

ROTATING WHEEL



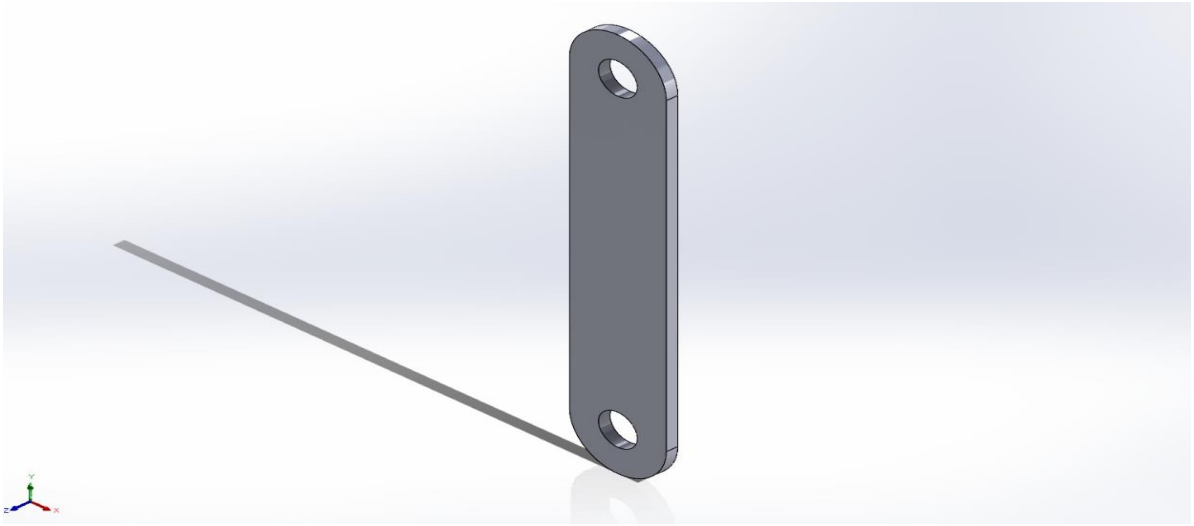
Part Model 6

LEG WITH SPEAKER



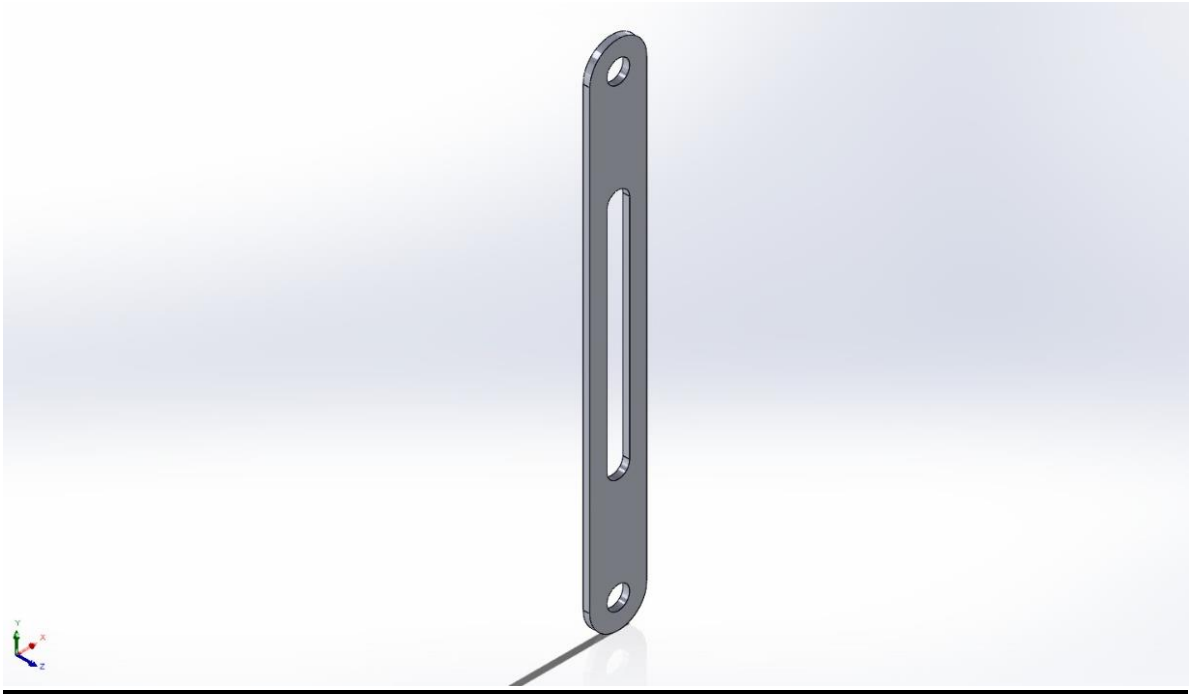
Part Model 7

CONNECTIVE ROD

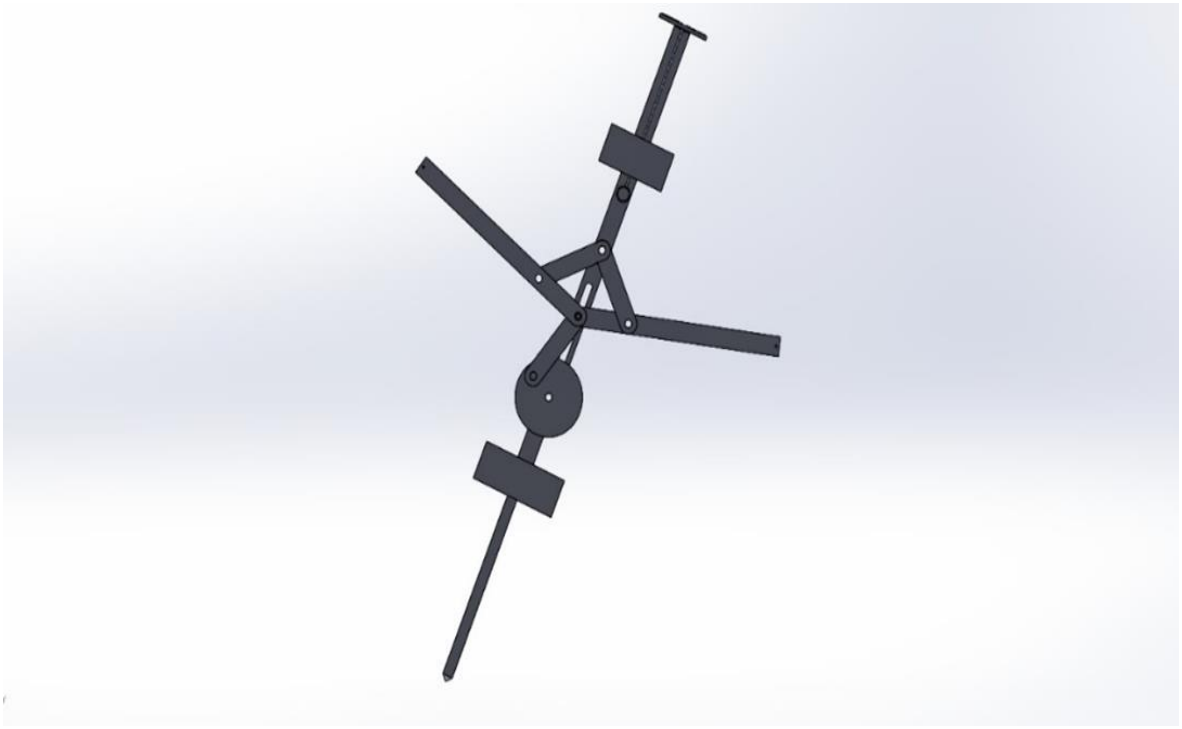


Part Model 8

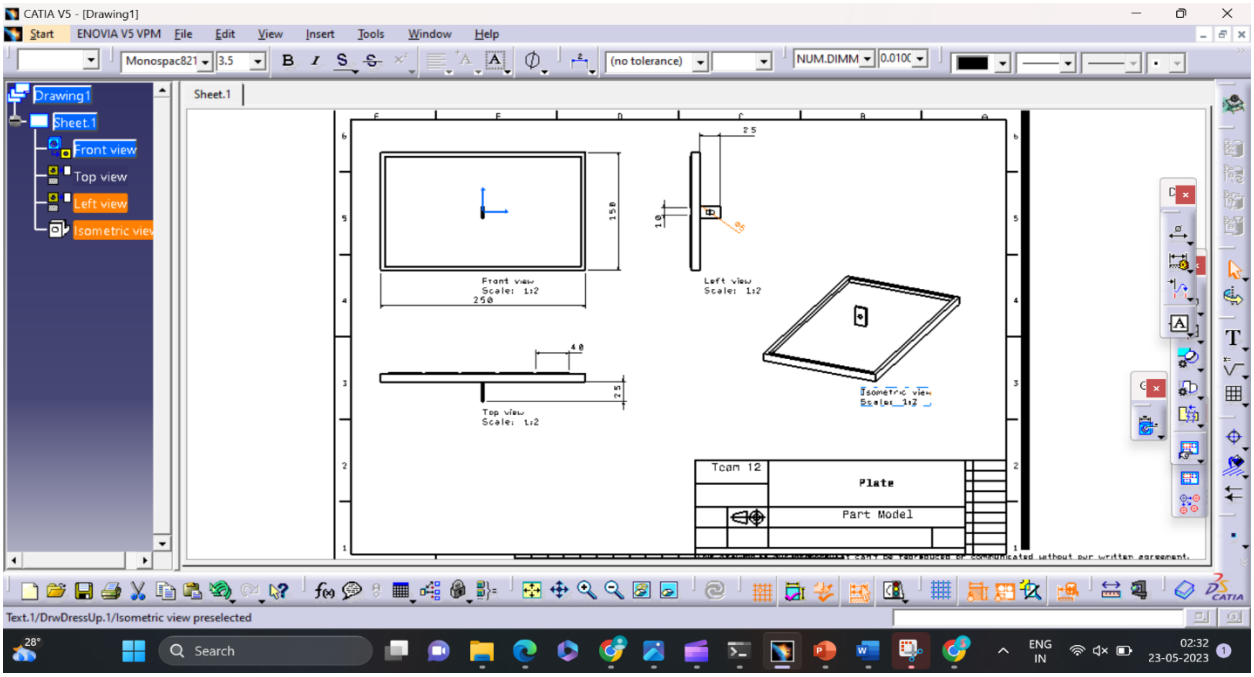
SUPPORTIVE ROD

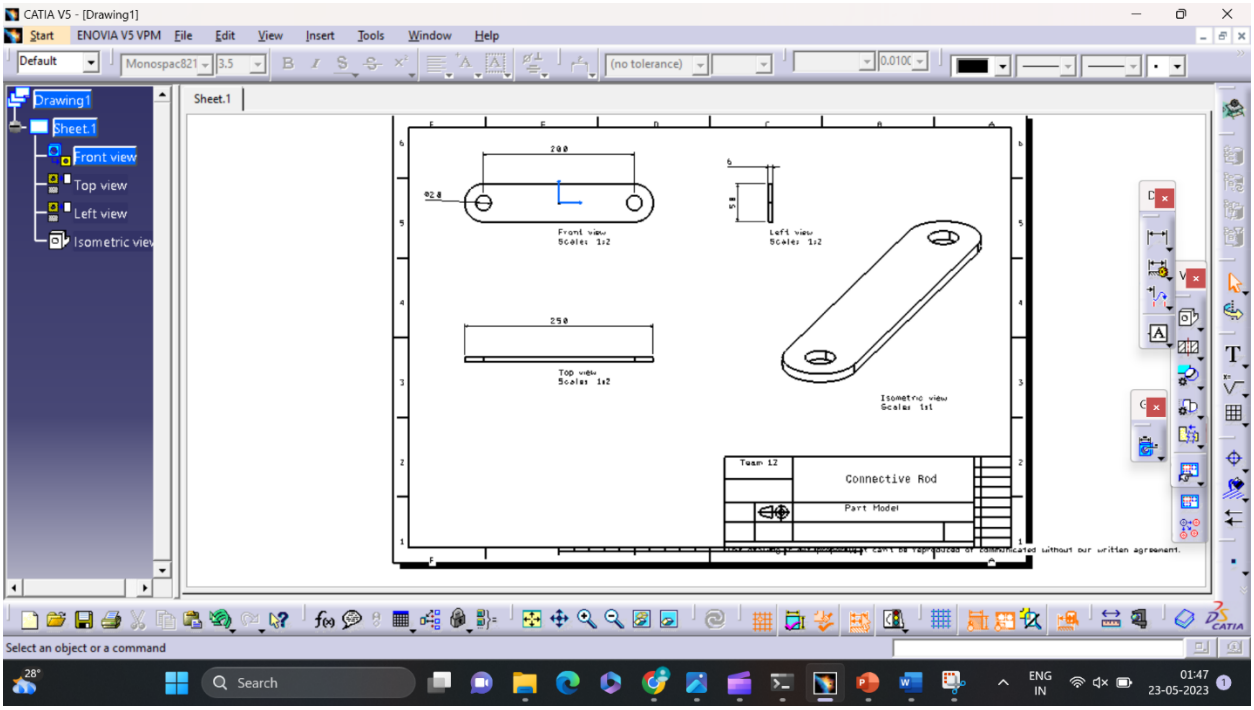


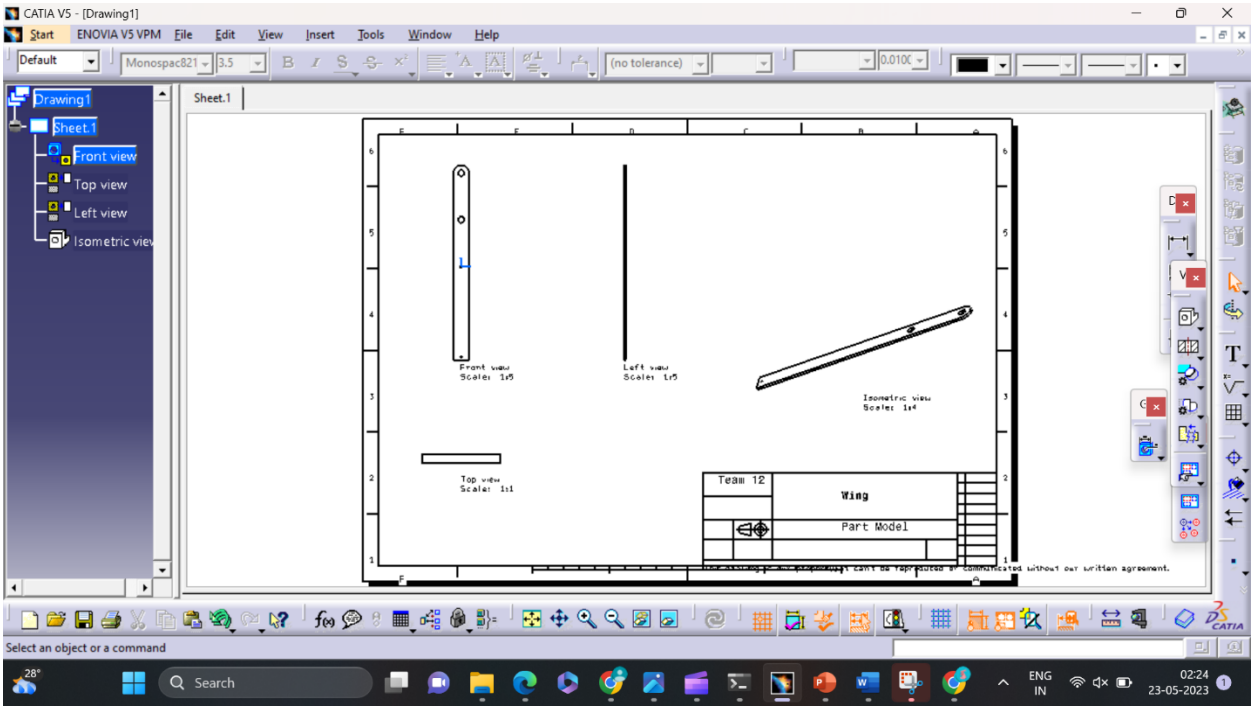
5.2 Assembly model

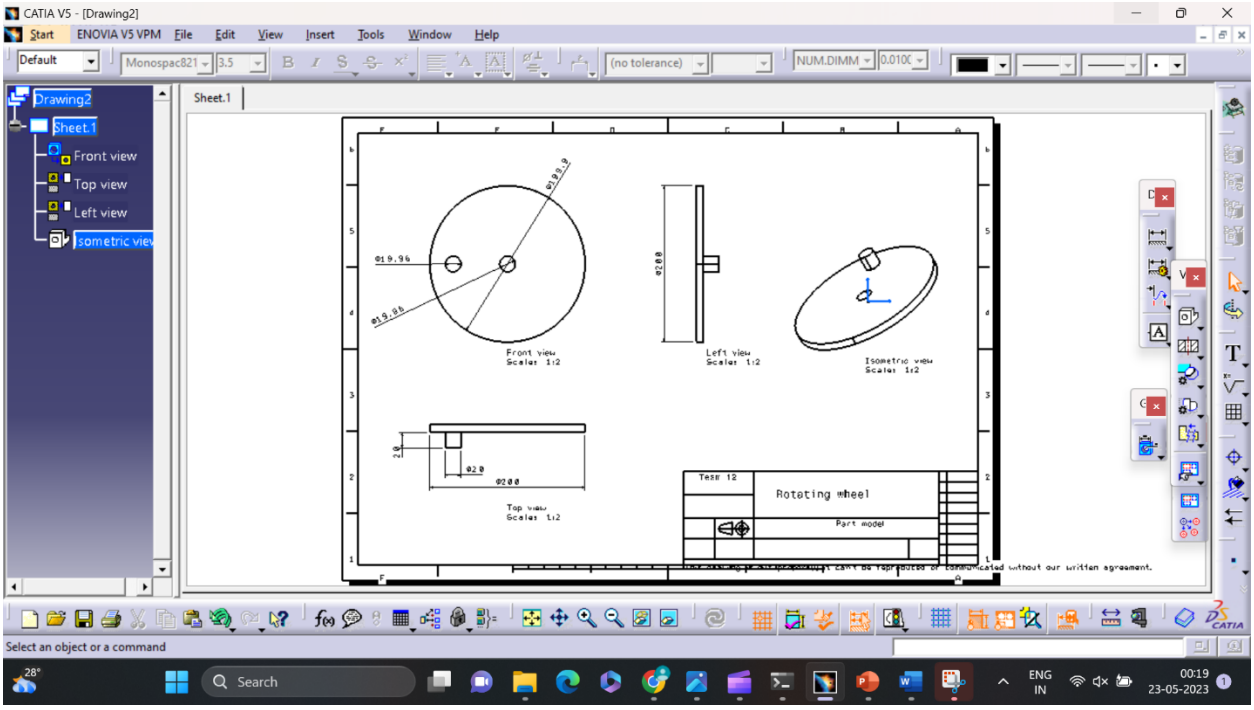
Assembly Model


DRAFTING


CATIA V5 - [Drawing1]
Drawing1
Sheet.1
Front view
Top view
Left view
Isometric view
Front view
Scale: 1:2
Left view
Scale: 1:2
Top view
Scale: 1:2
Isometric view
Scale: 1:2
Team 12
Plate
Part Model
Text.1/DrwDressUp.1/Isometric view preselected


CATIA V5 - [Drawing1]
Drawing1
Sheet.1
Front view
Top view
Left view
Isometric view
Front view
Scale: 1:2
Left view
Scale: 1:2
Top view
Scale: 1:2
Isometric view
Scale: 1:1
Team 12
Connective Rod
Part Model
Select an object or a command

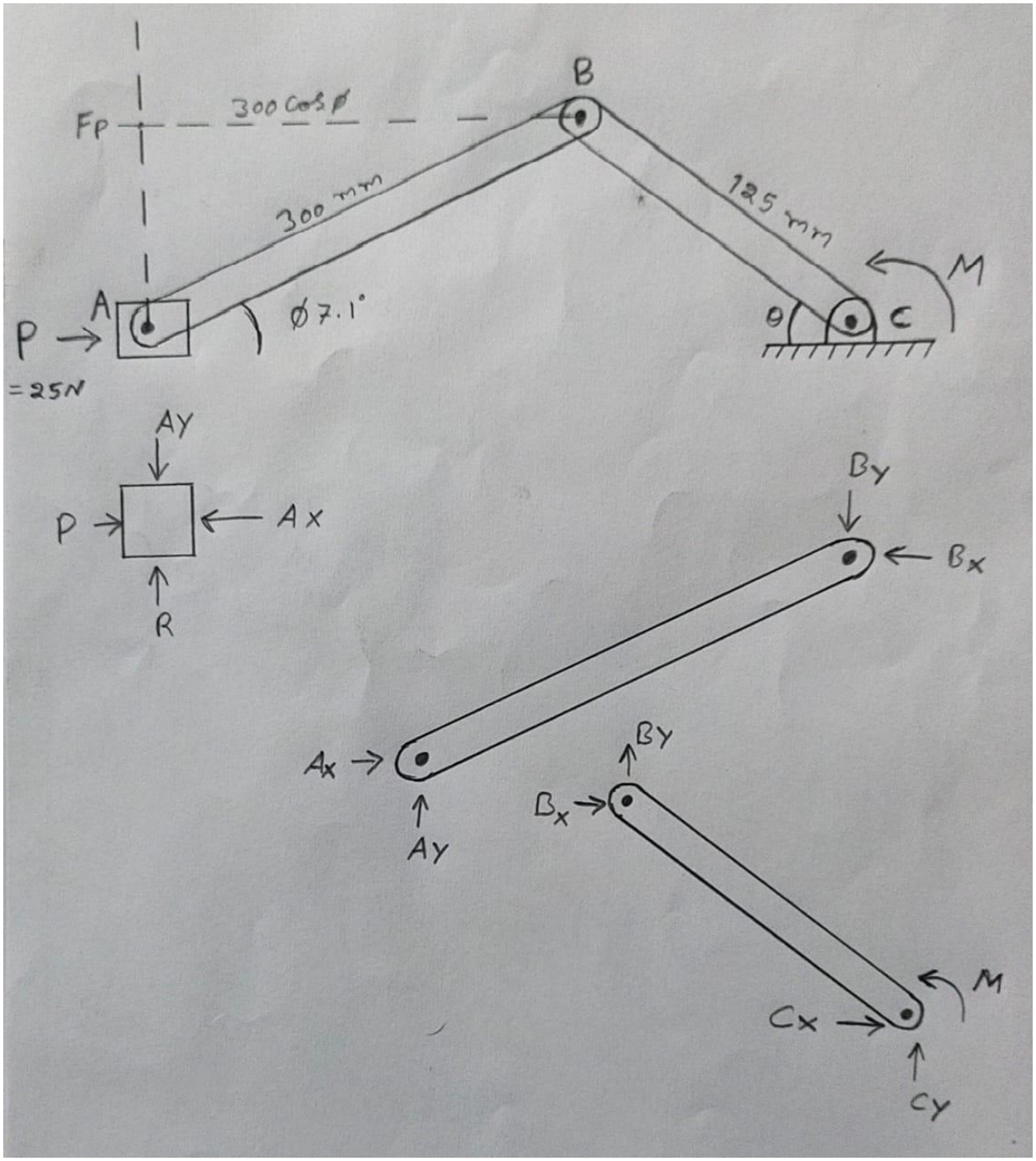

CATIA V5 - [Drawing1]
Drawing1
Sheet.1
Front view
Top view
Left view
Isometric view
Front view Scale: 1:5
Left view Scale: 1:5
Isometric view Scale: 1:4
Top view Scale: 1:1
Team 12
Wing
Part Model


CATIA V5 - [Drawing2]
Drawing2
Sheet.1
Front view
Top view
Left view
Isometric view
Front view Scale: 1:2
Left view Scale: 1:2
Isometric view Scale: 1:2
Top view Scale: 1:2
Team 12
Rotating wheel
Part model

5.3 Design Calculations

Design Calculations

DIFFERENT LINK DRAWINGS



CALCULATIONS FOR ABOVE LINKS

Ax, Bx and Cx are reaction forces in X direction.

Ay , By and Cy are reaction forces in Y direction.

R = Reaction Force, M =Bending Moment.

Ax=25 | **Ax = Bx=25**

Ay=R **Ay=By**

$$\sum M_{at\ B} - Ax*300*\sin\theta + Ay*\cos\theta*300 = 0$$

$$Ay = Ax \tan\theta$$

$$= 25*\tan\theta$$

= 3.11N=By

= Bx + Cx=0

$$= Bx125^{o} * \sin 30^{o} = By125^{o} * \cos 30^{o} - M=0$$

$$M = 25*125*0.5+3.11*125*0.86$$

M = 189.9 N-Cm. (Moment

$G\omega_{300}$ (Angular Velocity) = $\frac{2\pi N}{60}$

= (2*π*70)/60

= 7.33 rad/Sec.

=V.B=B_o*W_B (Length of link B).

= 125*7.3*30.

= 916.25mm/Sec.

Electricity Usage Table

#	LOAD	QUANTITY	WATT	T.LOAD	USAGE(HOUR/DAY)	TOTAL
1	LED PANEL/LIGHT PANEL	2	10	20	10	200
2	SPEAKER	1	50	50	2	100
3	D.C.MOTOR	2	2.4	5	14	70
4	PASSIVE I.R SENSOR	1	8	8	10	80
TOTAL			83 WATT			450 WATT/HOUR

= 83 watt + (30%*80)

= 108 Watt.

D.C.Current Required

P = V*I (V=Voltage, I=Current).

108 = 12I

I = 9AMP

Battery Size Selection in AH (Ampere Hour)

= (W*h) / u

= (Total Load*Backup time) / (Battery Voltage)

= (108*24) / 12

= 216 Ah.

= 216 / 10=21.6 Ah (BECAUSE BATTERY SHOULD BE CHARGED SLOWLY).

21.6 Ampere should be charged through solar panel.

The range of solar panels is 0 - 12Volts.

Therefore,

Power = 12V21.6 Watt

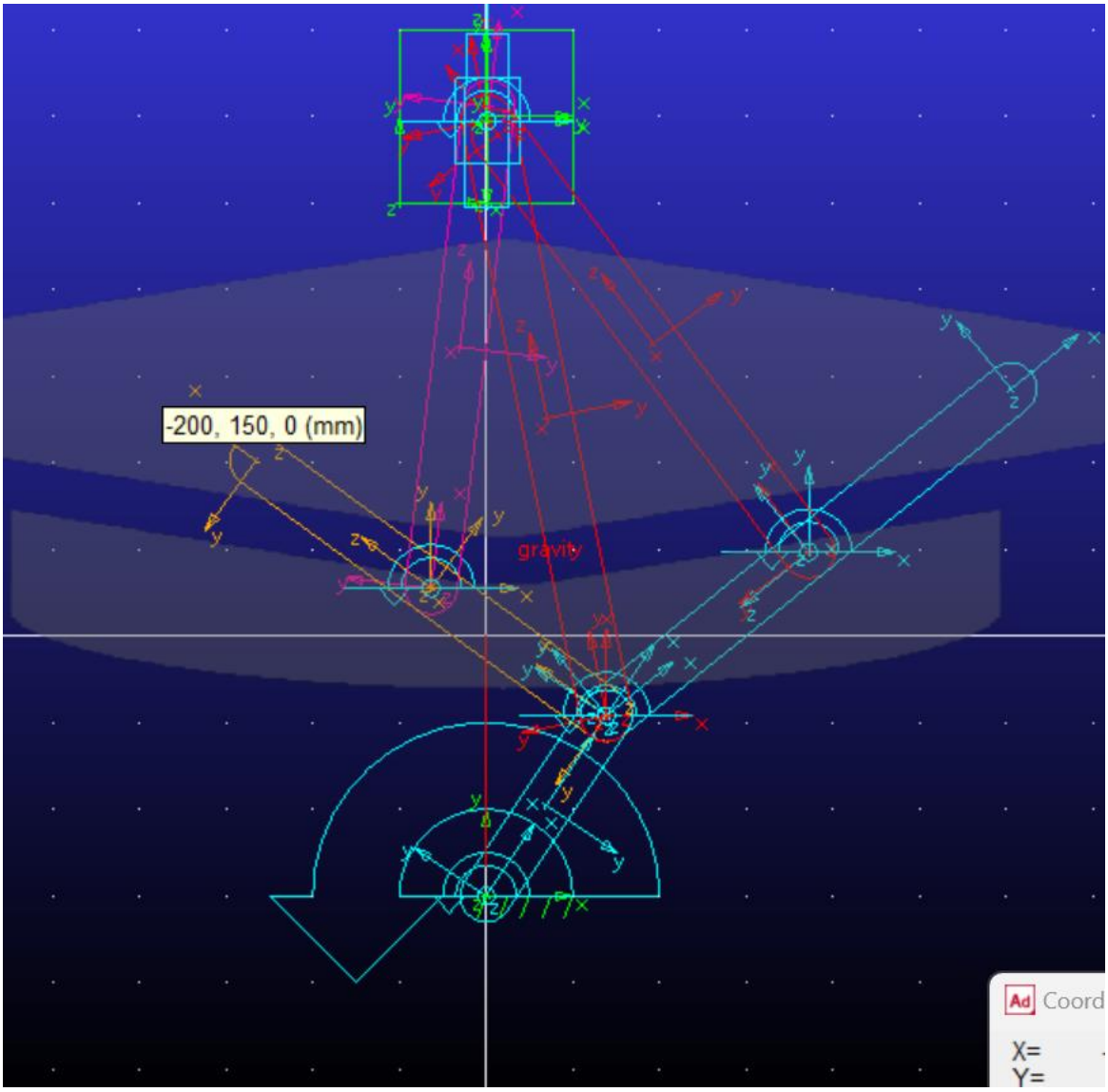
=259.2W.

Therefore, 135 are available with 12Volts

Two solar panels can be used.

6 Analysis of critical parts and Prototype Planning

6.1 Adams Software – Mobility check of the model.



6.2 Raw materials required for Prototyping:

#	Material	Properties /Reason for selecting the material	Part Name and Number
1	Steel Rod	High strength for Strong hold/To strengthen the body and earthing purpose.	Pillar for the body, Model hands and legs.
2	Cloth	To cover the body of the model for realistic look.	Cover parts of model.
3	Wood	To make some parts of the model/High weight for resisting natural collisions.	Hands, main body and legs of the model.
4	Strings	For exterior covering of the body and tightening some parts covered by cloth.	Supporting agent for cloth for tight grip.
5	Aluminum Plate	To make a space for attaching or keeping equipments.	To hold batteries, Speakers and sensors.
6	Nut and bolt	To fix different parts of the model.	To fix parts of the models (hands, legs, neck and head).
7	Wires	For current supply in the body.	For internal connection of electric equipments.
8	Gum	It is used to attach the particles.	To fix sensors and make the hold of joints strong.

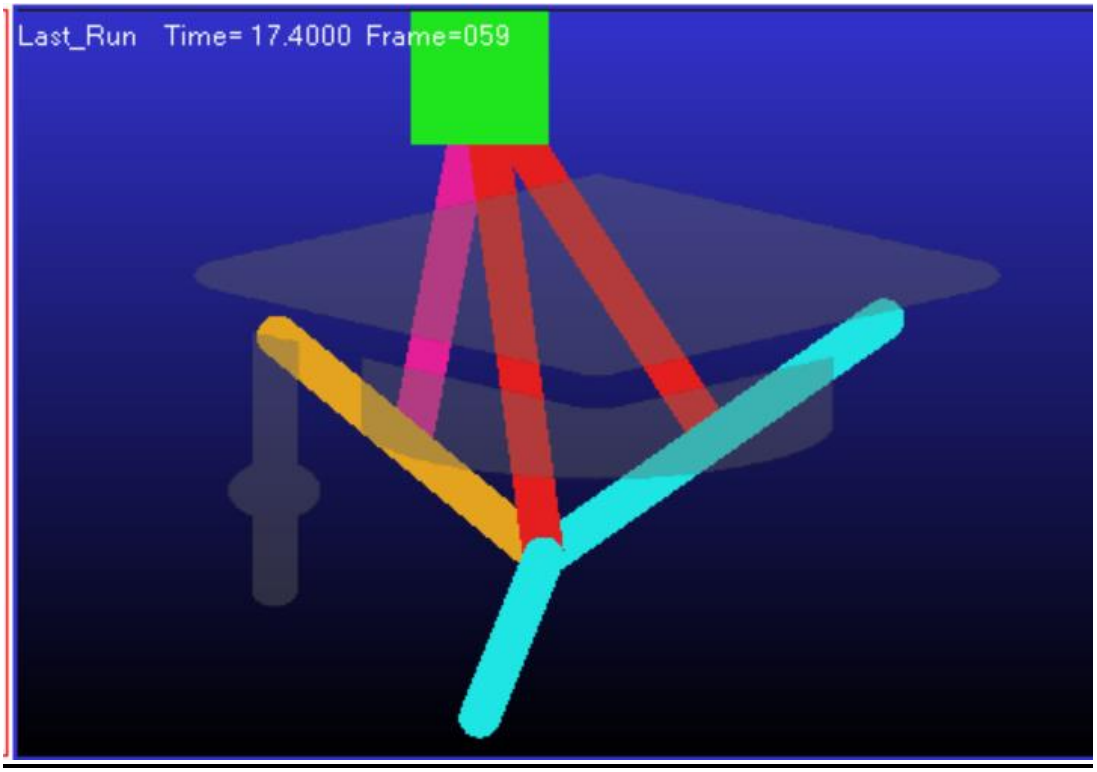
6.3 Bill of Materials

S.l No	Part Number	Part Name	Quantity	Material Specification
1	4	Structural Support	1	Steel Pipe
2	1	Arms	2	Aluminum Pipe
3	2	Connecting Link	1	Acrylic Strip
4	5	Battery Holder	1	Plastic
5	3	Solar Panel	2	135W,12W
6	8	D.C.Motor	1	12Volts,30 Rpm
7	6	Battery(Lead Acid)	1	21.6Ah,12Volt
8	7	Motor Disc	1	25 Diameter, Acrylic
9	9	Loudspeaker	1	50W
10	10	Passive I.R Sensor	1	5Volts,20Feet Range
11	11	Bulb(Led)	1	20Watt
12	12	Water Container	1	2 Litres, Plastic

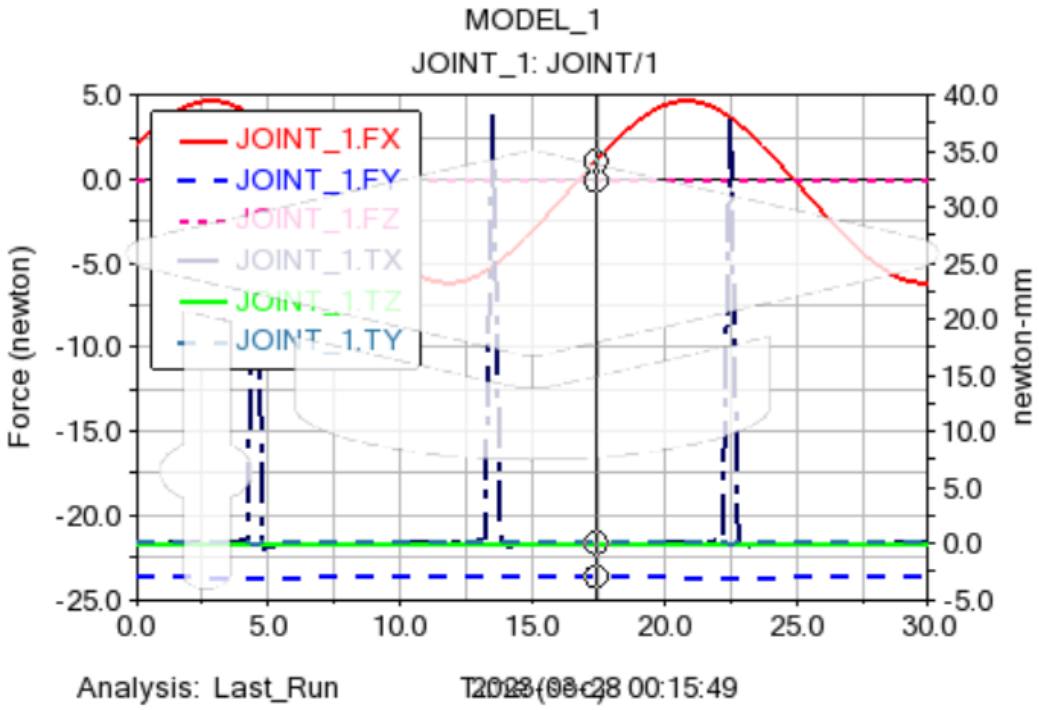
6.4 Joining techniques/ methods:

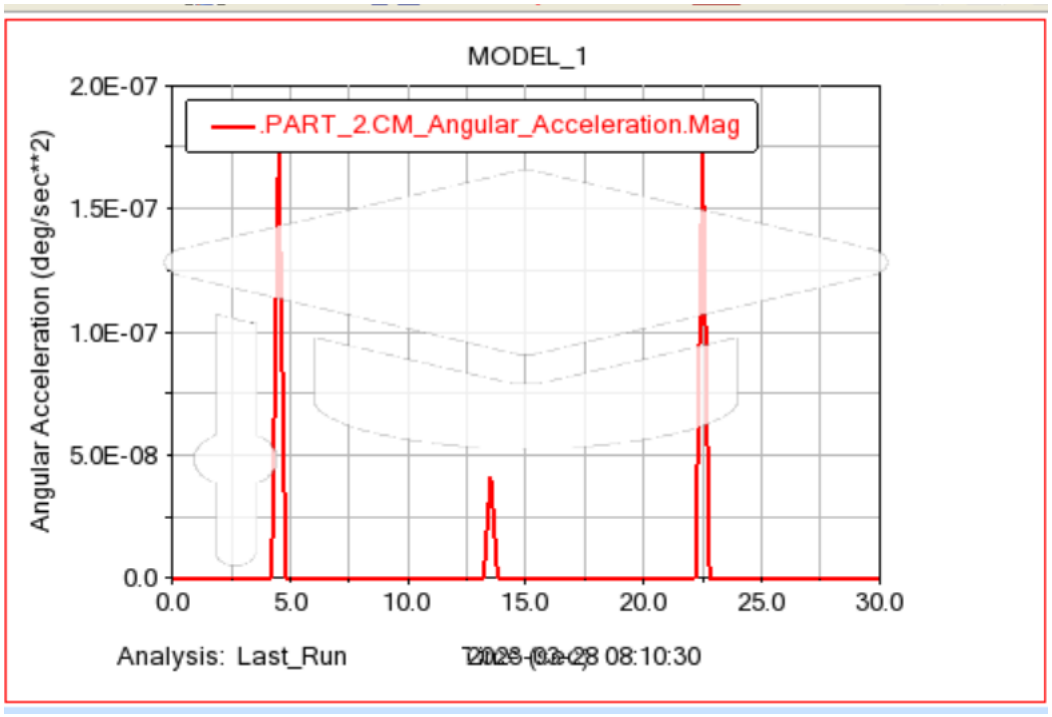
#	Joining Method	Material to be joined	Resources required and specification
1	Nuts And Bolt	Both Arm links with the body. Legs and lower part of the body. Connecting link with arm joint. Arm with T-Section. Connecting rod with Disc.	M3 M5 M5 M3 M2
2	Arc Welding	Aluminum Plates, Solar panel stand, Battery stand and Water tank Stand, Upper T-Section weld.	Electrodes.

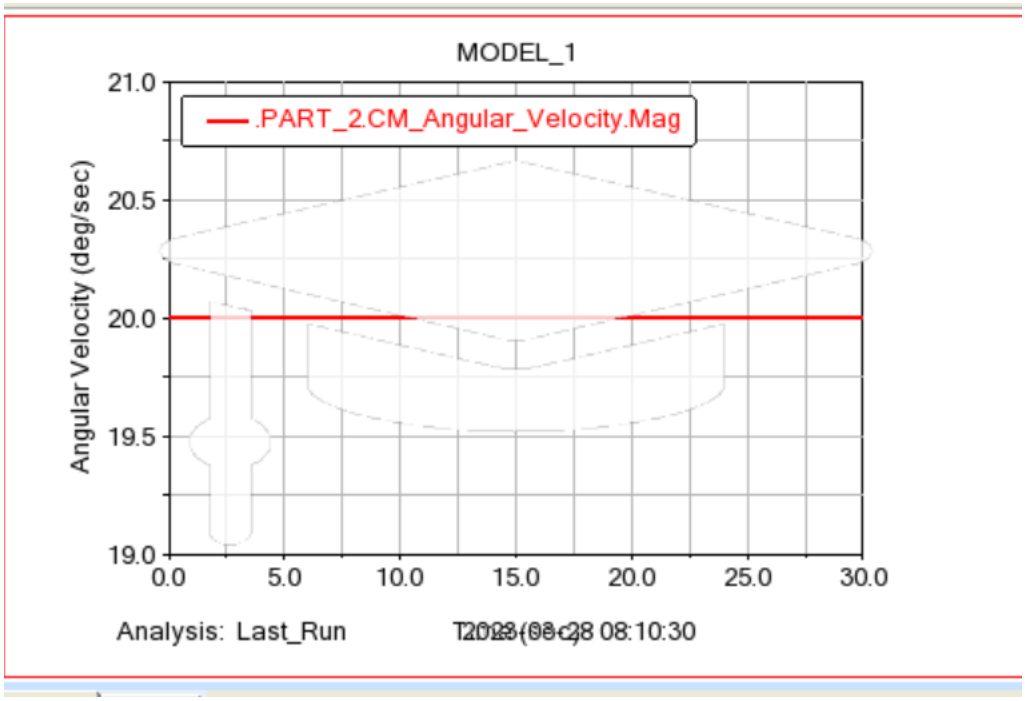
ADAMS SIMULATION

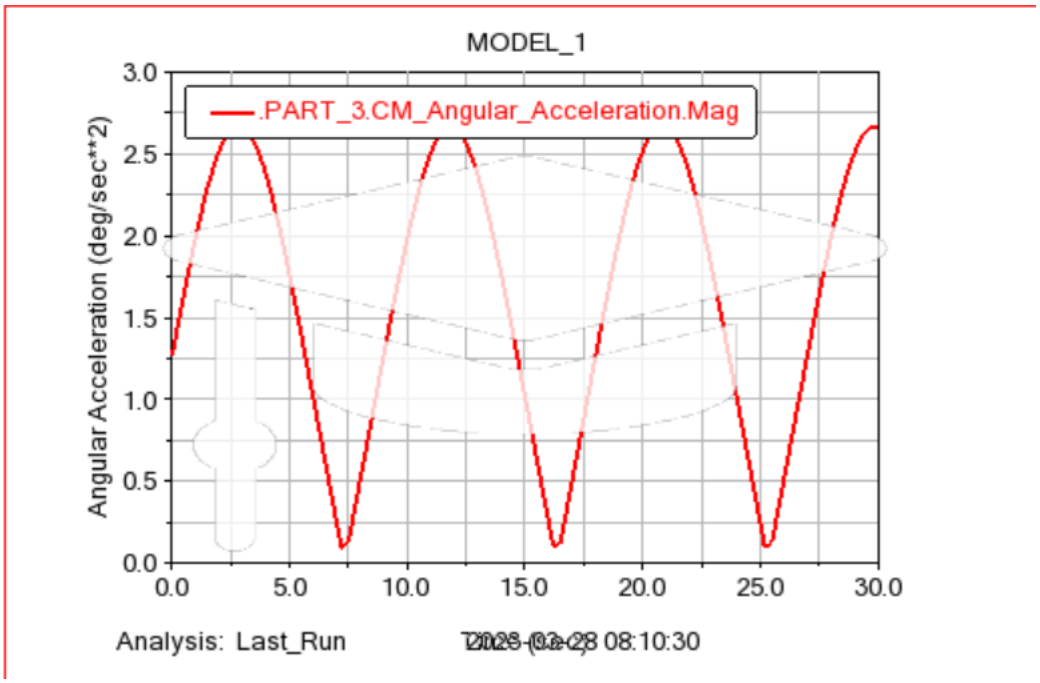


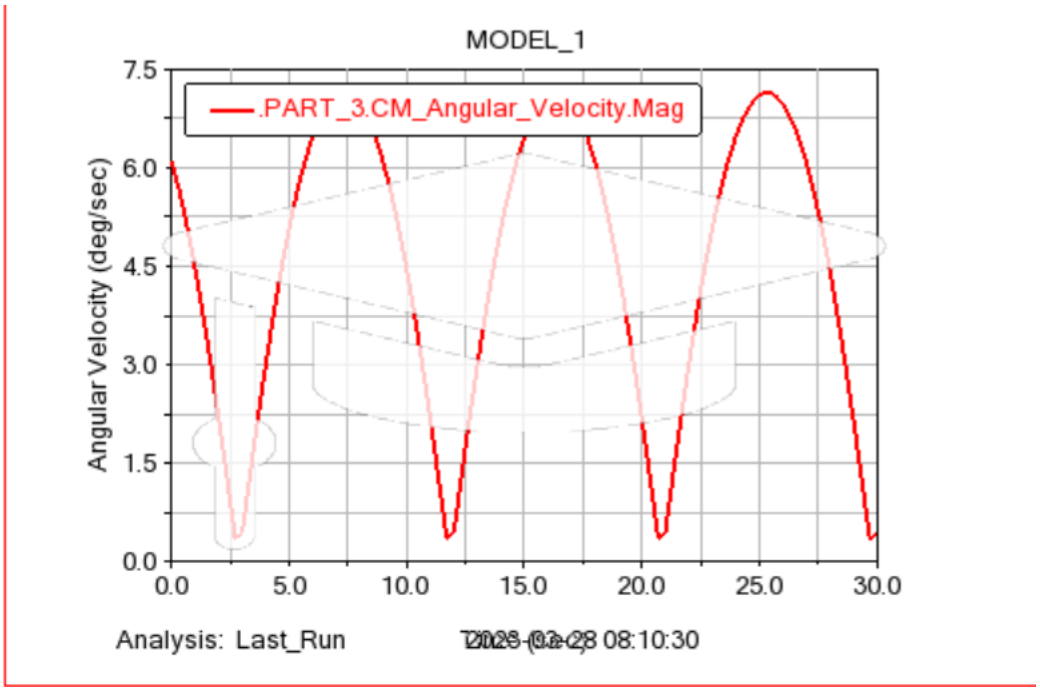
ANGULAR VELOCITY AND ACCELERATION GRAPHS

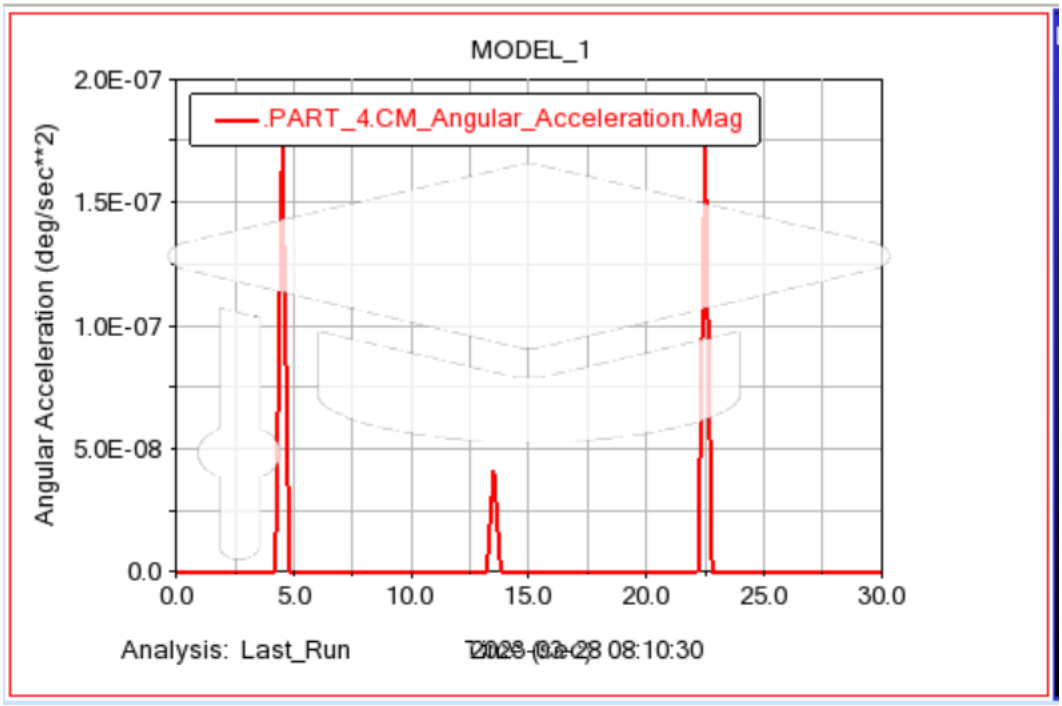



MODEL_1
.PART_2.CM_Angular_Acceleration.Mag
Angular Acceleration (deg/sec**2)
2.0E-07
1.5E-07
1.0E-07
5.0E-08
0.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
Analysis: Last_Run
2023-03-28 08:10:30


MODEL_1
.PART_2.CM_Angular_Velocity.Mag
Angular Velocity (deg/sec)
21.0
20.5
20.0
19.5
19.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
Analysis: Last_Run
2023-03-28 08:10:30


MODEL_1
.PART_3.CM_Angular_Acceleration.Mag
Angular Acceleration (deg/sec**2)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
Analysis: Last_Run
2023-02-28 08:10:30


MODEL_1
.PART_3.CM_Angular_Velocity.Mag
Angular Velocity (deg/sec)
7.5
6.0
4.5
3.0
1.5
0.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
Analysis: Last_Run
2023-02-28 08:10:30


MODEL_1
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Angular Acceleration (deg/sec**2)
2.0E-07
1.5E-07
1.0E-07
5.0E-08
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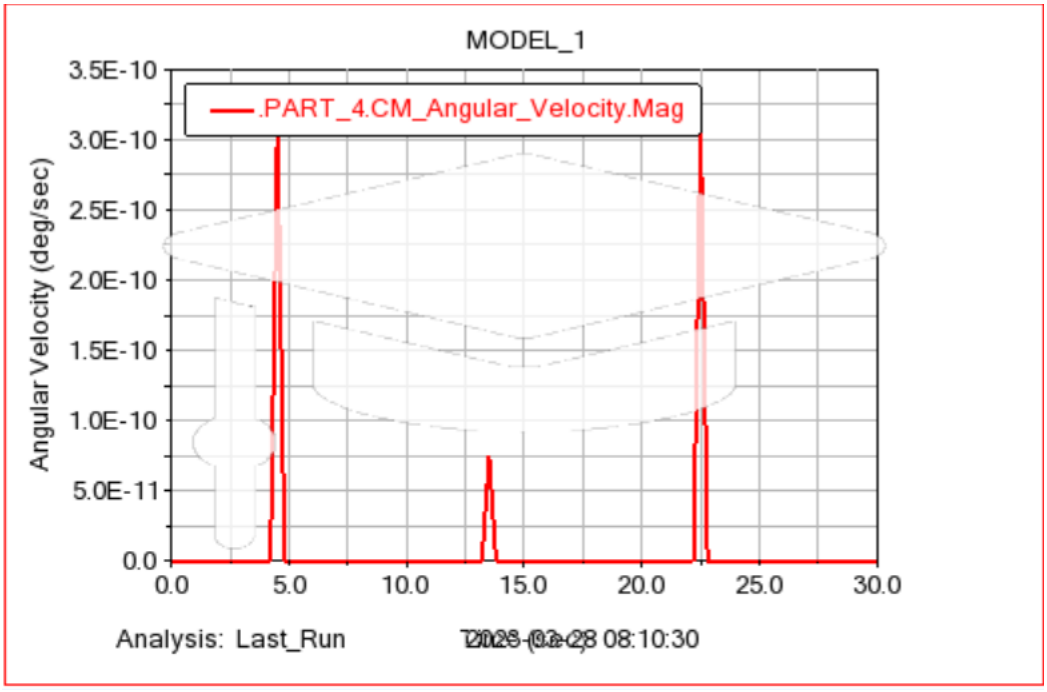
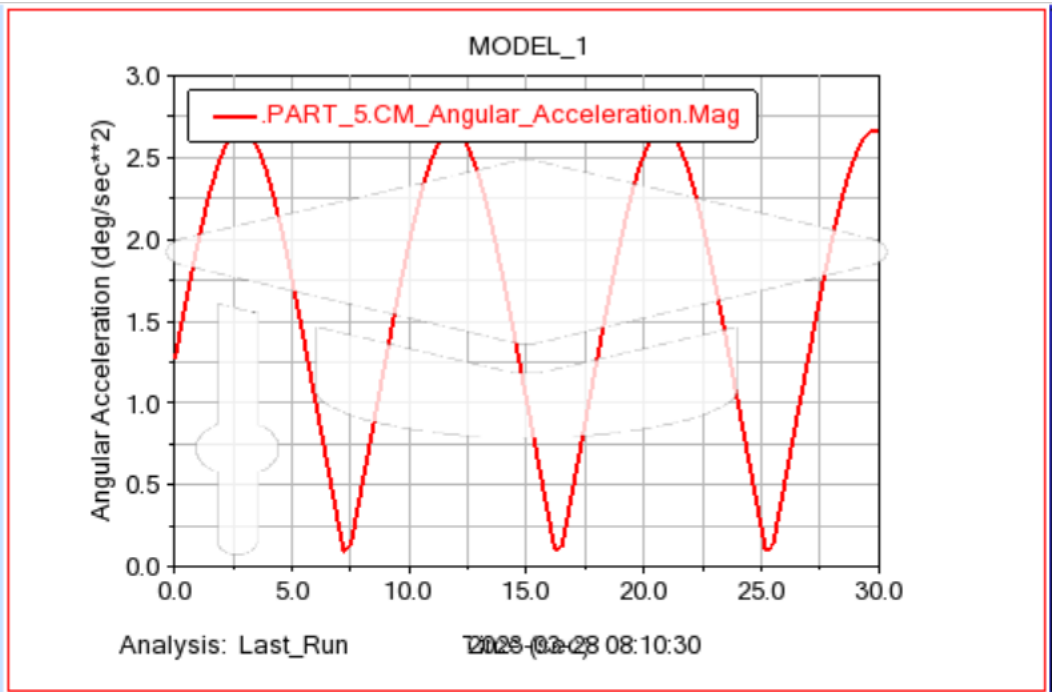
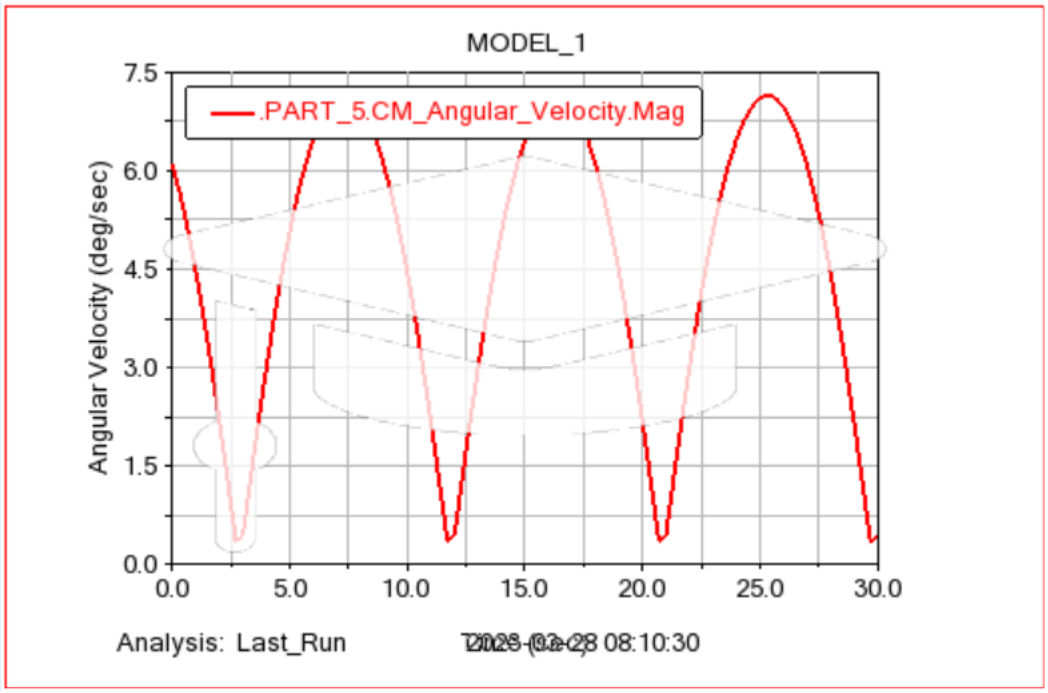
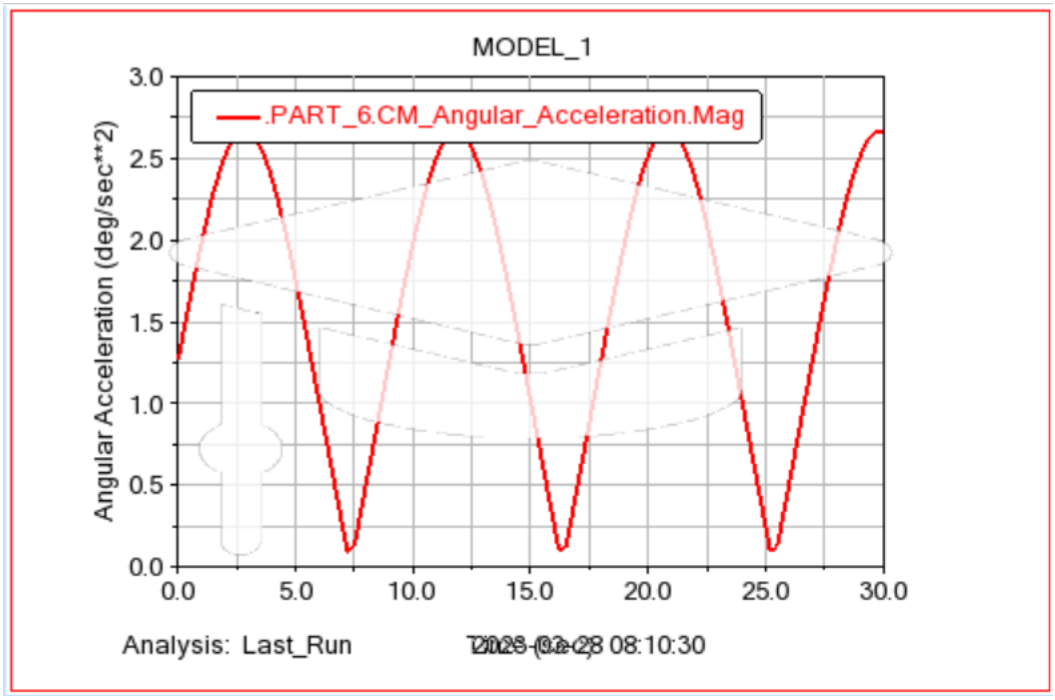
0.0
5.0
10.0
15.0
20.0
25.0
30.0
Analysis: Last_Run
2023-03-28 08:10:30


MODEL_1
.PART_4.CM_Angular_Velocity.Mag
Angular Velocity (deg/sec)
3.5E-10
3.0E-10
2.5E-10
2.0E-10
1.5E-10
1.0E-10
5.0E-11
0.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
Analysis: Last_Run
2023-03-28 08:10:30


MODEL_1
.PART_5.CM_Angular_Acceleration.Mag
Angular Acceleration (deg/sec**2)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
Analysis: Last_Run
2023-03-28 08:10:30


MODEL_1
.PART_5.CM_Angular_Velocity.Mag
Angular Velocity (deg/sec)
7.5
6.0
4.5
3.0
1.5
0.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
Analysis: Last_Run
2023-03-28 08:10:30


MODEL_1
.PART_6.CM_Angular_Acceleration.Mag
Angular Acceleration (deg/sec**2)
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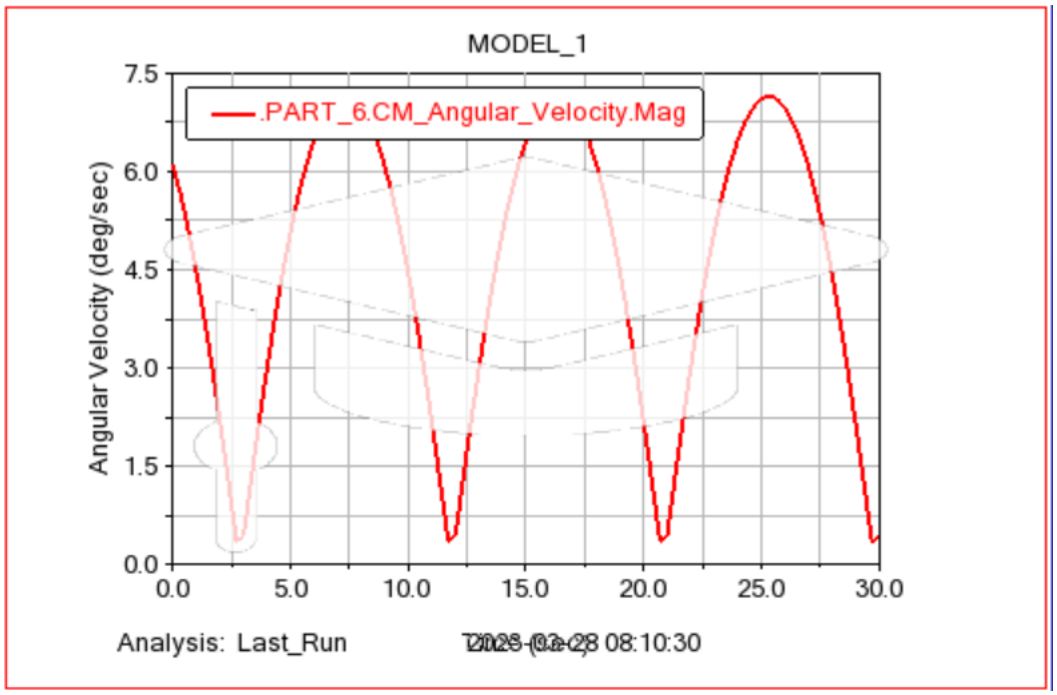
2.5
2.0
1.5
1.0
0.5
0.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
Analysis: Last_Run
2025-03-28 08:10:30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4.5
3.0
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25.0
30.0
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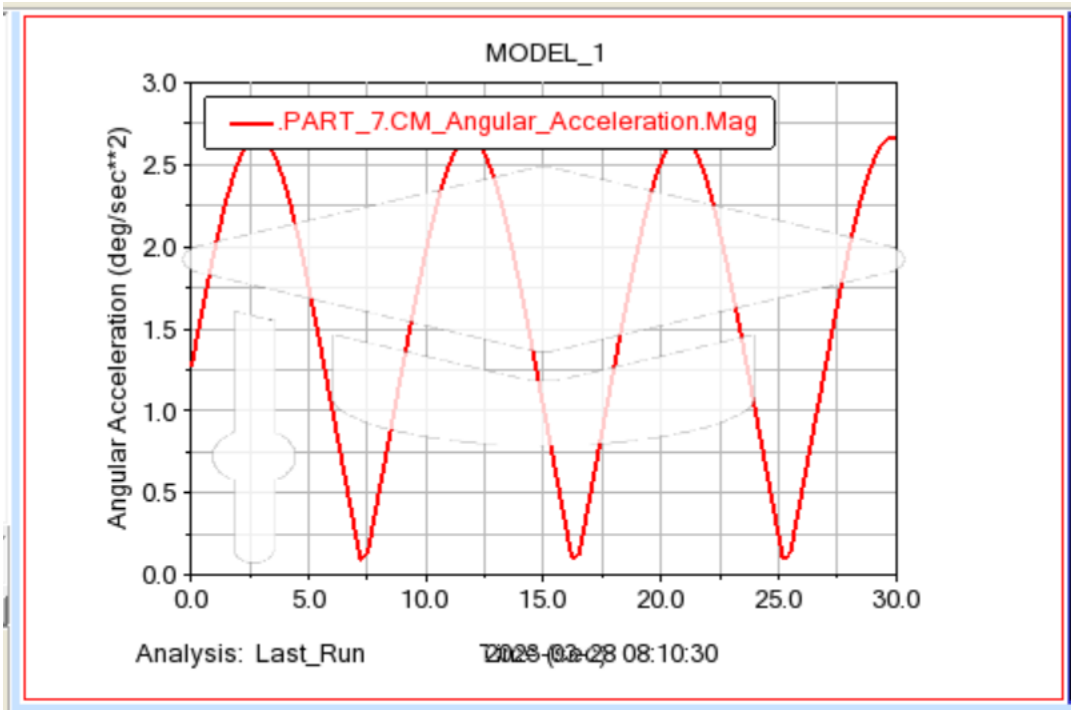
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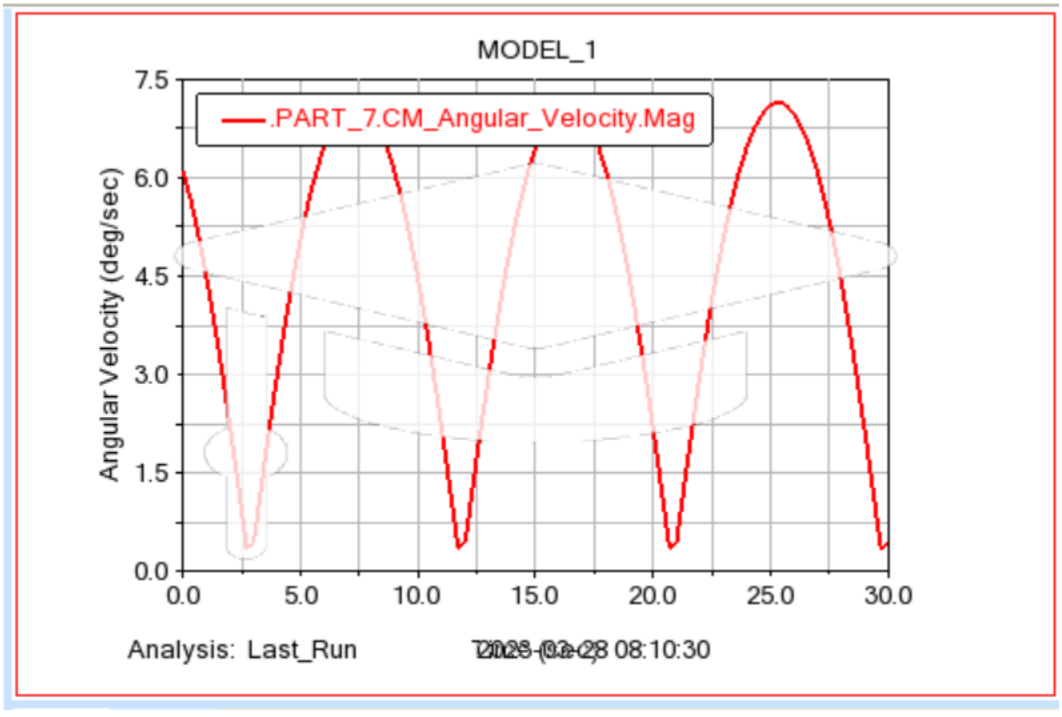
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3.0
1.5
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20.0
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30.0
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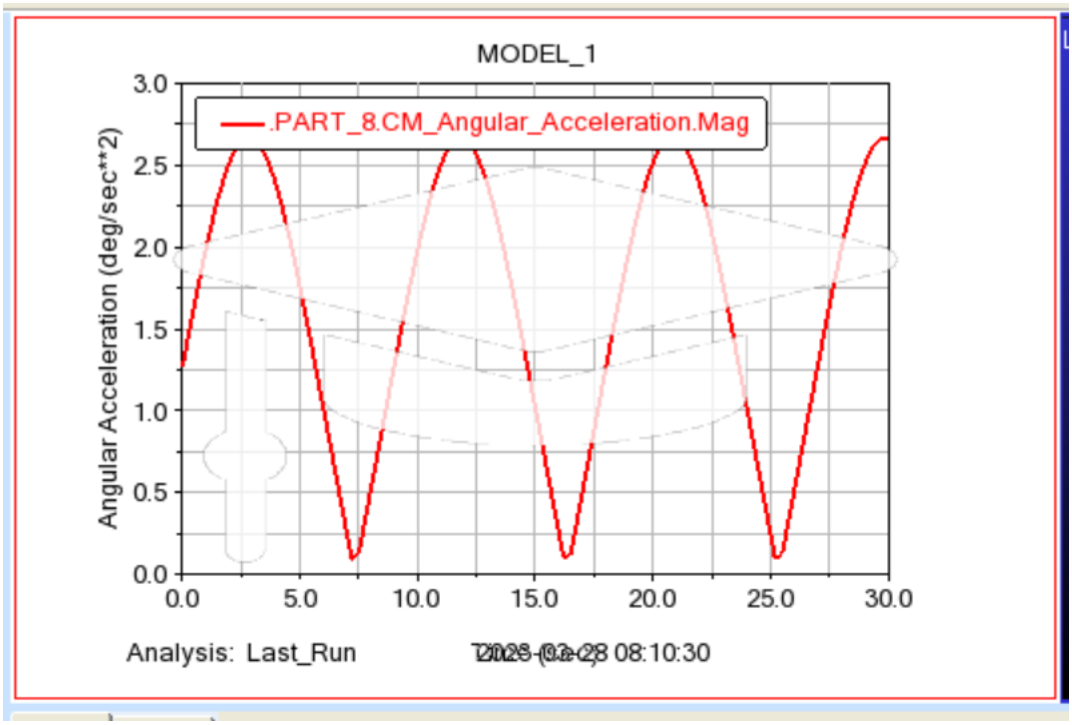
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Angular Acceleration (deg/sec**2)
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1.5
1.0
0.5
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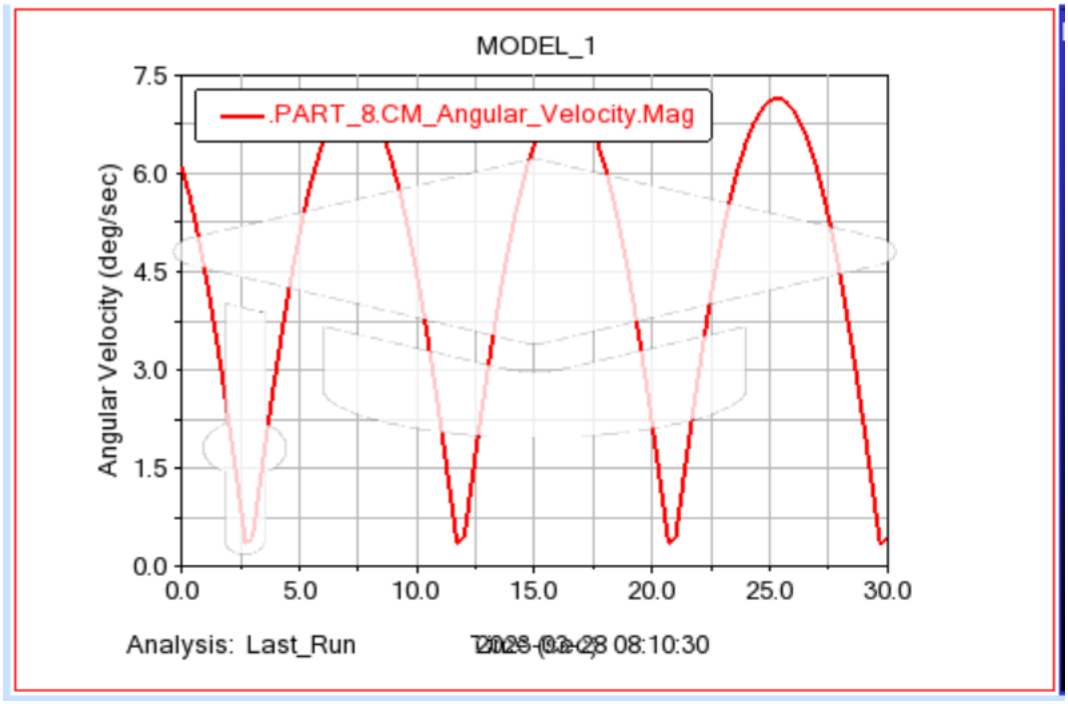
5.0
10.0
15.0
20.0
25.0
30.0
Analysis: Last_Run
2023-03-28 08:10:30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.PART_8.CM_Angular_Velocity.Mag
Angular Velocity (deg/sec)
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4.5
3.0
1.5
0.0
0.0
5.0
10.0
15.0
20.0
25.0
30.0
Analysis: Last_Run
2023-03-28 08:10:30

STUDY OF DIFFERENT LIGHTS AND THEIR WAVELENGHT

LED floodlights are a type of outdoor lighting fixture that is designed to provide bright, even illumination over a large area. They are commonly used for security lighting, sports fields, parking lots, and other outdoor applications that require high-intensity lighting.

Here are some key features of LED floodlights:

Energy efficiency: LED floodlights consume significantly less energy than traditional lighting sources, such as halogen or incandescent bulbs, making them more energy-efficient and cost-effective.

Long lifespan: LED floodlights have a longer lifespan than traditional lighting sources, lasting up to 50,000 hours or more. This means they require less frequent replacement, reducing maintenance costs.

High brightness: LED floodlights produce a high level of brightness and can provide a broad beam angle of up to 120 degrees, making them ideal for lighting large outdoor areas.

Durable: LED floodlights are designed to be durable and weather-resistant, with an IP65 rating or higher to protect against dust and moisture.

Easy to install: LED floodlights are easy to install and can be mounted on walls, poles, or other structures. They are also compatible with motion sensors and other smart control systems, allowing for greater flexibility and energy savings.

Overall, LED floodlights are an excellent choice for outdoor lighting applications that require bright, energy-efficient, and durable lighting solutions.

WAVELENGHTS OF DIFFERENT LIGHTS

LED floodlights come in different wavelengths, and the specific wavelength or colour of the LED will depend on the application and lighting requirements.

The wavelength of an LED is typically measured in nanometres (nm) and determines the colour of the light emitted. Some common wavelengths for LED floodlights include:

Warm White: This is a soft, yellowish-white light that has a wavelength of around 2700K-3500K.

Cool White: This is a brighter, bluish-white light that has a wavelength of around 4000K-4500K.

Daylight: This is a bright, natural light that has a wavelength of around 5000K-6500K.

RGB: These are LED floodlights that can emit red, green, and blue light, which can be combined to create a wide range of colours.

It's important to choose the right colour temperature or wavelength based on the specific lighting needs and application. For example, warm white LED floodlights are ideal for creating a cozy and inviting atmosphere, while cool white and daylight LED floodlights are better suited for outdoor lighting and industrial applications where brightness and clarity are important.

In summary, the wavelength of an LED floodlight determines the colour of the light emitted, and different wavelengths are used for different applications and lighting requirements.

DIFFERENT LIGHTS AND THEIR SPECIFICATIONS

Sl.No	Product Name/ Image	Price	Specification
1.	54x3W Warm White LED Par Can Light 	**₹ 3,200**	**Voltage:** AC 90V-245V/50-60Hz **Power:** 180W **Fuse:**3A **Lamp:** 54pcs 3W warm white LEDs **Beam angle:**15~45 degree (selectable) **Life time:** >100 thousand hours
2.	30W Titano LED Flood / Focus Light Cool White 	**₹ 1,219**	**Weight:** 0.650 kg. **Dimensions: 19** × 6 × 25.5 cm. **Rated Power:** 30W. **Nominal Voltage:** 180-260V AC. **Luminous Flux** 3000lm **Colour Temperature** 6500K

			CRI:>80 **Intended Use:** Outdoor **Beam Angle (º) :** 120°
3.	Sirui C60 Daylight LED Monolight 	**₹16,800**	**Model** : C60 **Size** : 92 x 116 x 110mm **Weight** : Light Body 660g **Power** : about 60W **Colour Temperature Range** : 5600K **Special Effect** : 8 **100% IL luminance (LUX)** : 3000 lux at 1m **TLCI** : 98 on average **CRI** : 96 on average **Working Temperature** : -10°C-45°C **Control Method** : Control Panel & App **Wireless Bluetooth Control Distance** : 15m

4.	50 W Aluminium RGB Flood Light, For Outdoor, IP Rating: IP66 	**₹ 2,500**	**Usage/Application : Outdoor** **Power:** 50W **Lighting Colour** : RGB **IP Rating : IP66** **Body Material :** Aluminium **Lighting Type :** LED **Input Voltage :** 220V **Frequency :** 50Hz **Remote Control :** Yes

SELECTION OF LIGHTS

LED floodlights do not typically have a focal length as they are designed to provide a broad beam angle of light to illuminate a large area evenly. Unlike spotlight or directional lighting, LED floodlights are designed to distribute light over a wide area and do not require a specific focal length to achieve this.

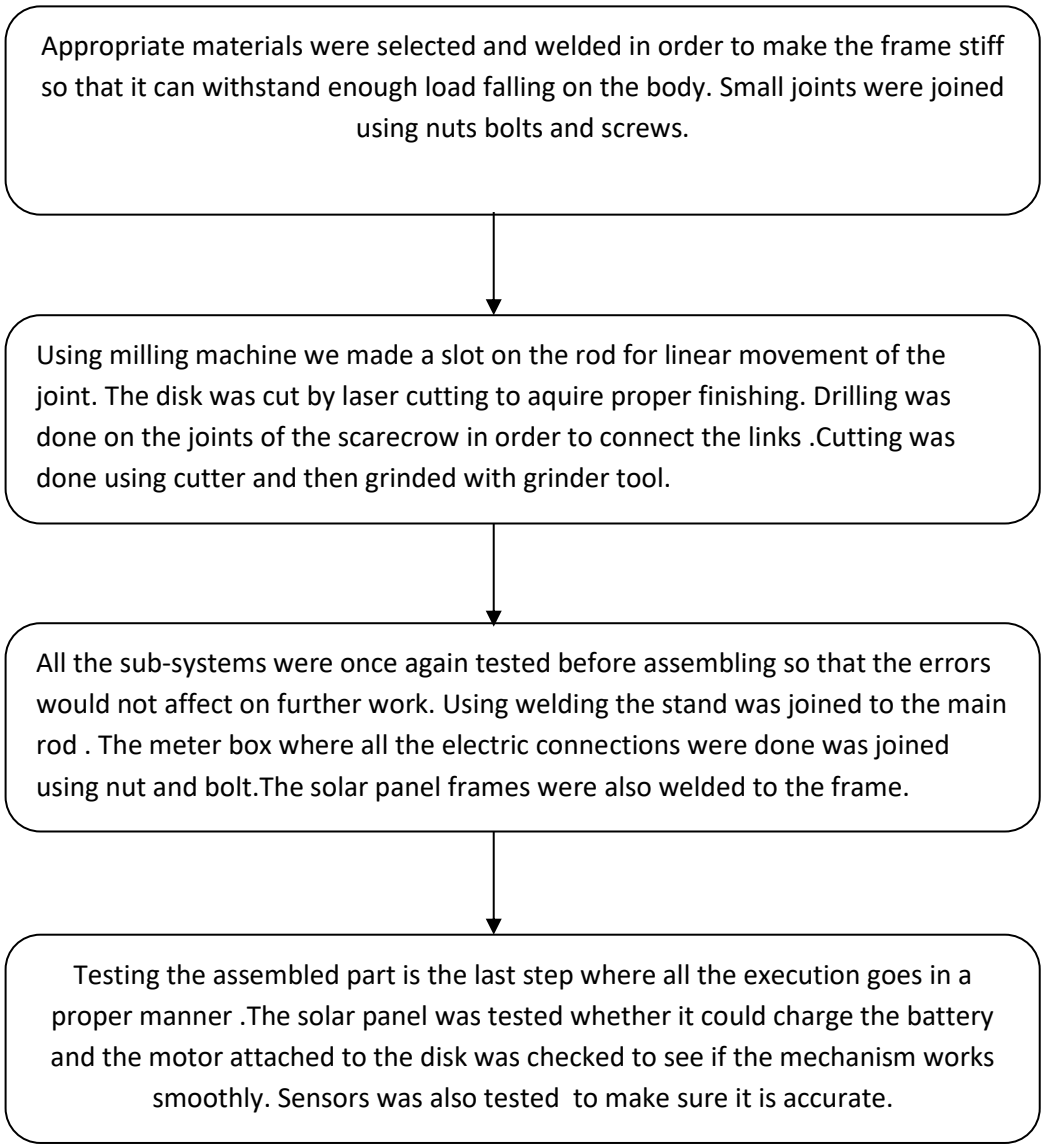
However, some LED floodlights may come with reflectors or lenses that can help direct and focus the light in a specific direction. These reflectors and lenses are typically used to control the beam angle and provide more focused or directional lighting for specific applications.

It's important to note that when selecting an LED floodlight, the beam angle should be considered as this will determine the coverage area and the level of illumination. The wider the beam angle, the more area the floodlight can cover, while a narrower beam angle will provide more focused lighting but over a smaller area.

Overall, LED floodlights are designed to provide a wide and even distribution of light over a large area and do not typically require a specific focal length.

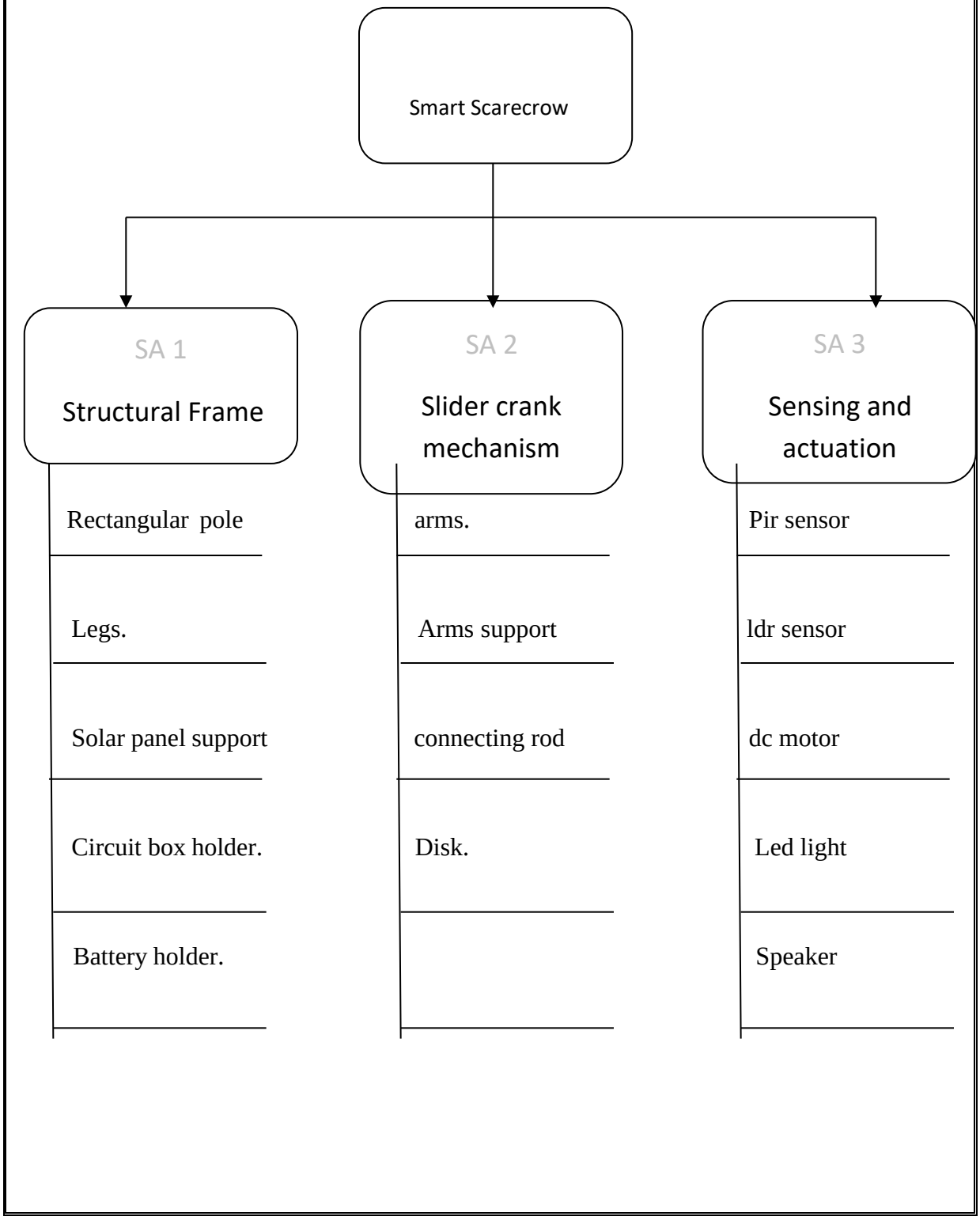
6.5 Flow Chart:

Prepare tentative flow chart of series of operation to be followed for prototyping:



6.6 Sub-Assembly Planning:

Plan to fabricate the Prototype in sub assemblies:



Sub Assembly #	**Brought out Parts**	**Manufactured Parts**
SA 1 Structural frame	Rectangular pole	
		Legs
		Solar panel support
	Circuit box holder	
		Battery holder
SA 2 Slider crank mechanism		Arms
		Arms support
		Connecting rod
		Disk
SA 3 Sensing and actuation	Pir sensor	
	LDR sensor	
	DC motor	
	LED light	
	Speaker	

7. Final Impressions

7.1 Final Cost Estimation

Product Expenses			
SI	**Part Name**	**Qty.**	**Total Cost**
1	**Arduino Uno**	**1**	**999**
2	**LDR Module**		**45**
3	**L298 Motor Driver**		**278**
4	**PIR Sensor**		**75**
5	**APR303A Module**		**750**
6	**Warning Light**		**650**
7	**Speaker**		**350**
8	**Motors**		**80**
9	**Meter Box**		**120**
10	**Solar Panel**		**2350**
11	**Battery**		**1500**
12	**Fabrication Parts**		**500**
	Total Parts Expenses Rs.		**7697**

The estimated total expenses is the sum of parts of Rs : **7697**

7.2 Final Prototype Pictures

7.3 Conclusions

A Scarecrow does not effective in the night to provide the security for the crops. So there is an option of using Automatic Scarecrow instead of using Normal Scarecrow. Automatic Scarecrow can also be called as Smart Scarecrow. An Automatic Scarecrow or Smart Scarecrow is more efficient than a Normal Scarecrow. Automatic Scarecrow provides all time security to the emps from the birds and animals. It is effective in both Day and Night. It works Automatically. Automatic Scarecrow is equipped with Sensors, Movable Arts and alarming device.

7.4 Product Catalogue