

# AVIRAL SUNDLI

MECHANICAL DESIGN ENGINEER



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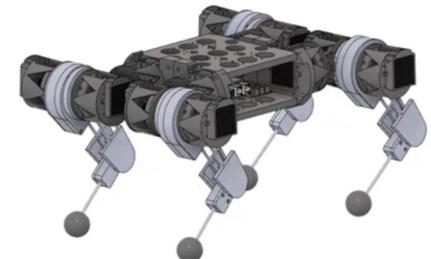


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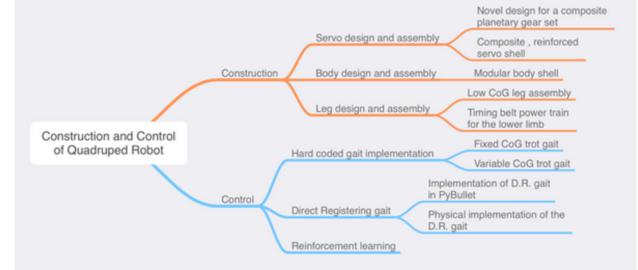
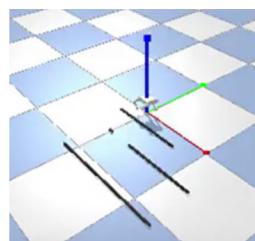
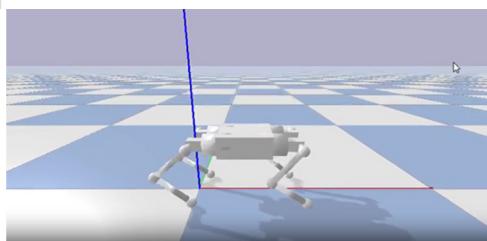
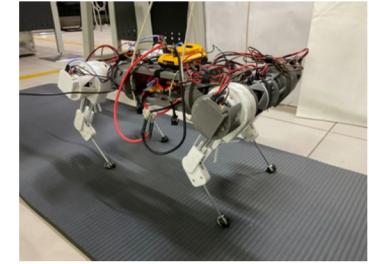
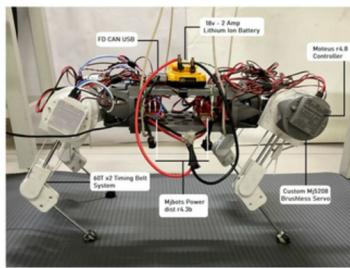


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## • DIRECT REGISTERING GAIT ANALYSIS ON A QUADRUPED ROBOT - 2022



No.	Specification	Description
1	Overall Dimension	
	- length	548.34 mm
	- width	392.36 mm
	- height	258.57 mm
2	Weight	7.2 Kg
3	Payload Capacity	0.5 Kg
4	Degree of freedom	12
5	Servo	Custom servo with mj5208 brushless motor
6	Control System	On board processor , fdcansub , PC controller
7	Power Supply	18v , 2Ah Li - Ion Battery , mbotics power dist r4.3b
8	Micro Controller	Moteus r4.8 controller
9	Built - in OS	Linux , Windows
10	Connectivity	Usb , Wi-Fi



### What?

- Design and fabrication of **quadruped robot** using in-house manufactured actuators for reduced cost of the project.
- Develop gait algorithm for efficient robot's trajectory planning.
- Funded by **Dassault Systèmes**
- Final Year Undergraduate Project.

### How?

- Used **SolidWorks** and **Shapr3D** for designing modular actuator and robot body.
- Employed FDM 3D Printing and Metal Machining for fabrication.
- Developed and analyzed the **Direct Registering Gait** algorithm using **PyBullet**.

### Results

- Successfully designed and tested the 12 DoF Quadruped Robot.
- Custom actuators decreased the cost by **60 percent**.
- Implementation of Direct Registering Gait reduced trajectory planning processing time by **50 percent**.
- Modular approach in both design and algorithm development allowed for subsequent students to build upon the platform.

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## • ORANGE WOOD ROBOT ( OWR ) V6.5 - ORANGEWOOD LABS - 2023



### What?

- Design , simulation and fabrication of an industrial robotic arm.
- Weight : 25kg
- Payload capacity : 5kg
- Reach : 850mm

### How?

- **SolidWorks** for designing.
- **ANSYS** for FEM Stress and Strain Analysis.
- Joint torque calculation for **CE certification**.
- **URDF development** and optimization for ROS.
- CAD drawing drafting and **GD&T** implementation.
- Vendor reach-outs , procurement and Q&C for CNC parts , plastic housing and accessories.

### Results

- Successfully design , testing and **30** batch run production of OWR V6.5.
- 27 of the robots are either deployed or in trial runs.

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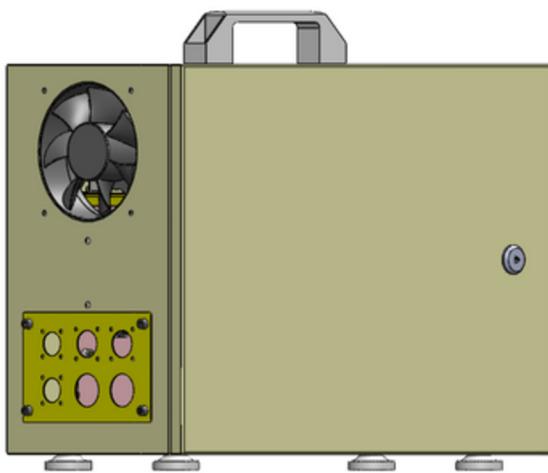


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## • CONTROL BOX : ORANGEWOOD LABS - 2023



Control Box v4.0 ( left ) vs previous versions

### What?

- Design and fabrication of control box for industrial robotic arm.
- Objective :
  1. Size reduction.
  2. Weight reduction.
  3. Convenient one-handed carrying

### How?

- **Sheet metal** feature in **SolidWorks** for designing.
- CAD drawing drafting and implementation of **GD&T**.
- Sheet metal vendors reach-outs and procurement.

### Results

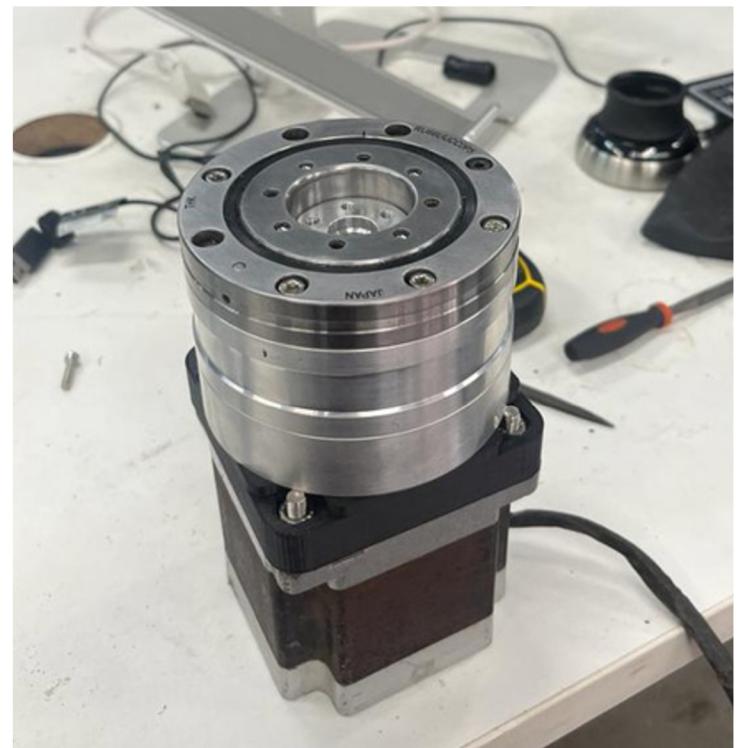
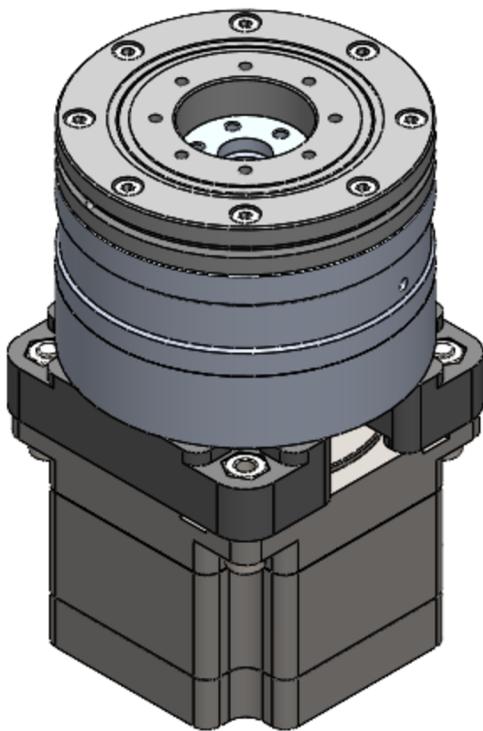
- **25 percent** size reduction.
- **30 percent** weight reduction.
- Single handed portability.

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## • GEAR BOX - 2023



### What?

- Design a new gearbox for industrial manipulators
- Objective :
  1. High reduction ratio
  2. Robust

### How?

- Innovative gear system that blends the qualities of planetary and cycloidal drive.
- Designed using **SolidWorks**.
- Manufactured using **Wire EDM Cutting** for gears and **CNC machining** for the housing.

### Results

- **1:131** reduction ratio.
- More robust compared to a harmonic drive.

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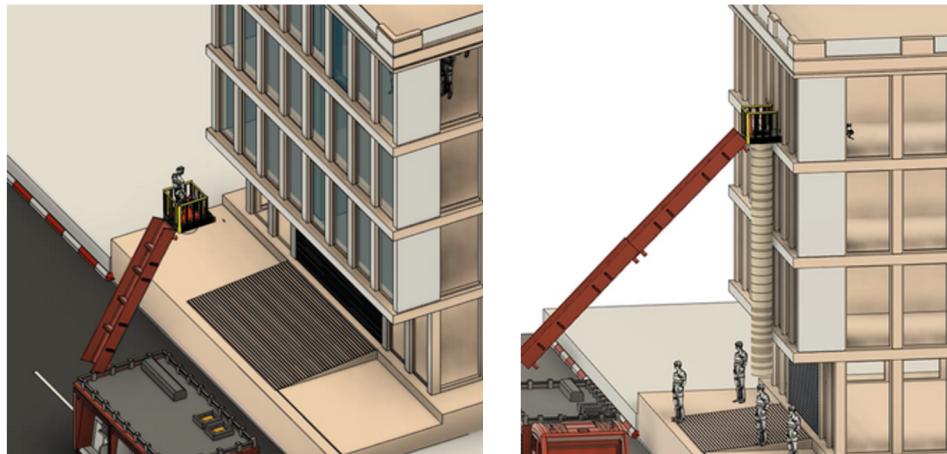
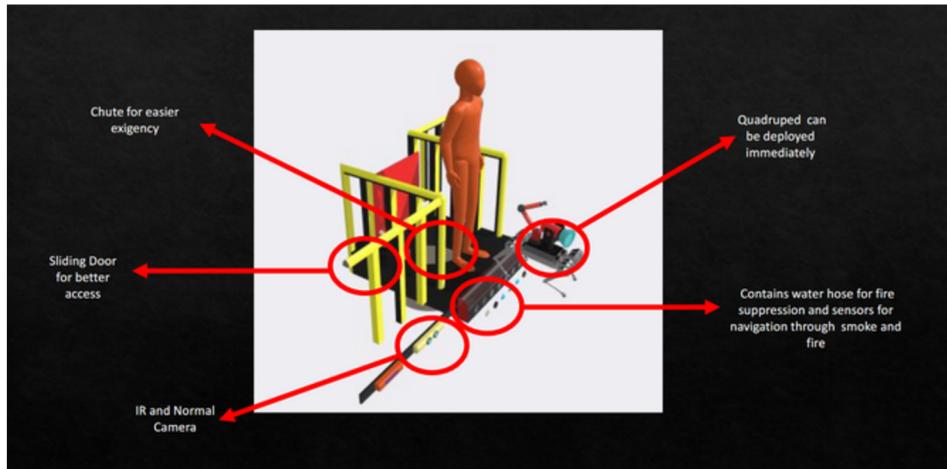


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## • HACKATHON : INGENIUS - 2022



### What?

- INDIGENIUS : Organised by ASME , SAE , RoboYantri & Shilpkulam.
- National level 48 Hrs hackathon.**
- Objective : " Fire broke out in a multi-storey building, Fire-Fighters have no chance for Entry, People are stuck inside crying for help " , **Design a rescue system for rescuing the people.**

### How?

- Designed **RAFES** : Robot Assisted Fire Escape System using **SolidWorks**.
- Vision System for easier human recognition through smoke.
- Water hose for fire suppression.
- Chute for easier exigency.

### Results

- Awarded First Prize**

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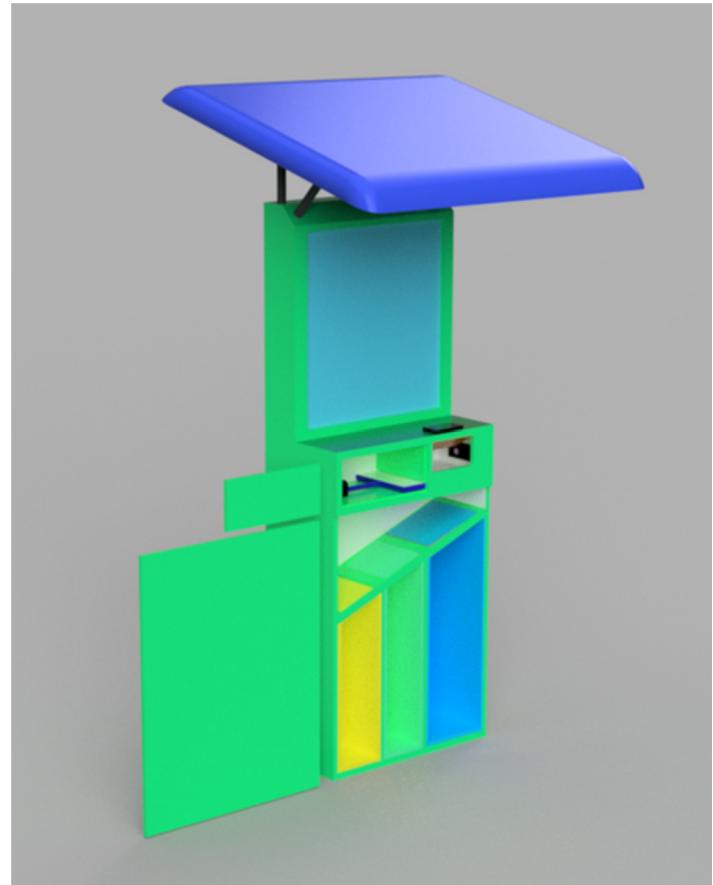
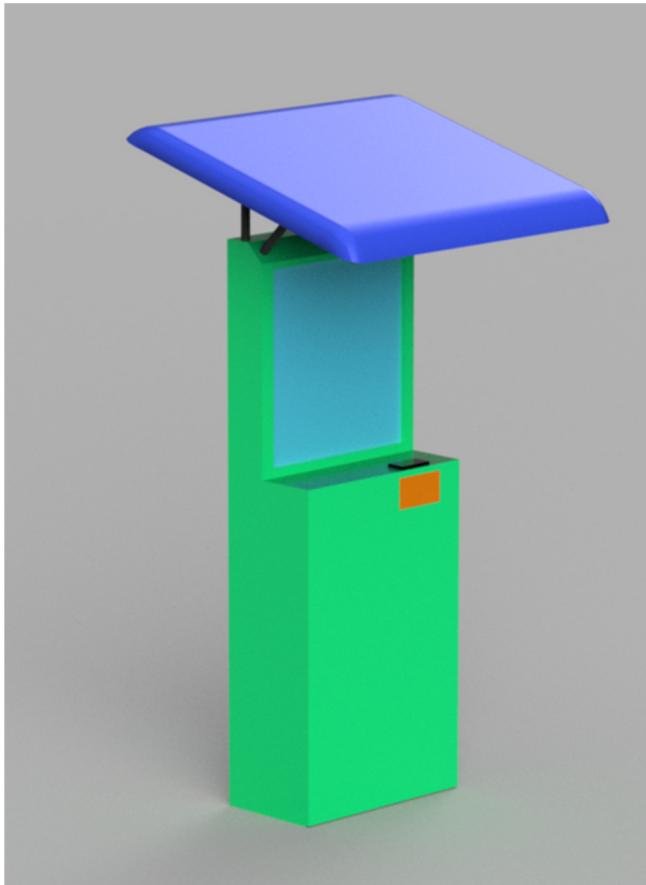


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## • HACKATHON : HACKTHECRISIS - 2022



### What?

- HackTheCrisis : Feeding India Hackathon.
- **National level hackathon.**
- Ideate , develop and present solution targeted towards 17 UN SDGs.

### How?

- Smart Bin that incentivizes people to use the bin in return for rewards points.
- Designed mechanism for waste identification and bin sorting.
- Used **Fusion 360** for modelling and animation.

### Results

- **Awarded Second Prize**

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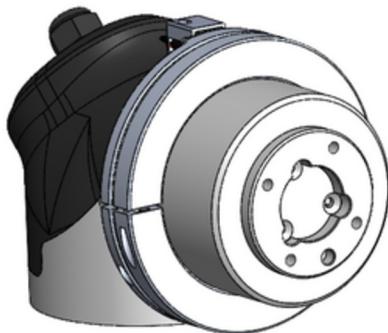


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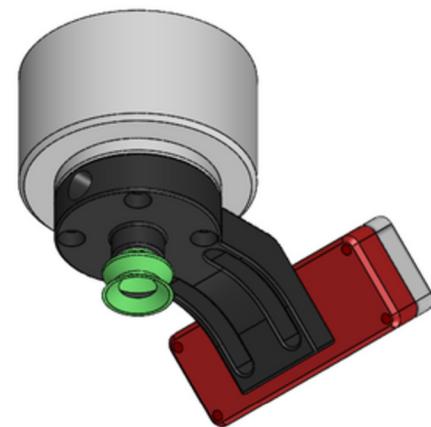


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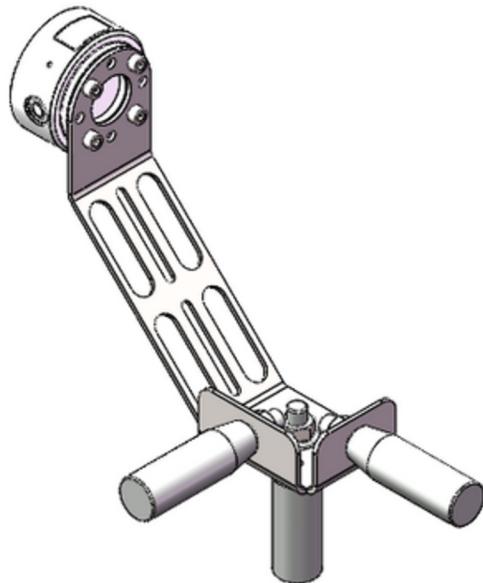
- ADDITIONAL MECHANICAL DESIGN PROJECTS :



END EFFECTOR EXTERNAL BRAKE SYSTEM



2 POINT 3D PRINTED SUCTION GRIPPER



UNIVERSAL TEACH HANDLE



Z AXIS COMPLIANCE SUCTION GRIPPER



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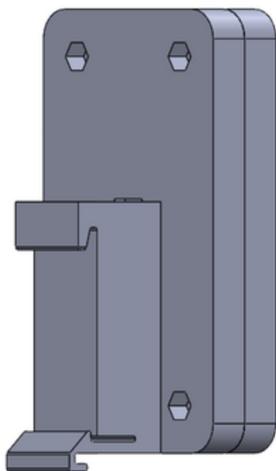


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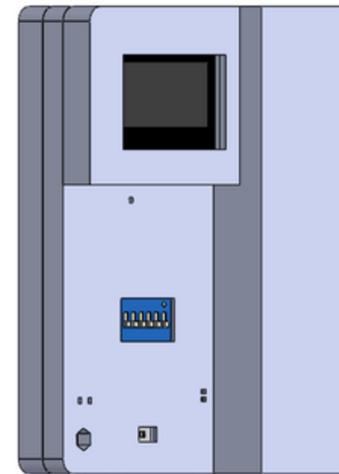


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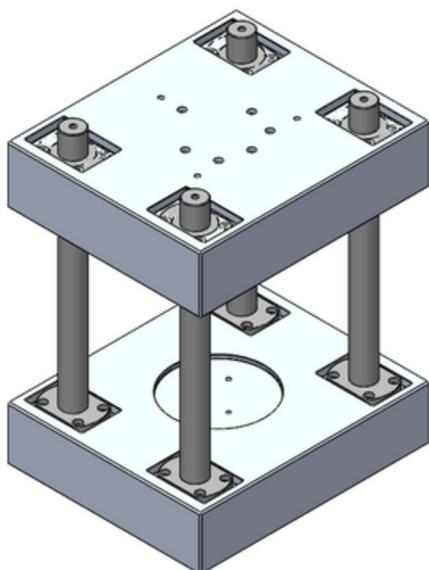
- ADDITIONAL MECHANICAL DESIGN PROJECTS :



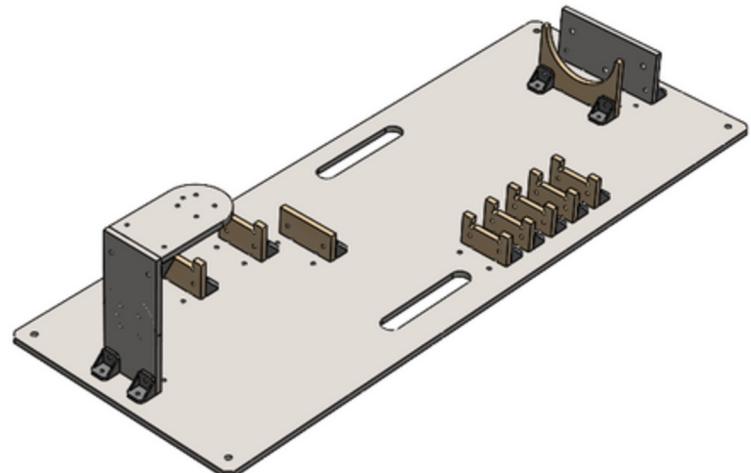
CANABLE ENCLOSURE



CAN-DEBUGGER ENCLOSURE



PRESS FITTING JIG



CALIBRATION JIG

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## • GRAPHIC DESIGN PORTFOLIO :

