

# Design Details Document

**University:** Sister Nivedita University

**Team Leader:** Jishnu Baruah

**Email Address:** jsbaruah1@gmail.com

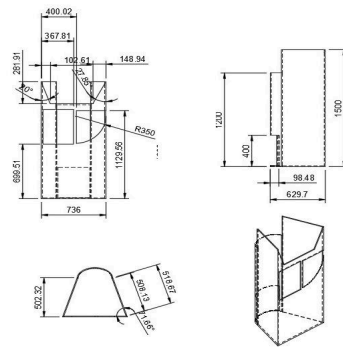
**Mobile No. of Team Leader:** +91-8638577811

---

## Design of Robot-1 (R1) and Robot-2(R2)

### A. Overall Bot Dimensions and Weight

- **Weight:** ~15-50 kg
- **Dimensions :**
  - Starting Height: 1500mm
  - Starting Width: 736mm
  - Starting Length: 629mm
  - Extended Height: 2400mm

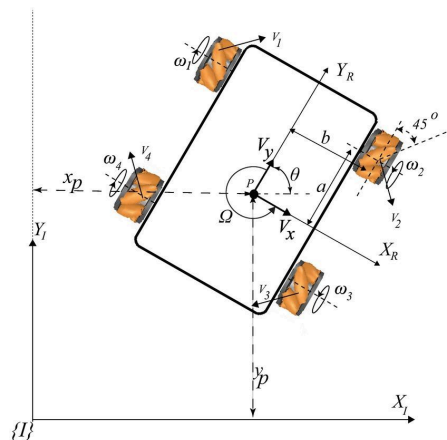


### B. Type of Drive

**Fig. 1 : Chassis**

The bot uses 6-Wheel Omni-Directional Drive for agile and flexible movement. It is controlled through a wireless controller, with free-wheel encoders and an IMU for accurate localization.

Justification: Omni-directional wheels allow for smooth rotational and translational motion, ideal for precise movements and quick direction changes.



**Fig 2: Omnidirectional wheel**

### C. Type of Actuators Integrated

Actuator	Specifications	Application
DC Motor	24V, Top Speed: 500 RPM	Wheel movement and dribbling mechanism
Servo Motor	5V, Torque: 10 Kg.cm	Shooting mechanism
Pneumatic Pistons	80mm Stroke, Extend Force: 150N	Jumping mechanism

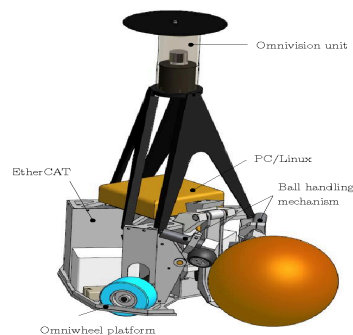
### D. Types of Sensors Integrated

Sensor	Specifications	Application
Detection sensors	Sensors	Ball and hoop detection
IMU	360-degree scanning, 5m range	Balance during jumps
Force Sensor	Force-sensitive resistor	Dribbling feedback

### E. Ball Handling and Passing Mechanism

- **Ball Handling:** Rubberized rollers with adjustable pressure for consistent dribbling.
- **Passing Mechanism:** Uses a catapult or flywheel system to pass the ball accurately.

**Justification:** Adjustable rollers and flywheels provide precision control and high passing accuracy.



**Fig 3: Ball handling Mechanism**

### F. Dribbling, Jumping, and Shooting Mechanism

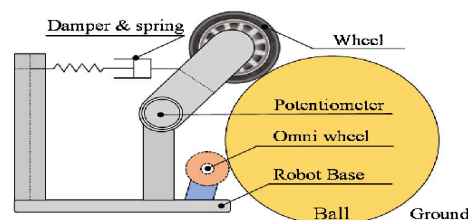
- **Dribbling:** Two counter-rotating rollers with force feedback for controlled bouncing.
- **Jumping:** Telescoping legs with pneumatic pistons for vertical leaps up to 2400mm.
- **Shooting:** Adjustable-angle catapult or flywheel system for precise shots.

### G. Control System

- **Main Controller:** NVIDIA Jetson Nano or Raspberry Pi 4 for AI/vision processing.
- **Motor Drivers:** CAN bus or PWM controllers for precise motor control.
- **Pneumatic Valves:** For jumping and dribbling mechanisms.

### Key Highlights for Both Robots

1. **Robot-1:** Focuses on agility and precision with omni-directional wheels and advanced sensors.
2. **Robot-2:** Focuses on simplicity and reliability with differential drive and linear actuators.



**Fig 4: Ball Holding State**

### Safety Features

- **Emergency Stop Button:** For immediate shutdown.
- **Redundant Systems:** Backup motor controllers and sensors.

---

### Additional Notes

- **Innovation:** Both robots incorporate AI-powered vision systems for real-time ball and hoop detection.
- **Safety:** Includes emergency stop buttons and collision detection sensors.
- **Testing:** Prototypes will undergo rigorous testing to ensure performance under competition conditions

## Key Components in the Diagram

1. **Funnel Receiver:** Wide opening at the top.
2. **Detection sensors:** Mounted near the top for vision and navigation.
3. **Dribbling Rollers:** Horizontal rollers with force sensors.
4. **Articulated Grippers:** Silicone grippers for ground pickup.
5. **Conveyor Belt:** Motorized belt for ball transport.
6. **Shooting Mechanism:** Flywheel system with adjustable angle.
7. **Telescoping Legs:** Pneumatic pistons or scissor lifts for jumping.
8. **Omni-Directional Wheels:** six wheels at the base.
9. **Battery and Control Unit:** Positioned at the rear.

## Submission Details

- **Repository Link:** <https://github.com/Mouli51ch/Robocon-2025>
- **Animation Files:**  
<https://drive.google.com/drive/folders/1NGXzD2RY2YW5PxN4lSipGCi0Jzv5619P?usp=sharing>