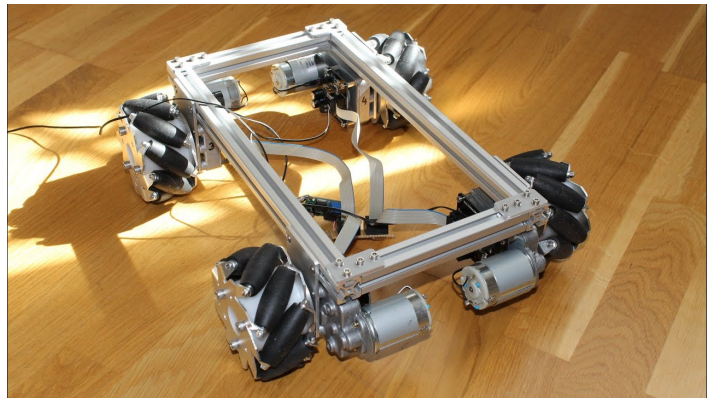
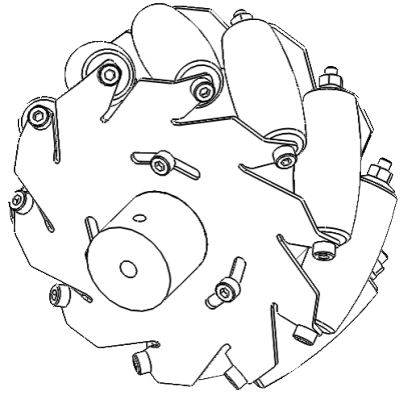
Cairo University
Faculty of Engineering
Electrical Power Engineering

Graduation Project:

Mecaum Wheel Robot





Team’s members:

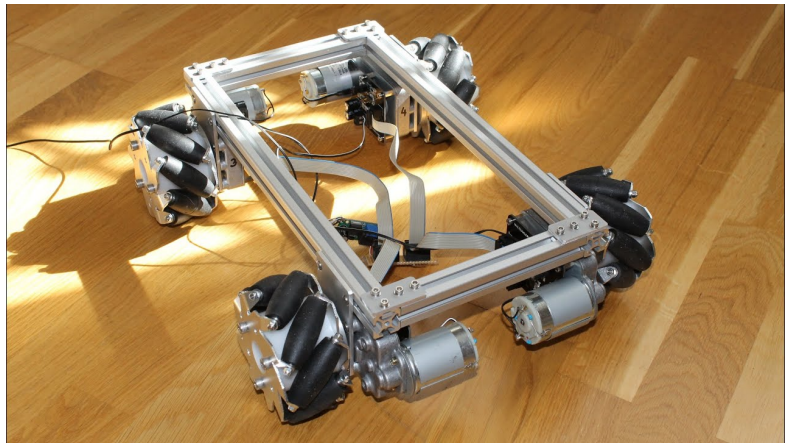
Name	MC1	MC2	MC3
Abanob Gamil Daniel	D	C	A
Omar Gamal Abd El Hamid	B	C	A
Noor Tarek Fawzi	C	B	A
Mohamed Tarek Abd El-Salam	D	C	B
Mohamed Ashraf Mabrouk	D	D	D

Grades:

Excellent: A V.good: B Good: C Fair: D

Introduction:

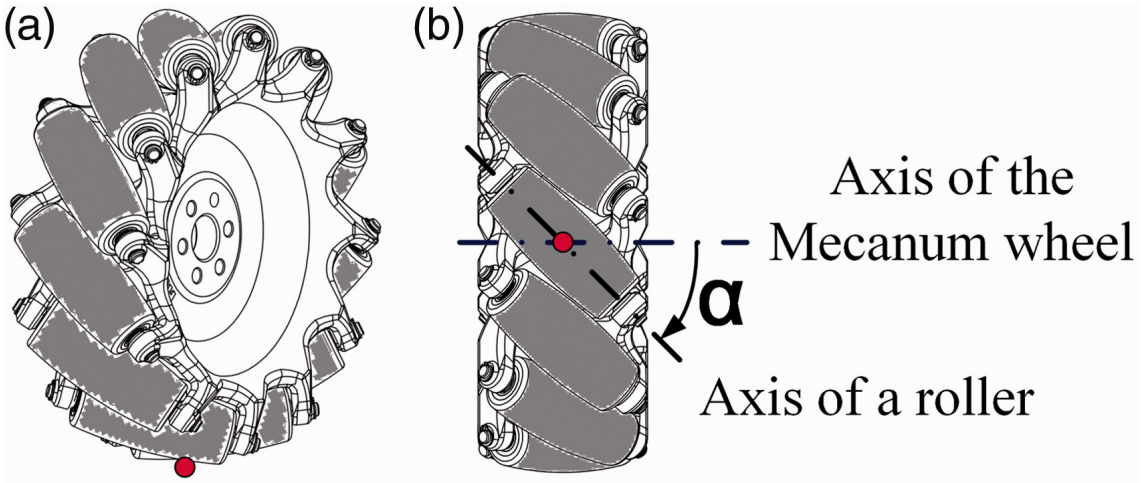
This project aims to create a versatile robot capable of moving seamlessly in any direction, even within tight spaces. Its potential applications are diverse, from aiding individuals with disabilities to optimizing warehouse operations.



Our goal is to bridge the gap between hardware and software, ultimately delivering a fully functional Mecanum Wheel Robot. Join us on this journey towards innovation, inclusivity, and improved efficiency as we present our vision for a robot that can make a significant impact.

:Principle of Working

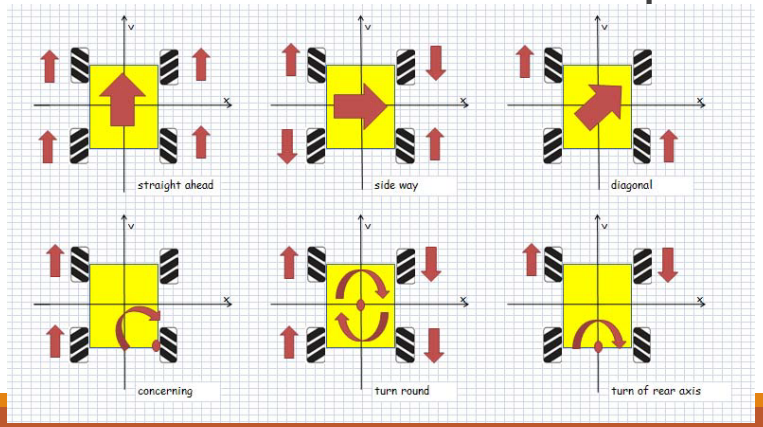
The Mecanum Wheel Robot operates on a unique and ingenious principle that enables it to move in any direction with precision and agility. At the heart of its functionality are the Mecanum wheels themselves, which are specially designed with angled rollers set around the circumference of each wheel.



Multi-Directional Movement:

When the Mecanum Wheel Robot moves, it utilizes a combination of these specialized wheels. By varying the speed and direction of rotation of each wheel independently, the robot can achieve movement in any direction.

For example, if all wheels rotate forward at the same speed, the robot moves forward. If the front wheels rotate in one direction while the rear wheels rotate in the opposite direction, the robot will pivot or rotate in place. By adjusting the wheel speeds and directions accordingly, the robot can move diagonally, sideways, or in any other direction with exceptional maneuverability.



Motor Control and Direction:

1. **Independence of Wheel Motors:**
   The Mecanum Wheel Robot typically has four Mecanum wheels, each equipped with its own motor. The key feature is that these motors can be controlled independently.

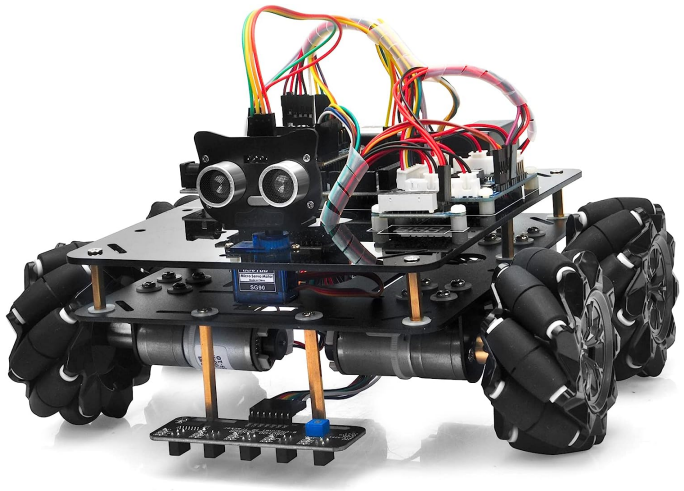
2. **Variation in Motor Speed:**
   - To achieve movement in a specific direction, the robot varies the speed and direction of rotation of each wheel motor.
   - For example, if you want the robot to move forward, you increase the speed of all four motors equally. This results in all the wheels moving forward, propelling the robot in that direction.

3. **Diagonal Movement:**
   - To move diagonally, the robot adjusts the motor speeds differentially. For instance, to move forward and to the right, the left front and right rear wheels rotate faster than the other two wheels.
   - This differential speed causes the robot to move diagonally while still maintaining stability.

4. **Rotation and Pivoting:**
   - To rotate or pivot in place, the robot changes the direction of rotation of certain wheels while keeping others stationary or rotating in the opposite direction.
   - By carefully controlling each wheel motor's speed and direction, the robot can execute precise rotations or pivots.

Control System:

The control system is responsible for orchestrating the movements of the Mecanum Wheel Robot. It takes user input or follows predefined commands to control the individual wheel motors.



Sensors, such as encoders and proximity detectors, provide real-time feedback to the control system, allowing it to adjust wheel speeds and directions to navigate obstacles, maintain stability, and execute precise movements.

User-Friendly Interface:

1. **Bluetooth Module (Short Range):**
   - If you prioritize short-range control and direct line-of-sight communication with the robot, a Bluetooth module is an ideal choice.
   - Develop a dedicated smartphone app compatible with both Android and iOS platforms, allowing users to connect to the robot via Bluetooth.
   - The smartphone app should offer an intuitive and user-friendly interface with joystick controls or touch gestures for precise and responsive maneuvering.

2. **Wi-Fi Module (Long Range):**
   - If you require long-distance control and the flexibility of remote operation, a Wi-Fi module provides the necessary reach.
   - Integrate a Wi-Fi module (e.g., ESP8266 or ESP32) into the robot's control system.
   - Develop a smartphone app that connects to the robot via Wi-Fi, either through a local Wi-Fi network created by the robot or by connecting to an existing Wi-Fi network.
   - With the Wi-Fi module, users can control the robot from different locations, even over the internet, making it suitable for applications like remote monitoring, surveillance, or controlling the robot in large-scale environments.

Sponsorship

1. Project's Financial Dependence:

   - Our Mecanum Wheel Robot project's ambitious scope requires external funding.
   - We aim to develop a complete, practical solution, surpassing a typical prototype.

1. Sponsorship and Partnerships:

   - Sponsors or partners who align with our vision are essential.
   - They provide crucial financial support, expertise, and industry connections.
   - Collaborating with us accelerates development, ensures scalability, and empowers innovation.
   - Join us in making a significant impact by supporting this project's journey towards innovation and application.

Key Project Personnel Recommendations

We propose **Dr. Mohamed Shalaby** as the Project Coordinator due to his extensive experience and leadership in relevant fields.

Additionally, we recommend **Dr. Ramadan Ragab** to provide technical support, leveraging his expertise to ensure the project's success. These appointments will enhance our project's efficiency and effectiveness.