Project Title:Autonomous Restaurant Service Robot for Food Delivery to Customers

Aim:

To build a simple and efficient autonomous robot that delivers food from the kitchen to customer tables in a restaurant using basic sensors, omni-directional wheels for smooth movement, and button-based input for destination selection.

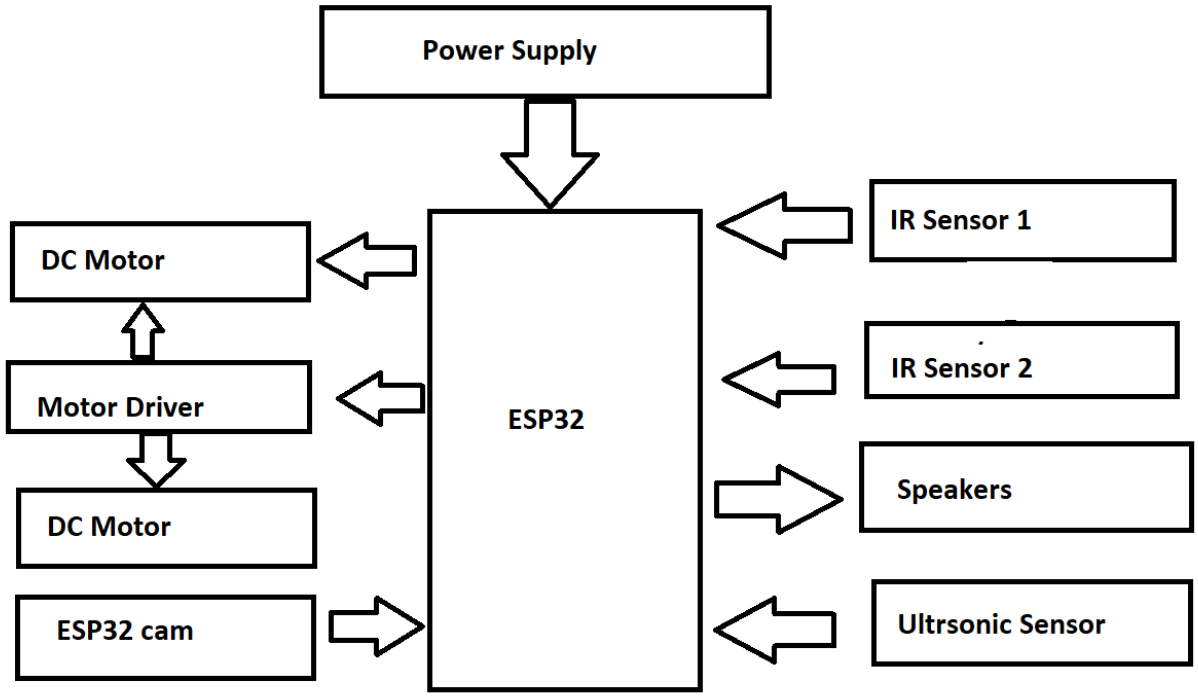
Objectives:

- To create a robot that delivers food to assigned tables without human assistance.
- To use line-following and obstacle detection to navigate safely.
- To allow staff to select delivery tables using buttons (not touchscreen).
- To use omni-wheels for better indoor turning and movement in narrow spaces.
- To improve service efficiency, hygiene, and reduce staff workload.

Working Principle:

The robot follows a predefined black line path using infrared (IR) sensors. It uses ultrasonic sensors to detect obstacles such as people or chairs and pauses until the path is clear. The kitchen staff presses a button to choose the table number, and the robot starts its journey. On reaching the destination (based on distance or line junction counting), the robot alerts the customer using a buzzer or LED. After the customer picks up the food, it returns to the starting point automatically.

Block Diagram



Hardware Components:

- ESP32
- IR Sensors
- Ultrasonic Sensors
- DC Geared Motors

Software Used:

- Arduino IDE
- Embedded C / C++

Advantages:

- Cost-effective and easy to implement

- Contactless delivery improves hygiene and safety
- Simple button-based interface—no need for a touchscreen
- Omni-wheels allow smooth turns even in tight restaurant spaces
- Reduces staff workload, especially during peak hours

Disadvantages:

- Only works along predefined line paths
- Cannot adapt to table changes without modifying path layout
- Requires regular line cleaning and sensor calibration
- Cannot speak or interact with customers like advanced robots

Applications:

- Restaurants and cafes
- Hospital patient meal delivery
- Indoor food courts or canteens
- Elderly care food delivery automation

Future Scope:

- Add voice alerts or simple audio greetings
- Add return-to-kitchen auto-docking for charging
- Improve navigation using QR codes or NFC at each table

Conclusion:

This simplified restaurant service robot offers a reliable and low-cost solution for automated food delivery within restaurants. With basic sensors and omni-wheels, it ensures safe and smooth movement, improving both service efficiency and customer satisfaction. It's a great starting point for future restaurant automation.