Project Description

This project creates a smart customer management system for a Michelin-style restaurant. Using Arduino, it integrates an ultrasonic sensor, servo motor, LED, piezo buzzer, and LCD display to manage customer queues and enhance the dining experience.

Objective

- Track customers entering and queueing.
- Automate door control.
- Provide real-time feedback via an LCD and buzzer.

Components and Configuration

Component	Pin	Configuration	Purpose
LCD Display	I2C	OUTPUT	Display messages
Button	7	INPUT_PULLUP	Door control
Ultrasonic Sensor	9,10	OUTPUT/INPUT	Detect customer distance
LED	3	OUTPUT	Visual feedback
Piezo Buzzer	6	OUTPUT	Audio feedback
Servo Motor	12	OUTPUT	Door control

Functionality

1. Ultrasonic sensor detects customers within 30 cm.
2. LED and piezo activate, LCD shows a welcome message, and queue count increases.
3. Pressing the button opens the door via servo, decreases queue count, and updates totals.

Testing

- **Hardware:** Verified sensor accuracy, servo operation, and LCD clarity.
- **Logic:** Simulated scenarios for queue management and door operation.

Results

Test	Outcome	Pass/Fail
Customer detection	Accurate within 30 cm	Pass
Door operation	Smooth opening/closing	Pass
Feedback systems	LED, buzzer, LCD functioned	Pass

Conclusions and Improvements

- The system effectively manages customers and provides accurate feedback.
- Future enhancements: Add Wi-Fi for remote control, touchscreen interface, and analytics for reports.

User Guide

1. Connect power and ensure components are wired.
2. Approach the sensor to a distance of less than 30 cm to trigger detection.
3. Press the button to open the door.