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Inspiring Excellence

Autonomous Car Parking Management System with Pneumatic Lift platform

Group: 01

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1. Introduction

The Advanced Automated Car Parking & Management System is a state-of-the-art solution for managing vehicle parking efficiently. It incorporates automation for entry, exit, and parking, ensuring optimal utilization of parking spaces. The system uses infrared sensors, servo motors, and a pneumatic lift mechanism to facilitate smooth operation. It is designed to handle up to 10 vehicles with ease.

This manual provides step-by-step instructions, safety guidelines, troubleshooting tips, and maintenance information to help you operate and maintain the system effectively.

2. Safety Guidelines

- Ensure all components are properly installed and connections are secure before powering on the system.
- Avoid obstructing the sensors or servo motors during operation.
- Do not exceed the maximum vehicle capacity of 10.
- Keep the system away from water and extreme environmental conditions.
- Regularly inspect the pneumatic lift and sensors for proper functioning.

3. System Overview

Components:

- **Arduino UNO R3:** The central processing unit for the system.
- **Infrared Sensors (x4):** Detect vehicle entry and exit.
- **Servo Motors (x2):** Operate the entry and exit gates.
- **Gear Motor:** Controls the pneumatic lift.
- **LED Indicators:** Provide system status updates.

- **Display Units (x2):** Show vehicle count and parking status.
- **Buzzer:** Alerts for errors or improper operations.

How It Works:

- **Car Entry:** When a vehicle is detected at the entrance using an IR sensor, the servo motor opens the entry gate. Once the vehicle passes through another sensor, the system increases the vehicle count.
- **Car Exit:** A similar mechanism works for vehicle exit, reducing the vehicle count.
- **Pneumatic Lift:** Operated using buttons, it moves vehicles between levels. One button lifts the platform, and another brings it down.
- The system halts entry when the parking lot is full (maximum 10 vehicles).

4. Operating Instructions

Initial Setup:

1. Connect the Arduino board, sensors, motors, and other components as per the wiring diagram.
2. Power on the system using a 12V power supply.
3. Ensure all sensors and motors initialize correctly.

Car Entry & Exit Process:

- **Entry:**
  1. Approach the entrance. The IR sensor will detect the vehicle.
  2. The servo motor will open the gate automatically.
  3. Once the vehicle passes the second IR sensor, the gate closes, and the vehicle count increases.
- **Exit:**
  1. Approach the exit gate. The IR sensor will detect the vehicle.
  2. The servo motor will open the gate.
  3. After the vehicle passes, the gate closes, and the count decreases.

Using the Pneumatic Lift:

1. Park the vehicle on the lift platform.
2. Press & hold the designated **Up** button to move the lift to the next level.
3. Press & hold the **Down** button to bring the lift down.
4. Ensure the vehicle is stable on the platform before operating the lift.

5. Troubleshooting

Issue	Possible Cause	Solution
System does not power on	Power supply disconnected	Check and reconnect the power supply.
IR sensor not detecting	Dirt on sensor or misalignment	Clean and realign the sensor.
Gate not opening	Servo motor connection loose or faulty	Check wiring and replace if necessary.
Lift not moving	Gear motor malfunction or button issue	Inspect the motor and buttons for defects.

6. Specifications

- **Maximum Capacity:** 10 vehicles
- **Power Supply:** 12V DC
- **Sensors:** 4 x Infrared sensors
- **Servo Motors:** 2
- **Display Units:** 2
- **Pneumatic Lift:** Gear motor-driven
- **Operating Temperature:** 0°C to 50°C
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7. Maintenance Guidelines

- Clean the IR sensors regularly to ensure proper detection.
- Inspect servo motors and the gear motor for wear and tear.
- Verify all connections periodically to prevent loose wires.
- Test the system weekly to ensure all components function correctly.
- Keep the system dry and protected from environmental damage.