**Smart Car Parking System**

**Project Overview:**

The **Smart Car Parking System** uses sensors and actuators to automate parking management. The system monitors parking spaces, checks for vehicle availability, and manages entry/exit with a **servo motor**. It provides real-time status updates on an **LCD** and audio alerts through a **buzzer**.

**Components Required:**

1. **Arduino Uno** - Microcontroller for controlling the system.
2. **IR Receiver and Sensor** - To detect vehicle entry and exit.
3. **PIR Sensor** - To detect motion in the parking space.
4. **Servo Motor** - To control the gate/barrier.
5. **16x2 LCD** - To display parking status (e.g., slots available or full).
6. **Buzzer** - For audio alerts (e.g., gate opening/closing).
7. **Push Button (optional)** - Manual override for gate control.
8. **Power Supply** - For Arduino and components.

**System Functionality:**

1. **Vehicle Detection**:
   * An **IR receiver** detects when a car approaches the parking gate.
   * The **PIR sensor** confirms if the parking space is occupied.
2. **Gate Control**:
   * The **servo motor** opens the gate when a vehicle is detected and closes it after entry.
3. **Parking Slot Management**:
   * Tracks the availability of slots.
   * Displays "Slots Available" or "Parking Full" on the LCD.
4. **Alerts**:
   * The **buzzer** provides audio feedback when the gate opens or closes.
5. **Manual Override (Optional)**:
   * A **push button** allows manual operation of the gate if required.

**Circuit Connections:**

| **Component** | **Arduino Uno Pin** | **Description** |
| --- | --- | --- |
| IR Receiver Signal Pin | D2 | Detects vehicle entry/exit |
| PIR Sensor Signal Pin | D3 | Detects motion in parking slots |
| Servo Motor Signal Pin | D4 | Controls gate movement |
| LCD (16x2, I2C) SDA/SCL | A4 (SDA), A5 (SCL) | I2C communication for status display |
| Buzzer Signal Pin | D5 | Audio feedback |
| Push Button (Optional) | D6 | Manual gate control |

**Workflow:**

1. **Idle State**:
   * The system continuously checks for incoming vehicles using the **IR receiver**.
   * The LCD displays "Slots Available" or "Parking Full" based on slot availability.
2. **Vehicle Entry**:
   * When a car is detected by the **IR sensor**:
     + The **servo motor** opens the gate.
     + The buzzer sounds briefly.
     + After the car enters, the system updates the available slots and closes the gate.
3. **Slot Occupancy**:
   * The **PIR sensor** detects if a parking space is occupied.
   * The system decrements the slot count when a car is parked.
4. **Vehicle Exit**:
   * The IR sensor detects a car exiting, updates the slot count, and opens/closes the gate accordingly.
5. **Slot Full Alert**:
   * If no slots are available, the system displays "Parking Full" and prevents the gate from opening.

Project Link:- https://wokwi.com/projects/418248356906846209