# Phase 2: Innovation

Concepts used in this project:

1. Parking Area Full Indicator:
   * When the parking area reaches full capacity, the main entrance gate remains closed, preventing additional vehicles from entering.
   * Vehicles are directed to the next available parking area or facility, ensuring efficient space utilization.
2. IR Sensors for Vehicle Counting:
   * Infrared (IR) sensors are utilized to count both incoming and outgoing vehicles.
   * These sensors provide real-time data on the number of vehicles within the parking area.
3. Status Indicator Lights:
   * Red and green lights serve as status indicators, making it easy for drivers to identify parking slot availability.
   * A red light signifies an occupied parking slot, while a green light indicates a vacant slot.
4. Driver Assistance:
   * The status lights help drivers efficiently choose available parking slots from a distance, reducing the time spent searching for a spot.
5. Ultrasonic Sensor Monitoring:
   * Ultrasonic sensors, mounted in the ceiling above parking slots, monitor vehicle occupancy.
   * Multiple sensors enhance accuracy, ensuring that objects obstructing one sensor do not trigger false occupancy readings.
   * The status light changes only when both sensors confirm the presence or absence of a vehicle.
6. Entry and Exit Time Tracking:
   * The system records entry and exit times when vehicles enter and leave parking slots.
   * This data is used to calculate the parking duration, and parking fees are generated accordingly.
7. QR Code Scanners in Parking Slots:
   * Each parking slot is equipped with a QR code scanner.
   * Users generate a QR code through the dedicated parking app, and this code is scanned when they park, allowing for user identification and tracking.
8. Motor-Controlled Slot Toll:
   * Motors control the opening and closing of parking slot toll gates.
   * Access to the slot is granted only when the user scans their QR code or token, confirming payment or authorization.
   * This mechanism ensures only authorized users can access the parking area.
9. User-Friendly Parking App:
   * A mobile app enables users to check real-time parking slot availability.
   * The app helps drivers find vacant slots easily, reducing congestion and wait times.
10. Vehicle Locator Feature:
    * Users can click a button in the app to locate their parked vehicle.
    * The system activates a light above their vehicle, making it easier to locate in the parking area.
11. Data Access for Maintenance:
    * Maintenance personnel can access system data through the app.
    * This access allows them to monitor system health, perform maintenance tasks, and address any issues promptly.
12. Rules and Regulations in the App:
    * The app provides information on parking rules and regulations, ensuring users are informed about guidelines and policies.

Components Used:

1. ESP32
2. RGB LED
3. QR Code scanner
4. Toll gates
5. Ultrasonic Sensor
6. IR sensor
7. LCD Display
8. Parking app
9. Jump wires
10. Buttons