

PROJECT FEATURES

1. Vehicle Entry

- Vehicle number input
- Vehicle type selection (Car / Bike)
- Category selection (Student / Faculty / VIP)
- First-time vehicle: manual category input, system automatically saves the record
- Repeat vehicle: system automatically detects category/type from previous data

2. Slot Assignment

- **Parking area divided into Zones (A/B/C) based on category:**
 - Student → Zone A
 - Faculty → Zone B
 - VIP → Zone C
- **Slot Allocation Logic:**
 1. First-time vehicle:
 - System performs simple linear search in the respective zone
 - First vacant slot is assigned
 - Duration is not required from the user
 2. Repeat vehicle:
 - System checks previous parking history
 - Slot assignment based on duration:
 - Short-duration → front/entry-side slots
 - Long-duration → corner slots

3. Vehicle Exit

- Upon vehicle exit, slot is freed automatically
- Parking duration is calculated automatically: $\text{duration} = \text{exit_time} - \text{entry_time}$
- Complete record is saved in parking history
- Next visit: duration-based slot assignment (corner/front) is automatic

4. Vehicle History

- Purpose: To view the past records of a vehicle
- Includes: date, entry time, exit time, duration, zone, slot
- Time-range filter: view records between specific date/time ranges

5. Search Vehicle Location (“Where is my vehicle?”)

- Purpose: Find current location of a parked vehicle
- Output: slot number, zone, and entry time
- Works only for vehicles currently parked

6. Live Dashboard / Operator View

- Real-time overview of the parking area:
 - Which slots are free or occupied
 - Which vehicles are parked and since when
- Zone-wise summary:
 - Total slots, booked slots, available slots
 - Category-wise breakdown (Student / Faculty / VIP)
 - Vehicle type breakdown (Car / Bike)

7. Smart Slot Management

- System automatically tracks whether a vehicle is long-term or short-term
- Slot allocation optimized for efficient space utilization
- Maintains history for future prediction / analytics

8. Parking Summary Table

- Purpose: Quick overview of current parking status
- Shows for each zone / category / vehicle type:
 - Total slots
 - Booked slots
 - Available slots
 - Slot locations for each status (free/occupied)

SUMMARY IN SHORT:

1. Entry & category detection
2. Zone-based smart slot assignment
 - First-time vehicle: simple linear search for first vacant slot
 - Repeat vehicle: previous history + duration-based allocation
3. Exit & automatic duration calculation
4. Vehicle history & time-range reports
5. Search vehicle location (current slot info)
6. Live dashboard & operator overview
7. Efficient slot management based on duration

Parking summary table (slot, category, type, location-wise overview)