

# Parking Monitoring System

# Problem definition

1. In urban cities we are facing problem of ever-increasing number of vehicles. Leading to problems such as inefficient parking lots, difficulty in finding open spaces as well as increasing need to allot bigger spaces for car parking.
2. Other problems like time wastage for finding inconvenient and inefficient parking spaces is also increasing.
3. This leads to people illegally parking their vehicles on either side of the road. Also increased search time results in more CO2 emissions from vehicles.
4. As parking lots are disorganized, accidents caused by moving vehicles causes accidents.

# Introduction

1. As technology is developing rapidly vehicles have become an integral part of our lives. Number of people buying vehicles is increasing day by day along with the problem of parking, which is not so easily available.
2. Moreover, traditional parking systems involve a lot of human labor, which requires a lot of investment. Hence, the need to develop a system which directly identifies a vacant or occupied parking slot.
3. This implementation tends to solve this problem by using real time footage of the parking lot. The implementation consists of 2 parking cameras, first mounted on the entrance of the parking and the second is mounted inside the parking lot. First camera will detect the number plate of the incoming car and create a log and book a parking slot for the car. The second camera serves two purposes, first, it makes sure that the car is parked in its respective slot, second, it detects when the car is exiting the parking area.

# Objective

1. To develop a parking monitoring system capable of analyzing and providing real time data about parking space to users.
2. Using OCR(Optical Character Recognition) to analyze car number plates(this will help to keep track of vehicles entering and exiting the parking lot).
3. To build a system that will help reduce the hassle of searching for available parking spaces.
4. To analyze the parking usage based on real-time data.
5. To reduce human intervention in parking lots.

# Technology Stack

1. **OpenCV** : For detection of cars and number plates.
2. **Optical Character Recognition (OCR)** :Used for detecting alphabets and numbers in the number plate and converting them into strings.
3. **Python** :Language used for implementing implementation.
4. **Firebase** :To store real-time logs for cars.
5. **Spyder** :IDE for implementing implementation.

# Benefits for Society

1. **Optimized parking** –Users can find best parking slot available, thus saving time, fuel and effort.
2. **Decreased Management Costs** - Due to automation, human intervention is eliminated, thus, labor cost decreases significantly.
3. **Reduced traffic** - Traffic flow increases as fewer cars are required to drive around in search of available parking slots.
4. **New revenue streams** -Reward programs can be introduced to encourage repeat users. Also, payment options based on parking location can be offered to attract customers.

# Benefits for Environment

1. Due to the availability of real-time parking system, car owners spend less time searching for parking spaces thus reducing CO2 emissions.
2. Will reduce parking search traffic on the roads thus optimizing traffic flow.
3. Less wastage of fuel.

# Applications

1. Parking space can be booked in advanced.
2. Predict and sense vehicle occupancy in real time.
3. Guide the users to available parking.
4. It can also be used in the parking lot of various shopping malls.
5. Parking can be made more cost effective by implementing dynamic pricing based on demand and time.