

Synopsis for Parking Monitoring System

1. Abstract(200) :

This implementation involves building a Parking Monitoring System for our college parking premises using opencv. It allows us to detect and track cars in the parking slot and book a parking slot for that respective car by creating a log of the car when it enters and exits. The log is generated by noting the number plate of the car using Optical Character Recognition. When the car exits the premises, again a log will be generated stating that the car has been moved from the allotted space and the parking slot is available for a different car to be parked. The parking monitoring system tracks availability of parking based on real time outdoor camera surveillance. This system is developed to determine the location and parking number of the available parking slot and to check if the car is parked at its allotted slot.

2. Introduction(100) :

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. 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. Traditional car parking system doesn't provide users with intelligent parking systems. All parking slots are managed by humans, which is a very time consuming process. Sometimes it creates blockage.

Have you ever thought of a system which is able to analyze and provide real time parking information? No, right?. 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.

3. Objective(100) :

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.

4. Literature Review(200) :

1. İlhan Aydın , Mehmet Karaköse , Ebru Karaköse, "A navigation and reservation based smart parking platform using genetic optimization for smart cities".
 - 1.1. In this paper, a navigation and reservation based parking system has been proposed. This system involves developing of small devices that can send parking data to Internet using IoT.
 - 1.2. The current position of the driver is taken using his/her mobile phone and the free parking space which is closest to the current location of the user is found using genetic algorithm.
2. Azhar Somani, Shubham Periwal, Kesha Patel, Pranit Gaikwad, "Cross Platform Smart Reservation Based Parking System".
 - 2.1. Smart parking devices connected to the cloud will provide real-time information of the parking lot obtained from UHF sensors.
 - 2.2. This system involves UHF sensors installed in parking lots, considering parameters like minimum display width and processing power.
 - 2.3. Users can then access this data using a mobile app.
3. Shidian Ma, Haobin Jiang, Mu Han, Ju Xie, and Chenxu Li, "Research on Automatic Parking Systems Based on Parking Scene Recognition".

- 3.1. This paper presents a smart car parking approach using machine vision and pattern recognition.
- 3.2. 3.2 Both machine vision and pattern recognition helps in recognizing vertical parking , planning parking path and develop a path tracking strategy.
- 3.3. 3.3 To recognize vertical parking spaces, vehicle orientation is detected using Adaboost vehicle detector. Then red taillights are identified using color model algorithm.

5. Problem Definition(100):

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.

Other problems like time wastage for finding inconvenient and inefficient parking spaces is also increasing. 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. As parking lots are disorganized, accidents caused by moving vehicles causes accidents.

6. Scope(200):

Description :This implementation involves building a Parking Monitoring System. 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.

Deliverables : We will be implementing parking slot detection using opencv and number plate recognition using OCR and provide a parking space for the car.

Justification :This implementation will help college staff and students to find available parking slot inside the college campus.

Exclusion :This implementation does not involve parking spaces for two wheelers and spaces outside the parking lot in the campus.

7. Technology Stack(100):

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.

8. Benefits for Environment (50):

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.

9. Benefits for Society (100)

1. **Optimized parking system** –Users can find best parking slot available, thus saving time, fuel and effort.
2. **Decreased costs of management** - Due to automation, human intervention is eliminated, thus, labor cost decreases significantly.
3. **Reduction in traffic** - Traffic flow increases as fewer cars are required to drive around in search of available parking slots.
4. **Increased safety** - Using real time lot data can help detect parking violations and suspicious activity.
5. **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.

10. Applications (200):

1. Users can access occupancy data to determine the availability of parking spots and then pay for them via their mobile phone.
2. Parking authorities can analyze parking usage based on real time data.
3. Parking space can be booked in advanced.

4. Predict and sense vehicle occupancy in real time.
5. Guide the users to available parking.
6. It can also be used in the parking lot of various shopping malls.
7. Parking can be made more cost effective by implementing dynamic pricing based on demand and time.
8. Parking violations or suspicious activities can be detected using lot data.