Survey on Detecting Parking Space System

Samiksha Chaudhar

P. G. Student,
Department of Computer Engineering,
VPKBIET, Baramati, Maharashtra, India

Abstract: **Finding parking space is one of the difficult problem most of the metro cities especially at the various public places such as shopping mall, cinema hall etc. It is difficult to search the available parking area. In this paper we have presents a methodology for detecting parking vacancy that uses an image processing techniques and deep learning methods. The availability of the parking space will be visualized on the smart phone and the user can take decision prior to the departure. This will save time, fuel and congestion on the roads.**

Index Terms: **Parking Space Detection,Image Processing,Deep Learning**
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I. INTRODUCTION

In developed countries, most of the people own a vehicle. This increases in number of vehicles on the road. Due to this Finding parking space in almost populated regions like shopping canter's, colleges, and exhibitions is challenging. The difficulty increases from unknowing where the vacant place may be at the required time.

Smart parking system (SPS) is a solution for metropolitan urban areas to decrease congestion and time by helping them in identifying a space to park. It helps to find satisfying parking spaces efficiently through information and communication technology. We propose different features of smart parking system including finding available parking space, inappropriate parking detection, show of vacant parking places and directional pointers toward empty parking spaces, payment services and various kinds of parking spaces(empty, busy and reserved) through the use of particular hardware and software.

Deep Learning (DL) [2] is a methodology for the finding of car parking vacancy. Deep Learning is a part of artificial Intelligence that goes for creating strategies that enables PCs to learn complex observation tasks, for example, seeing as well as hearing, at human level of exactness. DL approach especially powerful for vision work abuses Convolutional Neural Network (CNN) [3]. A CNN is made from potentially huge number of invisible interlayers, every one of which executes scientific calculations on the information given by the earlier layer and creates a final result. A CNN is different from classical neural network.Figure 1. Shows the basic working of Convolution Neural Network[12].
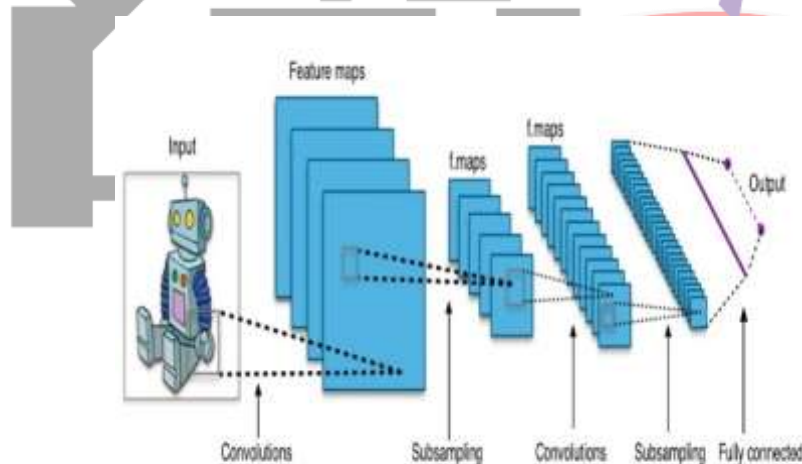

Figure 1Basic working of Convolution Neural Network [10]

Image Processing Technique [4] is also used for detecting the parking spaces. Image processing Technique identifies the free vacant parking sector to park our vehicles. Parking zone to be set apart with certain particular number and by using camera the vacant place can be recognized to park the car. Figure 1 shows the workflow of the proposed system by Sridevi.
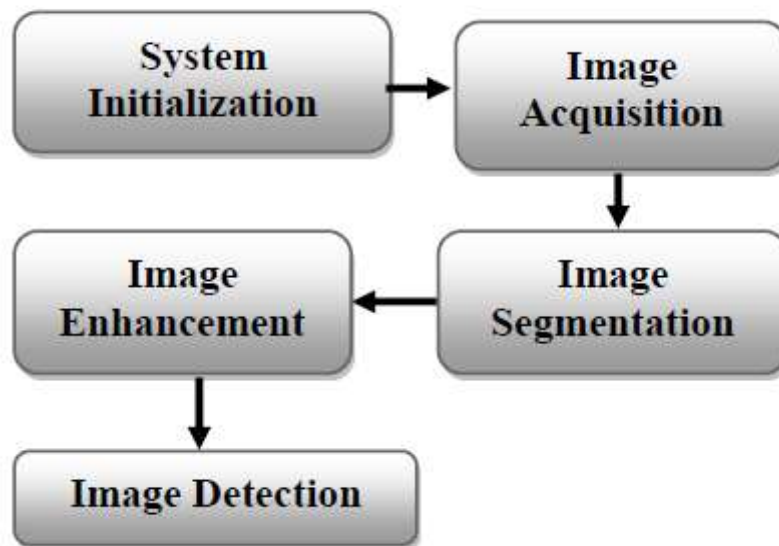
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┌─────────────────┐        ┌─────────────────┐
│     System      │   →    │      Image      │
│ Initialization  │        │   Acquisition   │
└─────────────────┘        └─────────────────┘
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┌─────────────────┐        ┌─────────────────┐
│     Image       │   ←    │      Image      │
│  Enhancement    │        │  Segmentation   │
└─────────────────┘        └─────────────────┘
         │
         ▼
┌─────────────────┐
│ Image Detection │
└─────────────────┘
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Figure 2workflow of the system [4]

II. RELATED WORK

A lot of scientific operations exist in the field of structure as well as improvement of smart parking system[2],[3],[4],[5],[6],[7],[8],[9]. Most of the smart parking system gives way out to the strategy of parking accessibility data module, parking booking system, vacancy finding as well as parking lot management, real time navigation within the parking services etc. though small amount of work have consideration to the real time finding of inappropriate car parking also programmed gathering of place cost. There are various methods are used for implementing the smart parking system. For implementation hardware and software are used.

Different approaches as well as methods have been designed to solve the issue of parking in the congested regions. Ichihashi [5] proposed detection approach based upon the usage of devices like ultrasonic, infrared as well as microwave for the identification of vehicles. Wan-Joo Park suggested the usage of ultrasonic devices fixed upon the vehicle to scan for an open parking place. The drawback of this technique was that the sensor devices are effectively influenced by environmental conditions for example temperature, rain fall, quick air breeze also snow. The wireless sensor strategy introduced by Vamsee K.Boda. This strategy was more affordable and it apply the remote sensor hubs actualized at the basic spots for example, path turns, passage and leave places of the parking area. The whole count of cars in the area of parking can be dictated by the distinction of approaching also active autos [6].

A visual image based technique[7] for identification of empty space in the outside parking zone is proposed by Najmi Hafizi . A small resolution network camera is used for getting pictures of the parking area that lessens the price incredibly. Yusnita[8] proposed an image processing strategy that catch the dark round drawn on the parking part and procedure it to identify the parking is vacant or not .Banerjee[9] saved picture of car as reference then the alternate pictures are compared with the reference picture by edge detection method. This gives data about vacant and reserved spaces. Existing System contains the RFID Technology,sensors.

A. RFID Technology

RFID is an unmanned, secure, automation technology with main components as RFID readers, labels, computers,barriers, software etc. The software is for controlling operations, reporting transactions and managing parking lot information.
Drawbacks:
i.   Expensive.
ii.   If two vehicles will enter the parking-lot side by side,within range of the RFID reader, the system will not read either of their identification information and process it.

B. Sensors

The detection methods were based on use of sensors like ultrasonic, infrared and microwave for the detection of space in parking area. These sensors are placed beneath every parking space.The ultrasonic sensors mounted on the cars to search for a free parking space.
Drawbacks:
i.   Expensive.
ii.   The sensors are easily affected by weather conditions like rain, temperature, snow and fast air breeze.

Table 1 Literature Survey In Succinct

Literature Survey In Succinct

Sr. No.	Name of paper	Technique/Mechanism used
1	Image Processing Based Intelligent Parking System	Sridevi.A [4] works on Image Processing Technique and uses Arduino Uno.
2	Vacant parking space detector for outdoor parking lot by using surveillance camera and FCM classifier	Ichihashi [5] works on camera based system ParkLotD and uses classifier based on Fuzzy c-means (FCM) clustering and particle swarm optimization(PSO)
3	Design considerations for a wireless sensor network for locating parking spaces	Vamsee K.Boda [6] works on wireless sensor technology.
4	Parking lot detection using image processing method	Najmi Hafizi [7] works on visual image based technique.
5	A cloud-based smart-parking system based on internet-of-things technologies	Thanhnampham [11] works on cloud based smart parking system.
6	Smart car parking system solution for the internet of things in smart cities	WaelAlsafery [12] works on data fusion, data filtering, machine learning algorithm.
7	Car parking occupancy detection using smart camera networks and deep learning	Giuseppe Amato, Fabio Carrara[13] uses deep learning technique.
8	Deep Learning for Decentralized Parking Lot Occupancy Detection	Giuseppe Amato, Fabio Carrara[14] uses convolution neural network technique and compare between two dataset.

III. CONCLUSION

A system has been proposed for detection of parking spaces using image processing and deep learning methods. Smart parking system is an answer to the current traffic congestion, to reduce driver's disturbance and saving fuel costs by giving data about the vacancy status of the parking places. The proposed system makes use of mobile application, which will visualize availability of parking spaces at specified parking lot.

IV. ACKNOWLEDGMENT

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