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Crearea unei rețele neuronale pentru analiza parcărilor auto
(Graf de rețea neuronală)

Teză de master

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ABSTRACT

One of the most annoying jobs people have to do these days is park cars. Nowadays, finding a parking spot has become a problem that shouldn't be ignored because it takes time and effort. Finding a parking spot is a major hassle, especially in urban areas. This essay tries to develop one parking system that, in many ways, lessens parking problems. The method described in the study classifies parking spots in a park into empty and filled slots using a machine learning model called a convolution neural network (CNN). In this study, the Transfer Learning approach is used to optimize the categorization task. Parking issues touch more than just the drivers; they also have a significant negative impact on the environment and much broader and more widespread concerns. Therefore, it is crucial to have a parking system in place. The model suggested in the research drastically reduces the amount of time a motorist has wait for a vehicle by sending parking instructions far in advance.

ADNOTARE

Timpul irosit în zadar este o pierdere irecuperabilă și destul de enervantă, iar șoferii, aflați în căutarea unui loc de parcare, o simt asta destul de frecvent.

Această problemă se face resimțită în toate orașele mari ale lumii și Chișinăul nu este o excepție:

- concentrarea activității în centrul orașului;
- lipsă acută de parcuri;
- drumuri înguste;
- număr mare de mașini,

acești factori transformă procesul de parcare într-o problemă destul de greu de soluționat pentru șoferi. În rezultat, deseori, parcarea pe marginea drumului duce la crearea ambuteiajelor și încetinirea vitezei medii de circulație a automobilelor, iar, în cazul parcării în locuri neautorizate, se soldează cu amenzi și chiar cu evacuarea forțată a autovehiculelor.

O soluție, care ar simplifica procesul de parcare, ar consta în:

- determinarea spațiilor destinate parcarilor automobilelor
- marcarea lor corespunzătoare
- implementarea unui sistem de monitorizare video a acestor spații
- elaborarea unui sistem de informare a șoferilor despre locurile disponibile

În prezenta lucrare se va studia posibilitatea elaborării unui sistem, bazat pe rețelele neuronale în bază de graph, ce ar putea să prelucreze imaginile video, captate de pe camerele de luat vederi, și să determine cu o precizie înaltă locurile disponibile de parcare.

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INTRODUCTION

The need for smart parking has grown significantly in recent years. Over the last few years, as the number of cars has significantly expanded, so has the demand for parking spots and search amenities. 120 hours a year may be better utilized if the typical driver just did not spend 20 minutes each day looking for such a location.

Although there are numerous smart parking initiatives being developed today, there are surprisingly few operational examples and little is known about how cost-effectively they can be implemented. It should be highlighted that while developing such instruments, the software bears the majority of the expensive burden, not the hardware. The method of smart parking utilizing visual surveillance based on an exterior closed-circuit television (CCTV) is much more effective than others, taking most of the aspects into consideration, it has been determined after studying and comparing various parking detection strategies.

Currently, with the increase in the number of cameras used for monitoring the situation in towns, streets, buildings, etc., they can be successfully used not only for monitoring parking but also in intelligent systems for determining available spaces. Computer Vision (CV) technologies can be used to capture, process, and transform the video stream, and the resulting data will be further processed by AI systems to obtain the desired result.

The first problem suggests that CV detects occupied and vacant parking spaces less accurately than sensor camcorders or conventional manual counting . The low accuracy of CV-based approaches typically results from a number of factors, including the different appearance of vehicles, the environment's influence on images (such as shadows, bright sunlight, or fog), occlusion by other vehicles (or stationary objects), and visual distortion as a result of cameras being inspected at an acute angle. For vision-based techniques, defining parking spaces in films or photos presents additional difficulty.

Even if a parking lot may be covered by multiple CCTVs, the limits may shift over time for legal or municipal reasons. Additionally, manually identifying each parking place in films and photographs takes time and increases the risk of technological errors.

Thus, for parking solutions based on intelligent information technologies, the adoption of automatic means and procedures for defining the limits of parking spots is particularly relevant.

The following tasks must be fulfilled in order to reach the study's objective:

- To look for and evaluate contemporary image and video processing technologies using contemporary CV techniques and tools;
- Choosing the best technology to build a smart parking system based on the outdoor security camera of the office parking lot;
- To create an information model for vehicle identification and parking spot detection;
- To verify the generated model's usefulness in real-world applications.

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