

PERSPECTIVES OF DEVELOPING AN INTELLIGENT TRANSPORTATION SYSTEM BY USING IMAGE PROCESSING TECHNIQUES IN SMART CITIES

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ABSTRACT

An article focused on the perspectives of developing an Intelligent Transportation System by using image processing techniques in Smart Cities and it explains an optimization types of transport flow with giving some real implemented examples.

Keywords: *Intelligent Transportation System, Smart City, image processing, Artificial Intelligence*

INTRODUCTION

One of the most important tasks of the transport system is to ensure the maximum efficiency of the functioning of the transport and road complex of the country by improving the quality of meeting the needs of the economy and the population in safe and efficient transport services. The implementation of the task of ensuring the required mobility of the population is possible due to two mutually complementary areas of activity: the construction of new road sections and the introduction of organizational management technologies transport system using modern information and telecommunication and telematic technologies [3].

MAIN PART

The volume of traffic in countries all over the world has expanded substantially as a result of the rapid expansion of social industrialization and urbanization. How to effectively oversee and control the orderly, high-speed, and safe passage of road vehicles has become one of the most pressing issues facing governments both at home and abroad today. However, there are numerous issues with the urban road traffic system, including traffic congestion, deadly traffic accidents, and worsening traffic pollution. The Intelligent Transportation System (ITS) is widely recognized as the most important factor in ensuring the safe functioning of highway traffic. In the intelligent transportation system, digital image processing technology provides a lot of theoretical and practical significance. In many foreign countries, including the United States, Canada, England, Germany, France, Japan, China, Russian Federation and others comparing images in states, identifying important features in objects and intellectual video surveillance using machine learning models solving system development problems.

An image processing in video surveillance systems around the world is automated by improvement of processing models and algorithms and dynamics to create algorithms for processing images of objects focused research work. In this regard, including image processing, dynamic object separation, recognition capture, monitoring them, and understand situations in the observation area modern methods and information technologies that allow reproduce images of dynamic objects in video surveillance based on the tools it is necessary to develop fast algorithms of performance.

Storage and processing of images in this direction in our country and automated for intellectual analysis develop measures for the creation and widespread implementation of systems. Uzbekistan in 2017-2021 in the Action Strategy for the further development of the Republic, including " ... apply and use of advanced information and communication technologies, ... information and communication to the economy, social sphere and management system introduction of technologies » functions are defined. This performance of tasks,

including signal processing and a wide range image processing, pattern recognition, analysis in large-scale video surveillance monitoring development and automation of methods and algorithms to improve video surveillance systems is considered as one of the important tasks.

Lets first of all we will try to know about Smart City (SC). There are several kind of definitions to SC but the World Bank Group gave clear one which defines a Smart City with effective, innovative, inclusive and resilience digital technologies. And all services and supplements have to focus on that 4 main values. However, a number of definitions share common features by describing smart cities' services in the sector of security, road, transportation, energy, education, or healthcare to increase the efficiency of resource allocations and contribute in solving urban problems. And those services use digital technologies such as mobiles, IoT, Big data, AI, Blockchain, etc., as implementing tools of Smart Cities.

Smart Cities are complexity of various areas. Smart City projects are consequently being conducted in various fields like transportation, safety, energy and environment, education and medical care. About 70 percent of the international smart city projects are centered on three key branches: energy, transportation and safety. Here (fig. 1) shown main significant strategic areas of Smart Cities.

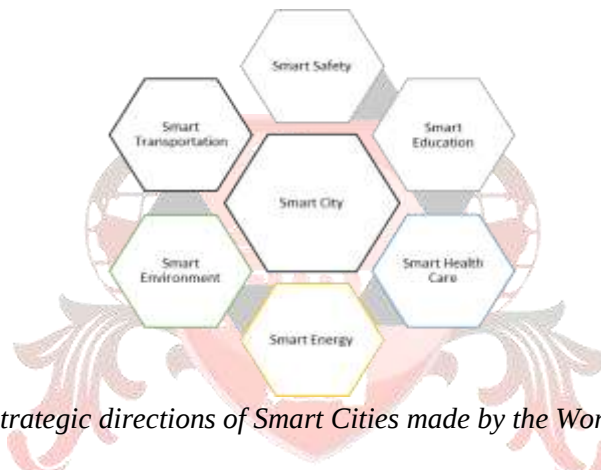


Fig. 1. *Strategic directions of Smart Cities made by the World Bank Group*

One of the main issues nowadays is planning an infrastructure of road and optimizing flow of transportation. Vehicle production of is the most hyper rising sphere as we can see in these days big change to the electrical engines. But now only European countries made a plan to reduce traditional cars into electric moreover they have already decided to refuse from fuel cars from 2030. Lets think about road problems as manufacture of transports and amount of them are growing which makes traffic and demand some concerns. Most of big cities have already developed an ITS in order to manage and monitor transport flow to reach optimization [1].

Cooperative awareness, safe lane change, safe junction crossing, optimal traffic signal control, emergency warning notifications, smart parking allocation, and other uses exist in smart city transportation systems. The Intelligent Transportation System (ITS) relies on two basic types of communication: vehicle to vehicle (V2V) and vehicle to infrastructure (V2I). This kind of AI based techniques making road infrastructure more optimized than before [2].

The public road traffics and road infrastructures how solved in San Francisco, USA. US government launched "Smart city efforts" in 2015, prominent communities around the United States have begun to undertake smart city programs. Because of its proximity to Silicon Valley, smart and inventive ecosystems have penetrated the city, particularly in San Francisco (pic. 1,2). As a result, there have been a plethora of opportunities to use smart technology. San Francisco encourages smart city projects in order to achieve the goal of being a "City of Smart Mobility." In this regard, the city has made use of shared economy services such as Uber and smart bikes.



Pic. 1. San Francisco gathers data related bike riders 24/7



Pic. 2. Ride App Pickup Zone in the Airport of San Francisco

With the growth of the economy, urbanization, and auto mobilization, it is necessary to use current management methods to achieve traffic management, which leads to the study of Intelligent Transportation Systems (ITS). Advanced electronic technology, information technology (IT), artificial intelligence (AI), geographic information (GIS), computer technology, communication, sensor technology, and system engineering technology are all integrated into the actual demand for ground transportation, resulting in a real-time, accurate, and efficient ground transportation system which all integrated by ITS. ITS can help to enhance traffic flow, reduce congestion, increase transportation efficiency, and increase traffic safety. The vehicle flow detecting system is an important aspect of ITS because it is an integral part of ITS. Detection coils, TV monitoring, microwave detection, and video detection are the four most prevalent vehicle flow detection systems used in the United States and abroad. Among these, the video detection approach has received widespread attention and use because it is more versatile than other methods and can be integrated with digital image processing technology [4].

With the advancement of computer technology, the acquisition of road traffic data no longer requires complex coil equipment; all that is required is the installation of a relevant camera in the detection road section, and the road taken by the camera is transmitted to the monitoring center via a transmission line (such as optical fiber). To calculate road traffic statistics, the monitoring center's computer employs the digital image processing approach. Vehicle behavior analysis and recognition require accurate detection and real-time monitoring of moving vehicles in traffic, whereas moving object detection and tracking can be divided into background extraction, moving point extraction, moving point location extraction, and moving object tracking. Researchers have conducted a comparative examination of several experimental investigations for each step of the various algorithms throughout the course of years of ongoing research [5].

CONCLUSION

One of the main concerns is improving the sustainability of road transport through the implementation of Intelligent Transport Systems. Moreover systematically using AI based technologies in order to process images from surveillance systems with improving and solving issues with road vehicles is giving good result in Smart Cities.

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