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Abstract

The complexities of urban traffic networks require sufficient amount and the correct type of data for planning and management purpose. Traffic conditions can be monitored through traffic cameras, however there are lack of predictive and management tools to process those data. We propose for a software architecture that can both manage, predict and design route interconnections in urban settings. The architecture would include image processing tools to identify and predict traffic flow, while the collected data will be processed in the background to direct automated traffic control systems, such as the timing of traffic signals to ease the flow of heavy traffic. Deep learning mechanism may also be implemented such that the data collection and extraction process can be adaptive to unique traffic situations.

Introduction 300 words/figures/tables

Literature review// update with 2020-2022 JA // figures/tables

Vision and image processing importance is increases in many sectors to solve different issues. The key issue is object recognition, is vital to manage the wide applications based on the size, pattern, and colours. Object recognition perfection is vital to application efficiency even if any obstruction (Akoum, 2017). In current situation application like traffic congestion manageability is important to solve indirect impact on society functions, and business activities. It is not only managing traffic, but also solve issues like accidents, and people time.

Uthra et al. (2018) said webcam role in each stage of the traffic light in order to take pictures of the roads where traffic is bound to occur. Count of vehicles in these images is calculated using image processing tools in Matlab and different timings are allocated according to the count along with a green signal for vehicles to pass. In the proposed prototype, the green and red signals are represented using LEDs and the decrementing timer for the green signal is represented by a seven segment display. Past research used diverse methods such as Intelligent transport system, and counting method is based on the traffic flow monitoring.

Hansan et al. (2014) implemented method to determining traffic congestion on roads using image processing techniques and a model for controlling traffic signals based on information received from images of roads taken by video camera, to extract traffic density which corresponds to total area occupied by vehicles on the road in terms of total amount of pixels in a video frame instead of calculating number of vehicles, and set two parameters as output, variable traffic cycle and weighted time for each road based on traffic density and control traffic lights in a sequential manner.

Bihari & Sudhakar (2019) used dynamic and adaptive system for automation of traffic signal control using image processing. The control of the traffic signals is based on the traffic analysis of vehicle density on the lanes at the junction using Image processing, also developed algorithm to take decision regarding the timing of the traffic signals by analyzing the vehicle density. Intelligent Transportation Systems (ITS) based on wide range of technologies have certain practical challenges in their application and implementation.

Video surveillance has proven advantageous over traditional systems based on inductive loops sensors and detectors for traffic monitoring. Accurate traffic density estimation which is basic to tackling traffic congestions requires detection of vehicles, assessing their speed, and tracking vehicles passing through surveillance zones. Image processing techniques require processing of large number of image frames for real-time applications in traffic management. More efficient and less costly image processing techniques for accurate vehicle detection and density determination are required for developing more effective traffic management systems. (Gulati & Srinivasan 2019).

Problem Statement://improve with new journal information

The needs of the population, business activities, and people causes movement from place to place. There is lack of proper-planned roads, causing the heavy traffic at many intersections[]. Traditionally, traffic is controlled manually according to the traffic situation according the intersections. Even now in this digital era, there is still lack of perfect traffic control systems to solve the intersection traffic issues, mainly due to data management and prediction issues[].

This research suggests a new architecture for intelligent traffic controller using image processing and artificial intelligence technology deep learning platform. Proposed methods include traffic camera sequencing analysis using different edge detection algorithms and object counting methods. The method makes use of the CCTV cameras installed along the road networks especially intersections, and using the image of an empty road as a reference image, the captured images are sequentially matched using image matching.

This research also proposes the use of artificial intelligence technology deep learning platform for pattern recognition on the minimal amount of available information from an image. This is in anticipation that the radio frequency and optical sensors may collect large-scale sets of spatial imagery data whose content is often obscured by fog, clouds, and other intervening object structures. The new architecture can be used to control the traffic light signals which is dependent on the number of cars on each direction.

Objective

To develop a software architecture to capture useful traffic data from traffic images.

To use the collect traffic data for design and planning of traffic routes and management

Research Questions:

How do we extract traffic data and parameters from CCTV images of urban routes?

How do we use the collected traffic data for management and planning of traffic?

Research methodology

The new architecture is for solving the traffic issues at traffic light junctions. The few stages of process involved to get results for this architecture. The key software is Yolov3 is used to process, and real time detect the objects.

Traffic images will first be obtained from available repository to test and develop the robustness of the vehicular detection software. Later, traffic images can be obtained from real-time capture of traffic images.

The main software used is Yolov3 for image processing and object detection. Later, data will be processed on Hadoop framework. Test images will be obtained from open source repository and will not pose legal implications.

Traffic Image capturing & processing with Yolov3

Extraction of image data into traffic parameters

Feed data into existing or designed traffic management system

Adaptive control with deep learning software codes (simulated traffic)

Hypothesis

The management of urban transport systems can be simplified once the data collection process is robust, automated and efficient. The collected data can be fed into pre-existing or future designed traffic management systems. Deep learning mechanism may be implemented so that there is an automated feedback loop to assess the outcome of the traffic control, and the architecture would be robust and adaptive to any unique traffic situation.

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