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SMART TRAFFIC CONTROL BASED ON IMAGE ARTIFICIAL INTELLIGENCE

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Abstract - *As there is a problem of urban road traffic, there's a pressing want for the introduction of advanced technological know-how and gear to beef up the state-of-the-art of site Road Traffic Control. The current ways use equivalent timers or humans to manage the traffic. It is proved to be not as good to alleviate this difficulty. In this paper, a method to manage the site visitors by measuring the true time car density using object detection with image AI is proposed. This imposing traffic manipulates procedure presents tremendous growth in response time, vehicle administration, automation, reliability and total effectivity over the prevailing methods. Apart from that, the whole technique from photo acquisition to object detection and subsequently green signal allotment making use of four pattern Images of one-of-a-kind visitor's conditions is illustrated with proper schematics and the final results are confirmed by means of hardware implementation.*

Key Words: - Smart Traffic Control, Object Detection, Image AI.

1. INTRODUCTION

Traffic congestion is among the primary modern-day-day obstacle in each giant city on this planet. Latest be trained of World bank has proven that common automobile pace has been lowered from 21 km to 7 km per hour within the last 10 years in Dhaka [1]. Intermetropolitan subject experiences recommend that traffic congestion reduces regional competitiveness and redistributes monetary activity by slowing progress in county gross output or slowing metropolitan subject employment growth [2]. As more and more automobiles are commissioning in an already congested traffic method, there's an urgent need for a whole new site visitors to control the procedure utilizing evolved applied sciences to utilize the already existent infrastructures to its full extent. Because building new roads, flyovers, extended throughway etc. requires wide planning, big capital and tons of time; the center of attention should be directed upon availing present infrastructures extra effectually and diligently. Previously extraordinary techniques had been proposed, comparable to infra-crimson gentle sensor, induction loop etc. To collect site visitor's data which had their fair share of demerits. In recent years, picture processing has proven promising results in acquiring real-time site visitor's knowledge utilizing CCTV pictures established alongside the site visitors mild. One of a kind strategies had been proposed to glean site visitor's information. A few of them depend on the total number of pixels [3], one of the crucial work calculate the number of automobiles [4 - 6]. These methods have proven promising results in amassing traffic data. Nevertheless, calculating the number of automobiles may give false outcomes if the intravehicular spacing is very small (two autos almost each other is also counted as one) and it would possibly not depend on rickshaw or auto-rickshaw as automobiles which are the quotidian means of traffic in particular in South-Asian countries. And counting the number of pixels has a disadvantage of counting insubstantial materials as cars similar to footpath or pedestrians. One of the crucial work has proposed to allocate time established exclusively on the density of traffic. However, this may be disadvantageous for those who are in lanes which have less frequency of site visitors. The image AI detection method is principal to extract the desired traffic information from the CCTV pictures. It can be used to isolate the required understanding from the rest of the photograph. There are a couple of photo AI detection methods available. They've specified characteristics in phrases of noise discount, detection sensitivity, accuracy and many others. Amongst them, Prewitt [7], canny [8], Sobel [9], Roberts and LOG are most approved operators. It has been determined that the Canny snapshot AI detector depicts larger accuracy in the detection of an object with greater entropy, PSNR (Peak Signal to Noise Ratio), MSE (Mean Squared Error) and

execution time compared with Sobel, Roberts, Prewitt, Zero crossing and LOG [10-12]. Here's an assessment between designated picture AI detection approaches.

2. RELATED WORK

2.1 Existing System

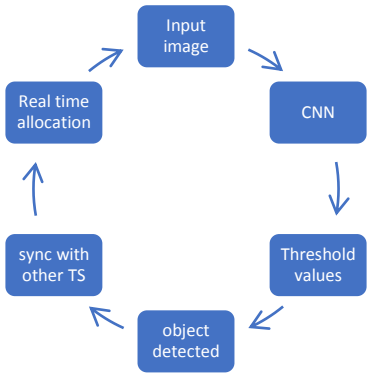
In the present system, manually we ought to control the site visitors. The part or lane which is having heavy visitors, on that side we put a green signal for a very long time. But it is not possible to control the site visitors manually during odd timings such as night time. It will require manpower and labor. So to overcome this, we automatically manage the visitors and control the signals using object detection.

2.2 Proposed system

To overcome the above drawback in this approach we are utilizing object detection procedure for detecting automobiles. We are giving the input image or photograph which is containing heavy traffic and then performing the object detection method on that image. It first calculates the percentage of automobiles from that image, then it will possibly manipulate the site visitors which will depend on the threshold price (percentage).

2.3 METHODOLOGY

Transfer learning is used for implementing a convolutional neural network. Then traffic images of the place of working are used to train the neural network for desired conditions and are made specific to that area if it has any special conditions or general development of the system is established. The camera is mounted on to of the traffic signal to get the maximum dynamic range. Surrounding or the majority of the traffic signals are synchronized with each other to get the information of the surrounding traffic also so is to maximize the efficiency of the system.



3. HARDWARE RELATED DETAILS

a. Camera

The camera has high resolution with a higher frame rate is used to capture the images from a height. Camera capture the frames perpendicular to the ground.

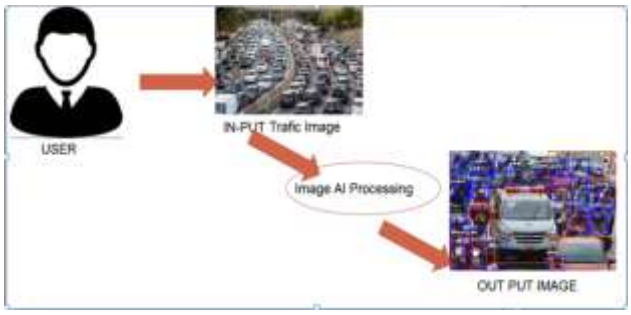
b. GPS Module

GPS Module will provide the location coordinates of the various traffic signals that are synchronized. This will also be helpful to get the coordinates of the locations easily in case of an accident, emergency, service error or the situation enquires a manual input.

c. Computer

It is used to process all the incoming data, keep in sync with the other traffic signals, for accurate calculations.

4. DETECTION SYSTEM



The detection system uses the TensorFlow platform to train the model and use it for the detection purpose. Tensor flow is an open-source library that uses the Convolution Neural Network for training the module using the provided image dataset.

4.1 Collecting Images for training the Neural Network

Online sources are used to train the CNN. Along with images captured by the real project operational camera.

4.2 Image-Preprocessing

- The camera will capture the high definition image of the targeted regions.
- This image has to convert into a suitable size for further processing.
- Removing the noise in the image which may get added due to certain environmental conditions.

4.3 Classification of Images

1)Creating Dataset: For training, the detection module required a large image dataset to be processed. Gathering the dataset from a certain selected region will help to create a strong dataset for the training module.

2)Training Model: 70% of the whole dataset is used to train the module. The model has to train up to the loss factor get minimize as small as possible.

3)Test the Model: The remaining 30% of the dataset is used to test the trained module to test the accuracy.

5. IMPLEMENTATION

5.1 Image Preprocessing

This Module is for image preprocessing. It is performed to convert the raw images into a more accessible form for Object detection purposes. At first, four images of different traffic scenarios are selected and the image of the empty road is chosen as a reference image.

5.2 Percentage Matching

Since reference image is basically an image of the Traffic road. The less the similarity between sample image and the reference image, the more vehicles are present on the road as irrelevant objects are detected in sample images such as cars, buses etc.

5.3 Time Allocation

Time allocated to green signal is governed by the percentage of objects in the Images. The proposed time allocation is based on an assumption. Contemporary time allocation may depend on miscellaneous factors; for instance, a number of vehicles, traffic conditions on neighboring intersections etc.

5.4 Traffic calculation

```
for var in d:
    print(d[var])
    if d[var] < 30 and d[var] > 0:

        b = TrafficDetection2.addSecs(a, 10)
        a = str(a)
        a = a[0:8]

        f.write("Signal"+str(var)+" :"+str(a)+"-"+str(b)+" : "+str(d[var])+"\n")
        f.write("Signal" + str(var) + " : 30 sec :  \n\n")
        a = b


    elif d[var] > 29 and d[var] < 50:


        b = TrafficDetection2.addSecs(a, 40)
        a = str(a)
        a = a[0:8]
        f.write("Signal"+str(var)+" :" + str(a)+"-" +str(b) + "  : "+str(d[var])+"\n")
        f.write("Signal" + str(var) + " : 40 sec : \n\n")

        a=b

    else:
        b = TrafficDetection2.addSecs(a, 50)
        a = str(a)
        a = a[0:8]

        f.write("Signal"+str(var)+" :" + str(a) +"-"+str(b) + "  : "+str(d[var])+"\n")
        f.write("Signal" + str(var) + " : 50 sec : \n\n")

        a=b
```

6. HARDWARE IMPLEMENTATION

6.1 Arduino Uno:

Arduino Uno is an 8-bit microcontroller. This was programmed in c language. Consists of 14 digital pins, 6 analog pins, 32kb of flash memory, 2kb of RAM and 1kb of EEPROM.

6.2 LED:

LED is Light Emitting Diode. LED's are used to give the traffic signal.

The system will process all the traffic signal images and resultant values are given to the Arduino using USB interface these values are applied to the four traffic signals. Received values contain the traffic signal time allotted for each lane.

7. EXPERIMENTAL RESULTS

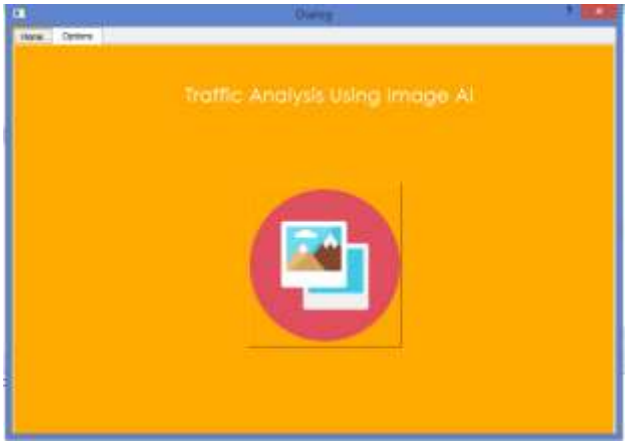


Fig: -2 Home Screen

Fig: -3 Image Upload

Fig: -4 object detection

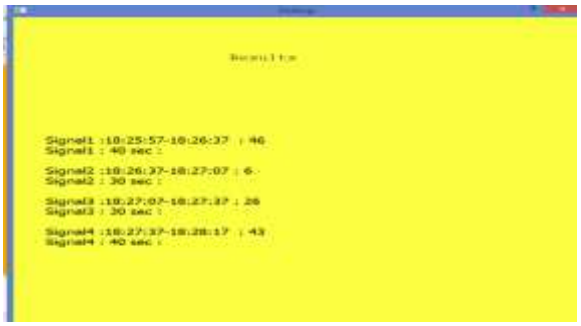


Fig: -5 Traffic Control

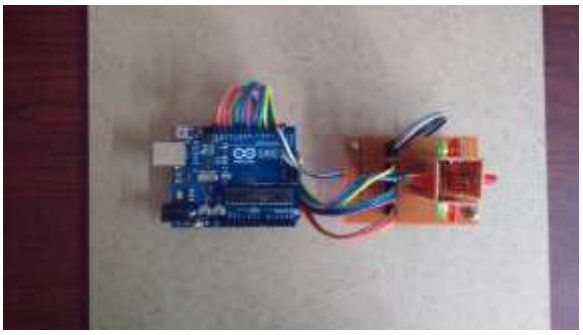


Fig: -6 Hardware Kit

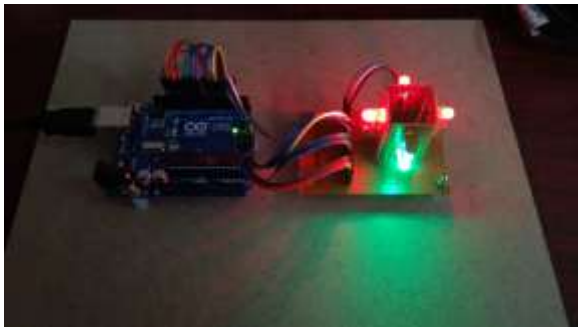


Fig: -7 Traffic control with hardware

8. CONCLUSION

In this paper, a smart traffic control system availing image processing as an instrument for measuring the density has been proposed. Besides explaining the limitations of the current near obsolete traffic control system, the advantages of the proposed traffic control system have been demonstrated. For this purpose, four sample images of different traffic scenarios have been attained. Upon completion of Image AI detection, the similarity between sample images with the reference image has been calculated. Using this similarity, time allocation has been carried out for each individual image in accordance with the time allocation algorithm. In addition, the similarity in percentage and time allocation have been illustrated for each of the four sample images using Python programming

language. Besides presenting the schematics for the proposed smart traffic control system, all the necessary results have been verified by hardware implementation.

9. RESULT

After training the module up to high accuracy it has been tested on different test images. The dataset consists of several images of heavy traffic captured by the cameras. The threshold for detection is kept high for more accuracy of detection. The output is obtained based on the threshold values set. Depending on the density of traffic priority to the specific lane is given.

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