Automation of Civil Surveying in Road Expansion

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Abstract— During the development stages of a road expansion, surveys are conducted by civil dept. or pwd department to make sure a specific road needs expansion or not, this is a manual process where in which workers will take count of vehicles depending upon the type and number of vehicles passing over that specific road. This count that is taken by human workers and we cannot assure the count or precision of the work done by them, so we are developing an application which automates this and makes actual count precise and helps save money spent on manual process and also to escape expanding roads which doesn't require expansion. The system first captures the video of the road using an camera and then the video is streamed to an processing system which does acquire the input from the environment and uses background subtraction mechanism to identify needed objects to count the number of vehicles and also to classify them using trained data sets, by this we can provide highest level of precision and accuracy of work needed for surveying. This also increases the efficiency of the surveying process.

Keywords—Vehicle tracking;Vehicle classification;vehicle counting; Width estimation.

INTRODUCTION

This paper focuses on the automation of the work with respect to the road expansion, the system uses image processing using python open CV which is open source platform, the system accepts video input from the system converts into frames and then system select an individual frame which is used as an reference frame which is constant in nature and upcoming frame will be used for background subtraction, [1] this is dynamic in nature where the new frame will be used as reference frame. After this image segmentation is done to identify vehicles, it is segmented by drawing a bounding box over contours. In segmentation we are considering each pixel as a unit of observation where we use edge-based segmentation to classify an edge and non-edge depending on pixel output. Edge detection is an important in digital image processing because the edge is boundary of the target and background. The system considers a predefined data set which is used to classify vehicles and we draw an intersection line in middle of a frame so that we can get an accurate count of vehicles which cross the line. This count is used to estimate the width of the road to be expanded by using the count and type of vehicles passing over the road.

PROPOSED APPROACH

Overview

Distinguishing moving objects from stationary is both significant and complex research problem. The first step is detecting moving objects. This creates a focus of attention for Higher processing levels for tracking and classification of vehicles, pixels belonging to foreground objects needed to be acted upon. This proposed system targets at extracting of an input image from the background which is done by background subtraction algorithm to separate the objects. This separated objects is used to classify and count vehicles on the frame and estimate the road expansion.

Background subtraction

In this model we use background subtraction method [2] to determine the location and information of the object. This phase removes background from video frames where background may include stationary objects like trees, road, pavement, then the moving object can be determined by taking the difference of the background image and input image to detect the objects on road. This is done by pixel to pixel subtraction of current frame with previous frame.it is also known as foreground detection which is an important step in image processing on behalf of utilizing the detected objects for further processes. For gray video input, intensity and for color information video input, This (Hue- saturation-intensity) color space background model is utilized. It is used to separate color information of image from intensive information.

Image segmentation

Segmentation is most important process in image processing which divides an image into regions and categories which corresponds to different objects. If this process is utilized properly other phases in the image analysis is simple. binary mask obtained from a previous step is segmented to identify vehicles this is done by extracting contours from an binary mask using open cv. contours are the set of points moved in a current frame with respect to background. In image segmentation we are utilizing shadow detection [3], edge based segmentation, and region based segmentation methods.

- In shadow detection we use shadow detection algorithm specifically canny-edge detection [4] for detection and removal of shadow which will be applied to each bounding box containing a vehicle.

- In edge based segmentation edge filter is applied to image, pixels are classified as edge or non-edge, based on a given filter output.

- Region based segmentation algorithm process information from the image by iteratively grouping pixels together which are neighbors in nature having similar values and splitting groups of pixels which are dissimilar in value.

Vehicle classification

Vehicle classification is a process in which we find the vehicle to which class the new observed data belongs to by utilizing the data obtained from the training set of data which category is known, this can be done by using machine learning-based classification [5] method by first extracting the features and then selecting classification algorithm [6] and then test the model by providing information from researches carried out on subject. We classify the objects as positive and negative where the positive dataset includes vehicles and negative dataset includes the unwanted objects like person, trees, and unidentified objects so we can accurately classify objects.

Vehicle count

In this process in each frames we are drawing an single intersection line at middle of each frame or image , where whenever the vehicle tend to cross that line we start counting the vehicle that passes it. This count is segregated upon classification of the vehicles and taken. The counter increases only when the objects area becomes zero and a vehicle is considered passing through the line.

Road width estimation

In this process by using all the result obtained in the process of image processing for vehicle detection and classification we utilize this for estimating the amount of road to be expanded by using past experience's which are manually calculated results stored in dataset. This process mainly decides whether it has to be expanded or not, if in case the amount of inches to be expanded.

CONCLUSION

The application developed for this purpose can be used to automate the civil survey process and road length extension process by using the above techniques in proposed approach, this is aimed at solving the common problems faced during survey and also human error which occur during manual process and helps us to reach the desired result accurately.

REFERENCES

[1] "Introduction   to   OpenCV   2.4.13.2