# Rating Quality of Roads Through Image Processing and Live Traffic Analysis

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***Abstract*:- There is growing consensus among the larger public for a database that indexes the quality of roads in a region. An unbiased algorithm is proposed that derives its standards from machine learning algorithms to evaluate traffic congestion data, and compare the flow of traffic in well maintained roads and poorly built roads. Moreover utilising map apis as well live images of the roads, the quality of roads can be determined.**

***keywords: Traffic Speed Estimation, Traffic density analysis,Image Processing. Rating Quality of Roads through Image Processing and Live Traffic Analysis***

## 1. INTRODUCTION

Traffic congestion on the roadway has continued to worsen as vehicle density has surged, and there has been a significant increase in the number of vehicles on the road over the last few decades. This has been a major concern for all those who use the road to get to work or other institutions,and the quality of the road is also a major factor in this problem.

Currently the decision to choose a path depends only on the current traffic conditions and not the quality of the road travelled and thus by creating a scoring system to decide the path to be travelled on. By this method we will be able to provide a more precise and efficient
manner of travelling from one place to another.

As a result, by examining the individual road scores, the user will be able to select the path that is most appropriate for them, allowing them to enjoy their journey. The score index will also assist the government in better understanding the traffic flow and deciding which roads to modify and enhance, as well as providing a broad overview of the most heavily travelled and worn-out highways.

With the development of this process, we will be able to move away from the traditional methodology of path selection and help the user in navigating to other
locations faster and more conveniently.

## 2. LITERATURE SURVEY :

Probabilistic traffic estimation is a common feature and the heart of navigation apps. Recent progress in large scaled apps is to beat through the heart of the traffic, but an official index in rating the quality of the roads and overall standard of the journey is lacking. To ensure a common standard in road quality, this proposed model awards points to the roads, to give an idea to users about the comfortability offered throughout the ride.

Currently, recently developed algorithms derive their quality based on real time congestion statistics and avoids inputs of the street image or the street views as a parameter in the learning algorithm. Offering a global system for rating or grading the urban and rural roads can help users to choose a better direction for longer journeys and trips. A trip with larger curves driving in several rural regions can be distinguished from well maintained roads through this proposed model.

This proposed model will give rise to a growing trend to index roads and their quality before finalising route options. These grading systems can be utilised by large navigation apis to drive better user acceptance.

## 3. METHODOLOGY

### 3.1 Traffic Speed Estimation

The algorithm for calculating traffic speed for a frame N is done by calculating the distance between pixels in two consecutive frames that optimises their resemblance. In other words, if all pixels in frame N-1 shifted by that offset, the pixels in frame N would be the closest match. The two consecutive frames will depend on the camera specifications and their resolution and fps. The speed analysis is performed for both individual vehicles and for the traffic group of vehicles.

Traffic speed estimation for a given latitude and longitude can be explored with help of Traffic Flow APIs of various API services like (Tomtom Map API services). By providing latitude and longitude details, and the proximity value of major roads beside the given points, the api can arrive at live maximum speed possible on the road. Furthermore, it can arrive at the free flow speed, or the best speed that can be achieved by vehicles in ideal conditions. With the help of the best speed and free flow speed, along with the confidence level, the quality of the road stretch for a given set of coordinates can be estimated.

Moreover, these API services help us categorise the roads based on FRC(functional road class).

Based on the classes FRC0 represents Motorway, freeway or other major road,FRC1 represents Major road, less important than a motorway and FRC2 represents other

major roads. There are classifications like FRC3, FRC4, FRC5, FRC6 the road.

This traffic dataset in ideal conditions can help us predict the best time taken to complete a given stretch of the road, further analysing the road maintenance.

### 3.2 Traffic density analysis

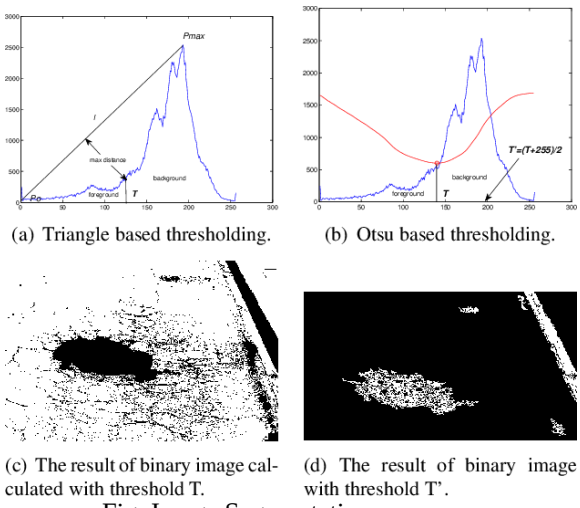
To estimate the traffic density of a road the coordinates enclosed by the traffic is taken for a set period of time. In this method a real time area and frame based on traffic density is done to understand the traffic congestions in different roads. The used APIs also give information like free flow time which refers to ideal time to cover the stretch of coordinates. This comes along with current free flow time that helps us analyse the traffic density also.

### 3.3 Image Processing:

The examination of road surface conditions is a critical duty for many countries, particularly those where roads are routinely examined. Roads that are well-maintained improve the comfort and safety of those who use them. Roadways experience breaches in their internal structures and on their surfaces as a result of topography changes, human damage, temperature contraction and expansion, and ageing.

The image processing method is extremely beneficial to the traffic information system because it enables the observation of road surface texture that are not visible using other methods. The image processing algorithm can detect many cracks in the roadway surfaces and provide mathematical statistics for each fracture. Block, transverse, and longitudinal cracks are all detected using the image processing method.Potholes are distortions in the road surface that can be catastrophic if appropriate road maintenance are not performed and they are allowed to occur. If left unchecked, they can cause car damage and even accidents. Before moving on to how they can be recognised using image processing, it's critical to understand how they're made.Potholes which are a bowl-shaped deformity can be caused by internal effects like pavement erosion due to water accessing it, change in climate like large amounts of rainfall and external factors such as poor manufacturing and large amounts of traffic.

Image segmentation is the first stage in this process. Image segmentation can be done in a variety of ways, including thresholding, clustering, transform, and texture approaches.Histogram-based thresholding is the simplest of these methods, and it works on the idea that an image is made up of different colour or grey zones.




(a) Triangle based thresholding. (b) Otsu based thresholding.

(c) The result of binary image calculated with threshold T. (d) The result of binary image with threshold T'.

Fig: Image Segmentation

The next stage is to determine and count all of the potholes. Image processing is used in this situation.It's crucial to assess surface roughness when mapping roads for accuracy. Road surfaces, according to, are a reflection of a random process, and the consequences of serious flaws such as potholes must be eliminated and dealt with separately. Pavement roughness is defined as unexpected abnormalities in the road surface that might affect the ride quality of a vehicle. Roughness affects not just the quality of the ride, but also the amount of fuel used and the cost of maintenance. This method must be improved by transportation engineers. Roughness can also be described as smooth. In the field of transportation engineering, roughness is usually stated as an International Roughness Index (IRI). For different roughness metrics, IRI generates a common measuring interval.

### 3.4 Edge Detection:

The most crucial step in feature identification in a picture is edge detection. In the image that is used to analyse the feature, edges represent a significant local change. This typically happens where the two regions meet. The initial stage in extracting feature information from an image is Edge Detection.There are numerous different edge detection methods; the two most well-known ones are the Canny edge detector and the Sobel operator. Operators like the Prewitt, Laplacian, etc. The most popular of them are Sobel and the canny edge detector.

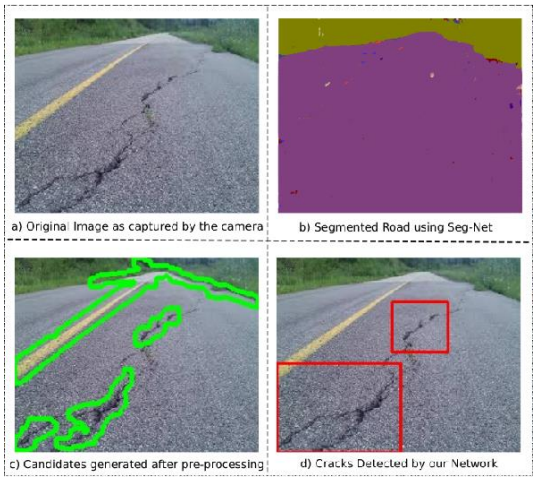


Fig: Image Segmentation and Edge detection

### 3.5 Contours detection:

The next crucial step in any form of image processing, including object detection and image segmentation, is contour detection. Contours are the curves or edges that unite all the continuous points to form a polygon and have the same colour or intensity. The contours are a helpful tool for object detection and recognition as well as form analysis.While the technique behind contour detection does actually discover edges in images, it also collects the linked edges or polygons into an array. Any recognised outer edges of objects in images can be called from that array to do additional image processing, a computation, or make a decision.

## 4. CONCLUSION:

Poor driving surfaces are often caused by a combination of seasonal and traffic. These roads lead to accidents creating an enormous hazard to drivers. Potholes, ice patches, shoulder drop-off, oil and chip , construction work zones and slick roads are the types of bad roads existing in various parts of the world. To determine the conditions of the roads, image processing is applied where satellite imagery, road views , altitude profiles which provides information to the driver so that the user can take precautions by taking a different route or by reducing vehicle speed. The position and time information is extracted from the satellite in the navigation system. These are equipped with various attributes to build a real time application . Considering various factors such as shadows of object that make it hard to detect the surface of roads, elements used to determine the accuracy of the surface of the road, the type of road , the difference in the vehicle speed and the weather is monitored along with image processing and geo tagging provides a higher success rate in determining the surface of the roads. Further algorithms are used to detect unique characteristics of bad roads . Apart from the surface of the roads , estimation of traffic density is taken from video analysis of un-laned traffic prevalent The system provides the information on the google map display application.

## 5. REFRENCES

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