ROAD CRACK DETECTION BASED ONVIDEO IMAGE PROCESSING

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ABSTRACT: *The harm of road surface reduces its carrier life. In order to enhance road protection and control efficiency, detection and popularity of pavement are studied based on video images. Firstly, we gather a huge range of road surface images of 3 different situations consisting of transverse crack, longitudinal crack and turtle crack separately to assemble road surface situations library. Secondly, deal the road broken photo with gray, gray transform and image smoothing. Then, use mathematical morphology technique to cope with crack image and projection to pick out crack category. Finally, increase the pavement crack recognition software based on Matlab. Selecting the pavement samples for experiment, the results display that identity algorithm can accurately pick out the category of crack.*
Keywords:-Pavement crack image; Image smoothing; Projection; Mathematical morphology; Fracture identification

I.INTRODUCTION

With the fast improvement of economic construction of our country, road traffic is playing a more and more essential role in the countrywide economy, road pavement maintenance and control issues additionally emerge as greater prominent as well. In order to enhance the service life of the road, acquiring pavement damage information and doing research on it becomes the pavement maintenance management's maximum essential work at this stage. Pavement crack damage is one of the most common diseases in the road destruction phenomena, the manner to detect road situations especially is based on people and instruments at present.

The Earth technology agencies in the United States developed a pavement condition evaluation system (PCES) that makes use of threshold segmentation to extract damaged information of the road surface. Japan's consortium developed a Komatsu device which implemented the information of various pavement disease detection, which include rut, cracks and section. The HARRIS device developed through Britain's Transport Research Laboratory combines information real-time processing with offline processing manner to automatically detect the end result that is stored as a image, in accordance with the image we are able to easily identify the area of the crack, length, type and route of the details. Zhao Chunxia developed a N-1 road intelligent checkout automobile can complete the pavement diseases information collection and testing tasks at the same time, which include crack, rut and smoothness.

He Anzhi developed JG - 1 type laser 3-dimensional road intelligent detection device which includes a high precision laser ranging and section 3-dimensional Reconstruction can realize intelligent detection to the road crack, roughness, rut and pit slot diseases information, in addition to compare the road conditions and generate the test report. Liu Jinwei developed a road detection automobile ZOYON-RTM which collects pavement cracks picture via high resolution linear CCD, finishing the road crack, rutting, roughness and different pavement diseases detection.

II.LITERATURE SURVEY:

This paper introduces several related works about road inspection carried out by different people. These people proposed many factors of road inspection by using different techniques. They make an effort to find a fast, objective, and relatively cheaper computerized road inspection technique. It is difficult to complete this Project wit out their files. Mature manufacturing of road inspection is developed by a few companies. However, few published papers and files about their manufacturing could be found Li, Chan and Lytton proposed a technique for detecting thin cracks on noisy pavement images. The mean width of a thin crack is much less than 0.25 inch. This technique is

described: First, the edges of a gray level picture are extracted with the Sobel edge operators in the picture information acquisition. The technique will calculate the threshold level. After the pavement picture is segmented into a binary image, this technique will eliminate noisy spots, scan the crack segment, trace the boundary of the crack segment and determine the orientation of the segment

Finally, the length and width of the crack are calculated. The threshold T is calculated by the gray level of every pixel multiplied by its gradient and weighted with the corresponding gradient. Some researchers have used wavelet transform techniques as a crack detection tool. The advantage of the wavelet transform is its multi-resolution property, which allows efficient identity of nearby functions of the signal. The transform C has been efficiently applied for crack localization in beam structures. The Lipschitz exponent is used to estimate the size of the crack. Douka, Lourdesand Trochoids proposed a technique for estimating both the area and size of the crack by defining an depth element which relates the size of the crack to the coefficients of the wavelet transform. Although cracks in beam structures are different from those in pavement, we are able to use those techniques as a source of reference in pavement crack detection.

Leontiasis, Duke and Athanasions proposed an algorithm for crack detection called the Kurtosis Crack Detector(KCD).They analyzed the essential vibration mode of a cracked cantilever beam and predicted each the vicinity and length of the crack. The area of the crack is decided by the abrupt change in the spatial variant of the analyzed response, while the size of the crack is related to the kurtosis estimate. The proposed method forms a Kurtosis-based crack detector, which takes under consideration the non- Gaussianity of the vibration signal in order to effectively locate each the area and the size of the crack. They observed that the proposed method is more robust towards noise or measurement errors as compared to different strategies which includes the wavelet analysis. Huang and Xu proposed the crack cluster connection technique. First, this technique finds verified seeds of a crack and then connects the individual seeds into seed clusters. Starting from one seed, a crack cluster grows through accepting adjacent seeds one at a time until no nearby seeds can be found.

III. PROPOSED SYSTEM:

- The schematic block overview of the proposed crack recognition and identification system is shown in fig.
- Making pretreatment to the road crack image collected before can be helpful to the later recognition, it can also increase the accuracy greatly.
- The process of image preprocessing includes format conversion, graying, gray transform, image smoothing, and image sharpening.

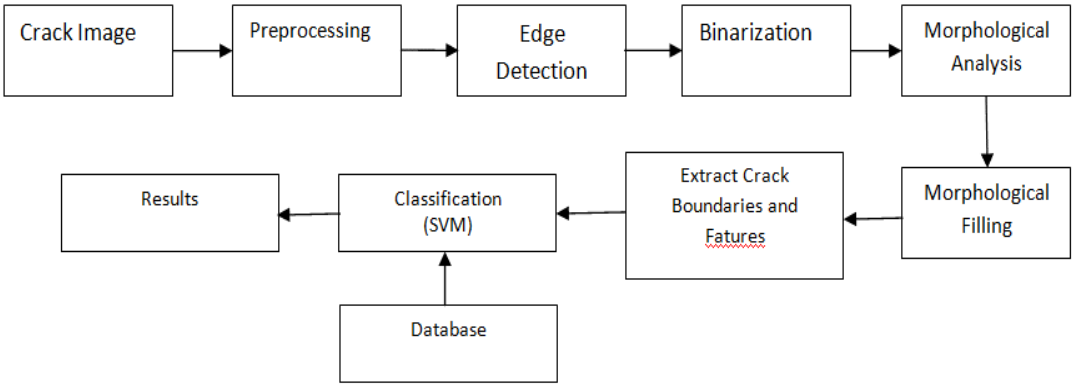

Fig. Block Diagram Of Proposed System

- Transforming color image into grayscale image can reduce the amount of calculation, and the image of the converted will still be able to reflect the whole image of global and local distribution characteristics of chromaticity and brightness level
- Now after deploying the system, during operation the system first considers the crack image and perform preprocessing operation on it to enhance its visual clarity and quality.
- Next an Edge Detection operation is performed to extract all edge patterns of the test crack image
- After extracting the edge and structural features from the test crack image, all these edge patterns are

binarized first to bring them into two levels.

- Next to isolate the unwanted road portions and to highlight the required crack patterns we perform the morphological erosion and dilation operations.
- After highlighting the crack patterns with morphological filling operations, we draw rectangular bounding boxes around the crack and extract them toperform post processing operation.
- Based on the classification results, the type of the crack, size of the crack and its impact will be estimated and predicted.
- All these crack recognition and its specifications will be displayed on the screen.

Advantages of Proposed System

- Highly accurate.
- Computational complexity is less.
- Efficiency is very high.
- Better Performance even under noisy conditions.
- Speed of processing is very high.
- Low Operational and maintenance cost

IV.RESULTS AND DISCUSSIONS:

In this paper we proposed and developed a novel approach for roadcrack detection based on video image processing. The proposed approach captures the real time road video and converts it into the discrete frames and teach frame converted into the discrete images. All the images are processed in sequence to get the crack features from them and then all the extracted crack features are combined together to get the clear crack pattern. The proposed approach is designed, coded, implemented and tested in the matlab environment and the simulation results are presented as follows.

Fig1: Original Crack Image Under Test.

Fig2: Contrast Stretched Crack Image.

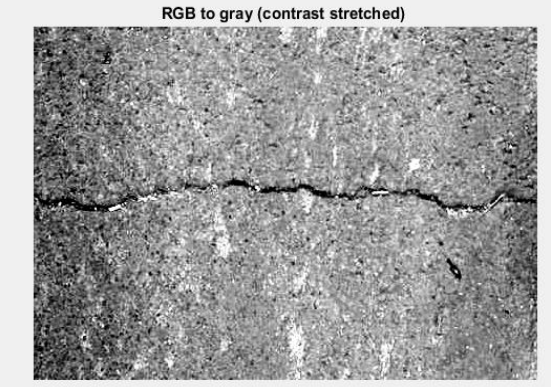

Fig3: Gray Scale Contrast Stretched Image.

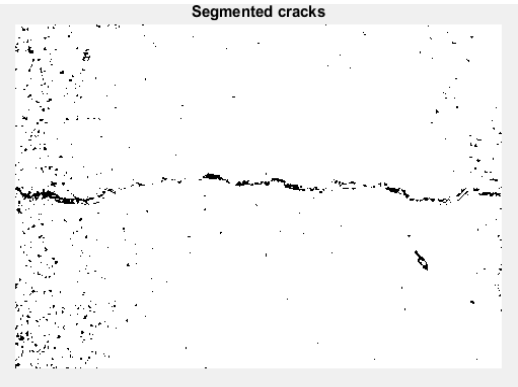

Fig4: Segmented Crack Image.

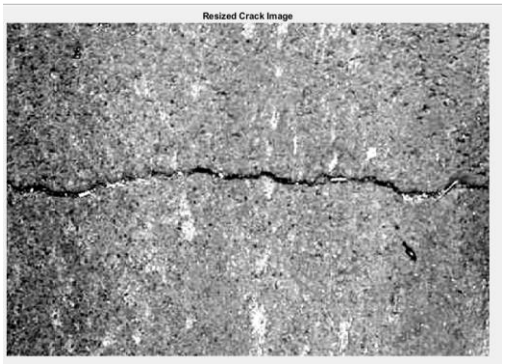

Fig5: Resized Crack Image

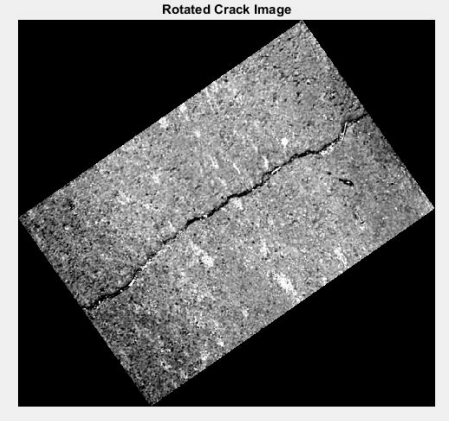

Fig6: Rotated Crack Image.

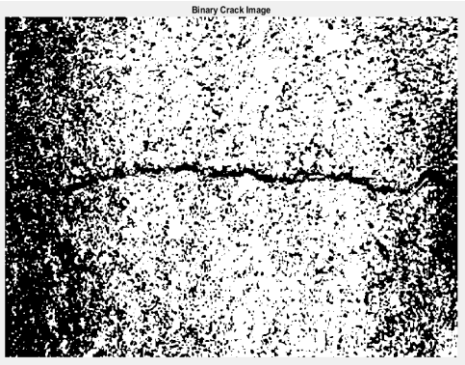

Fig7: Binary Crack Image.

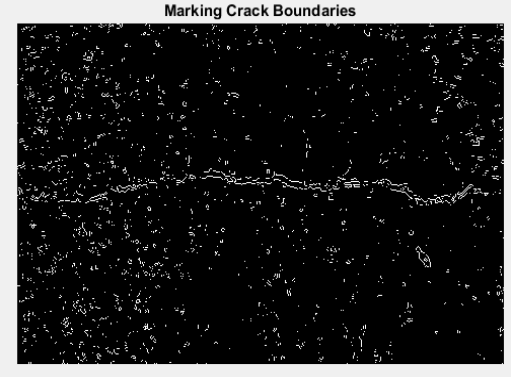

Fig8: Crack boundaries marked image.

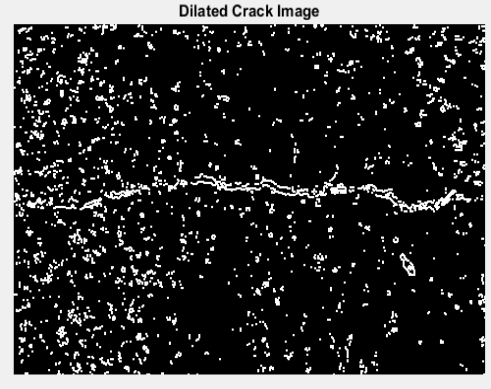

Fig9: Morphological dilated crack Image.

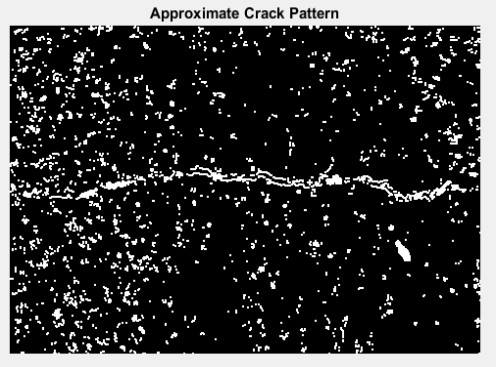

Fig10: Extracted Approximate Crack Pattern.

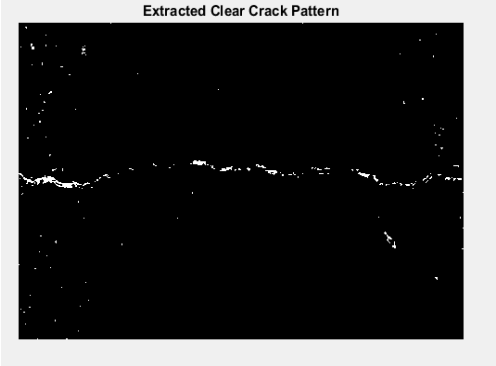

Fig11: Extracted Clear Crack Pattern.

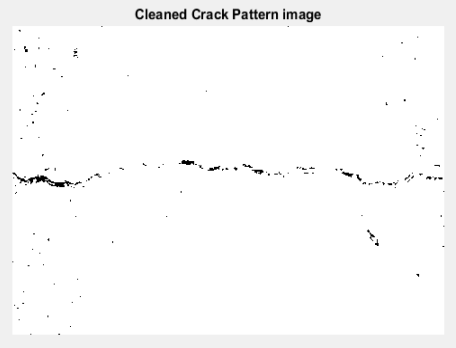

Fig12: Cleaned and improved crack pattern.

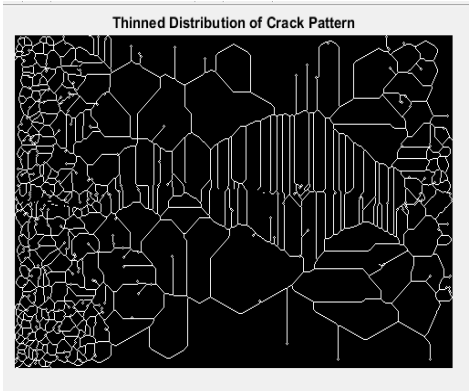

Fig13: Thinned Crack pattern.

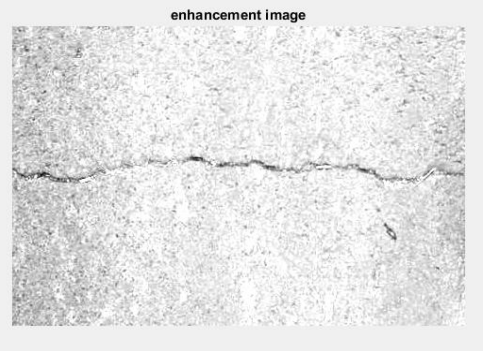

Fig14: Enhanced Crack Image.

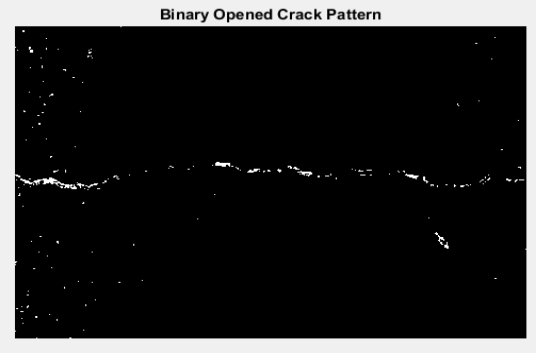

Fig15: Morphologically Binary opened crack pattern

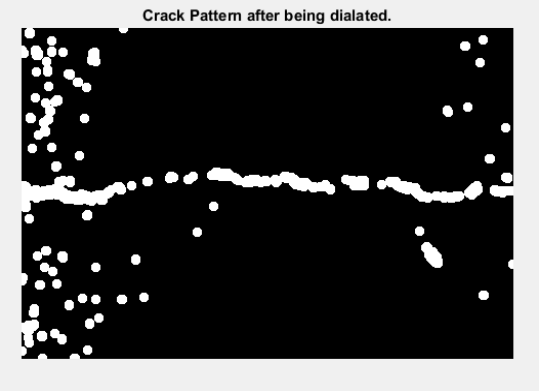

Fig16: Crack Pattern after being dilated .

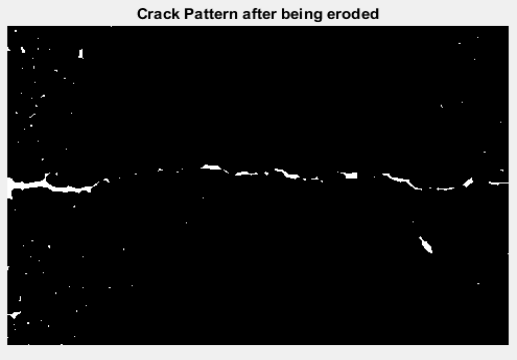

Fig17: Extracted Crack Pattern after being eroded.

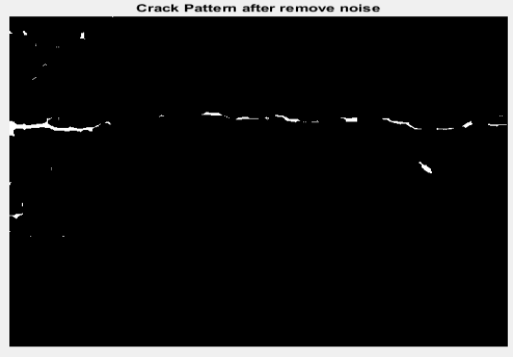

Fig 18: Clear Crack Pattern After Removing the Noise.

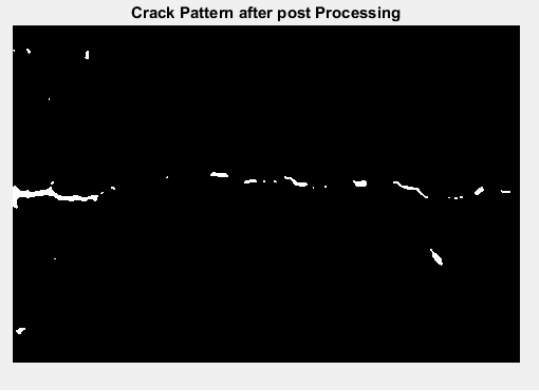

Fig19: Clean Crack Patter After Post Processing.

V.CONCLUSION:

Based on the video image, we develop road crack recognition software with MATLAB. This paper result shows that the software can identify cracks accurately and classify crack detailedly according to its characteristics.

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