iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VI **Month of publication:** June 2021

DOI: https://doi.org/10.22214/ijraset.2021.34888

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VI Jun 2021- Available at www.ijraset.com

MATLAB Image Processing Method using Histograms for Railway Track Crack Fault Detection

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Abstract: ***A software technique (i.e. image processing in MATLAB) has been explored in this project, which will aid in accurately detecting track cracks with minimal human interference. There will be a system in place to capture photographs of the track and send them to the server. i.e. to the rail employee's machine. The employee only needs to scan that picture. However, no special efforts are needed to detect cracks which will certainly benefit the employees of the railway. In addition, with less maintenance, the project's total cost is lower.***
Keywords: Railway tracks, image processing, MATLAB, drone, histogram.

I. INTRODUCTION

The majority of people fly by train, and the majority of goods are transported by train as well. The railway is quicker than the bus and safe random is cost-effective than flying, so it is widely used and the popular mode of transportation. However, one of the issues with railways is the rising number of incidents, which are caused by a variety of factors, including:-

1) Inter-train collision
2) Issues with the signalling system
3) On the rail path, obstacles appear
4) Keep track of failures

However, the majority of accidents are caused by track failures, which are described as cracks in the tracks that result in accidents. This resulted in the loss of life and property. As a result, the a real need to stay away from it.

a) As a result of temperature changes the thermal stress produced in the track are excessive
b) As a result of bad weather, there is a presence of corrosion on the track.
c) Trains carrying more weight than the track's weight capacity due to passenger overcrowding in the train's coaches, which exceeds the actual capacity of the coach.

II. PROPOSED APPROACH

In this project, we proposed a computerised method for detecting cracks that require very little expense, or even no cost at all, and no manual inspection.

This approach is MATLAB-based. In MATLAB, we used image processing. First and foremost, a crack-free reference image is given in MATLAB. This picture is the same every time. Then there's the matter of capturing the track's image. This picture is then sent to the server, which is located somewhere close to the station where a staffer is keeping an eye on the situation.

This employee is only responsible for a few tasks, such as assigning the photos a name or browsing the image's files, which do not necessitate any different knowledge. The crack detection software file, which is already stored in MATLAB must be opened after browsing the photos in MATLAB. The picture name must then be entered into the programme in the correct format. We can make a different arrangement by writing specific commands for this, which will eliminate the need to type the name every time, and then the programme can run and browse the captured image file. The file's immediate viewing window is depicted in the diagram below.

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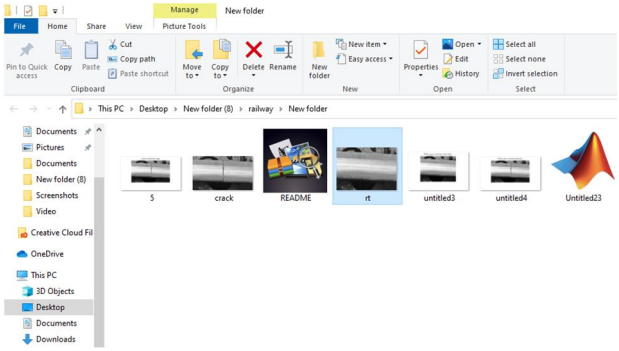

Simply open the relevant image file by clicking on it. The program's actions are executed to this recorded image, and the output result is displayed. The histograms of the reference image will be plotted (without a crack) and one capture image (with or without a crack) in this project. If both histograms are the same after plotting them, then there will be no crack.

1) Current, with various histograms indicating that crack is present. However, the key issue is how to capture the videos.
2) It is essential to constantly observe the tracks by capturing images to carry out this project. Another requirement is that we just want the view from the top of the track. Consequently, manually capturing photographs is a challenging process.
3) We've discussed two methods for capturing images in this project. Both methods make use To continuously capture images, position cameras at a specific distance between the poles and decide a certain range for each camera, i.e. the range in which only that camera can capture images. The photos are then sent to the server after they have been captured. However, this approach necessitates a large number of cameras, which is costly and time-consuming to maintain. So, we've discussed this idea, but only use it if you have enough money. for new technologies.
4) The photograph will be captured by using a Drone camera. The image for the drone with a camera is shown in the following figure:-
5) The drone will have a transmitter-receiver, which will be used to transfer information to the drone as well as send images to the server when the image is captured. The camera used must be efficient and capable of capturing high-quality images. The job of capturing photos at night is difficult, but we will use infrared cameras.

Isn't there also the question of how many drone cameras are required? If we consider a 20-kilometre railway line and a drone with a 20-kilometre range. The drone will first gather photographs over the first 10 kilometres and then send them to a server. Then it captures for the next 10 kilometres and sends the images to the server.

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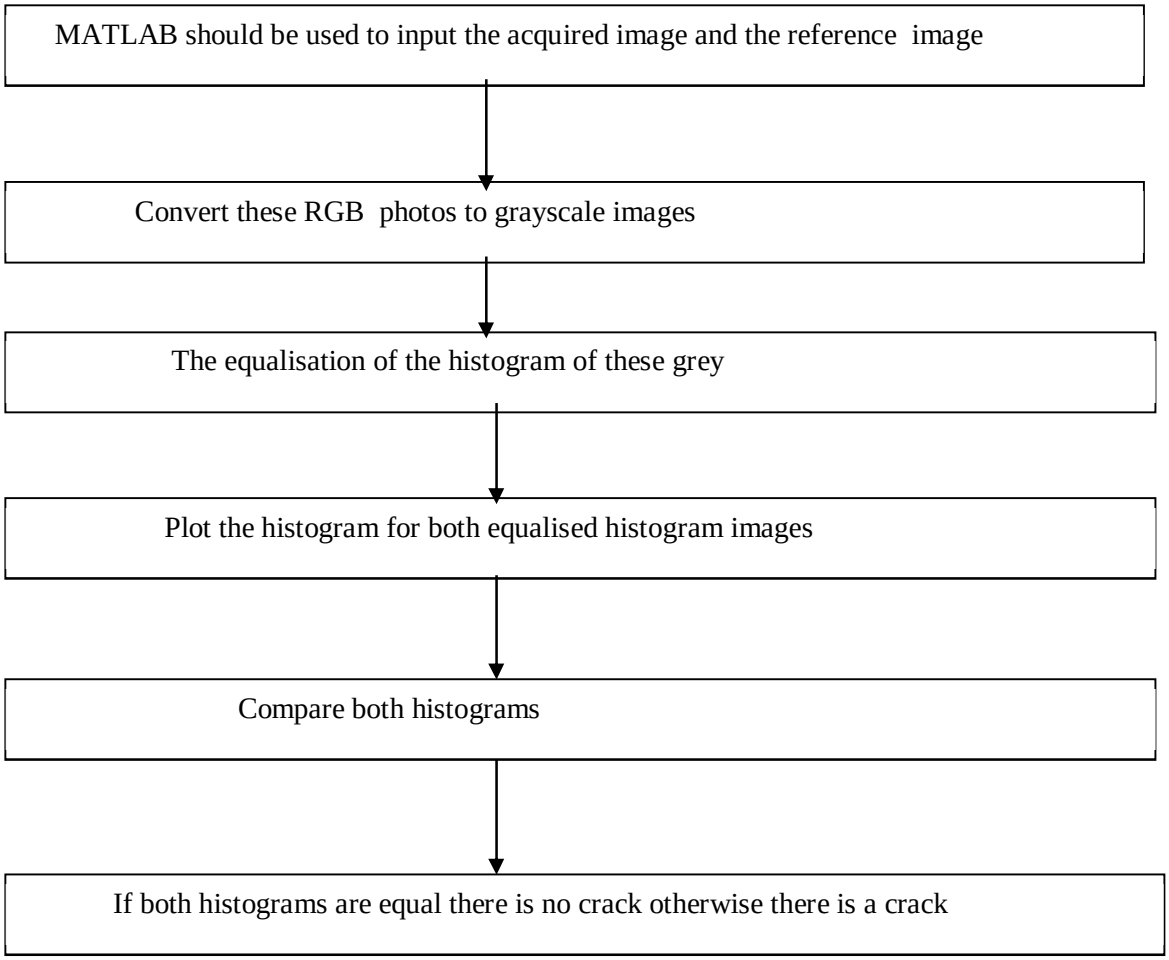
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VI Jun 2021- Available at www.ijraset.com

Every thirty minutes or as soon as the train crosses the track. The operation of this drone camera is also quite quick and does not require a lot of machinery. Another benefit of adopting it is that it may be used for other things like security.

The picture will be captured by the drone camera and sent to the server where the employee is working. As a result, the employee can open MATLAB and run the software. If the employee notices the crack present as soon as he receives the result, he may also locate the location of the crack and send information to the relevant authority as soon as he receives the result.

III. FLOWCHART



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A. The Explanation For A Flow Chart

The captured image and track reference image are browsed into MATLAB in this first phase. Then, in the MATLAB editor, begin writing the commands. MATLAB is used to read these images. These are RGB (red, green, and blue) files.

Now it's time to put the algorithm to work on these files. In MATLAB, the algorithm can only be applied to two-dimensional images, no three-dimensional images.

Since RGB images are three-dimensional, we are unable to apply algorithms to them, so we convert them to greyscale images.

The images are then transformed to histogram equalized greyscale images.

The reason for converting to histogram equalised images is that it spreads the intensity values over the entire spectrum, enhancing contrast.

The contrast is automatically calibrated by the histogram equalization to equally distribute the image's pixel values over the entire potential range.

The intensity value on the X-axis ranges from 0 to 255. (these images are uint8). The Y-axis changes depending on the number of pixels in the image and how they are distributed in terms of intensity.

IV. WORKING

Load the captured image in MATLAB first and read this image. The commands for this are as follows:-

```
[fname, path]=uigetfile('*.*','Enter an image'); fname=strcat(path,fname);im=imread(fname);imshow(im);
title('original captured image');
```

The result for this is shown in MATLAB as

Figure1: Originally captured image

This RGB image is then converted into GRAY image and the commands for this areas follows:-

```
b=rgb2gray(im);imshow(b);title('gray image of original capture image');
```

Figure2: A grey image of an originally captured image

After that, the GRAY image is transformed to a histogram equalised image. Due to sunlight, the track is brighter than the backdrop, necessitating histogram equalisation. As a result, histogram equalization is required to observe the track, and the commands for this are as follows:-

```
c=histeq(b);imshow(c);title('histogram equalizedofinputcapturedimage');
```

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The result for this is as follows:-

Figure3: Histogram equalized image of grey image of an originally captured image

Then the histogram of the above image is plotted. The reference image without crack is provided. Similarly, it is converted into a grey image and then into a histogram equalized image. After this histograms for both images are plotted.

The commands are as follows:-subplot(2,2,2);
imhist(c);

title('histogram of captured image');REF=imread('rail2.jpg');m=rgb2gray(REF); n=histeq(m);subplot(2,2,3);
imshow(n);

title('histogramequalized imageofreference
image');subplot(2,2,4);imhist(n);
title('histogramofreferenceimage');

The result for this is follows:-
The whole program is shown ones again:-

[fnamepath]=uigetfile('*.*','Enter an
image');

fname=strcat(path,fname);im=imread(fname);

imshow(im);

title('originalcapturedimage');b=rgb2gray(im);
c=histeq(b);subplot(2,2,1);imshow(c);
title('histogramequalizedofcapturedimage');
subplot(2,2,2);imhist(c);
title('histogram of input capturedimage');REF=imread('rail2.jpg');m=rgb2gray(REF);n=histeq(m);
subplot(2,2,3);imshow(n);
title('histogramequalizedimage ofreferenceimage');
subplot(2,2,4);imhist(n);
title('histogramofreferenceimage');

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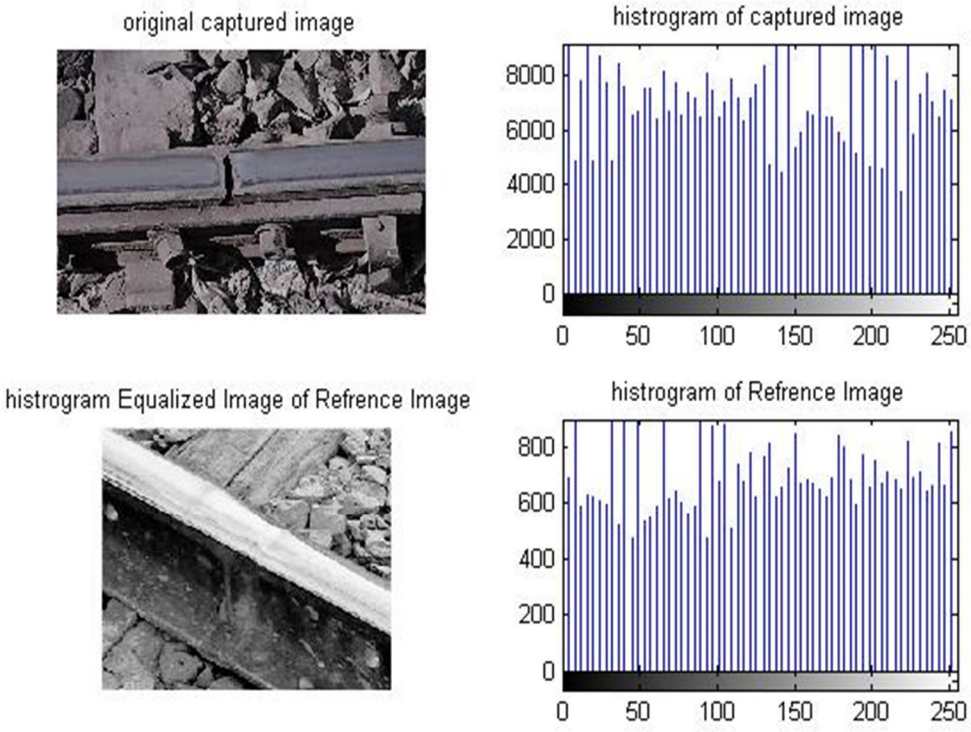
The result for this is as follow



If we look at the two histograms above we can see that they are not the same and thus we can conclude that there is a track crack**.** The railway employee only needs to identify the histogram before making a conclusion on the presence of the fracture.

V. LITERATURE REVIEW

VOL3, ISSUE4, 2017, Rizvi Aliza Raza, Khan
Pervez Rauf, Ahmed shafeeq:
A Computer vision-based method for detecting cracks is proposed in this research study.
According to this study article rolling stock is employed to collect photographs. They used MATLAB Graphical user Interface.

Mr Prashanth. Addagatla and Mr G.Koteshwar Rao, International Journal of Engineering Science Invention ISSN: They recommended that LED and LDR systems be used effectively. When light from an LED deviates from its direction due to the presence of a crack or a split, a sudden decrease in the resistance value of the LDR occurs, according to this research paper.
A change in resistance in the rails suggests the existence of a crack or other structural defect.
A GPS receiver, whose purpose is to obtain existing latitude and longitude data, is used to detect the device's current position in the event of a crack.
A GSM modem was used to relay the information received.
The GSM module in use is used to send existing latitude and longitude data to the appropriate authority via SMS.
Four DC motors are used to propel the robot.
Only the latitudes and longitudes of the broken track will be obtained with the current system, so the exact position cannot be determined.

VI. FUTURE SCOPE

This project could be beneficial in places like Mumbai. Where the number of passengers on trains is extremely high. The procedure mentioned above is the simplest way to identify a crack. We may be able to use video processing instead of image processing in the future. This image processing in MATLAB can be used to extract a variety of features.

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VII. CONCLUSION

Using picture processing techniques, this paper presents a method for detecting cracks in railway tracks. With some manual work on the device, the proposed method aids in the detection of cracks. The tracks are photographed with a drone and fed into the suggested crack detection machine. This will aid in the early detection of cracks and the reduction of the risk of injuries.

The proposed method identifies cracks with high accuracy, ensuring the system's maximum performance. As a result, it is simple to find the cracks in the tracks using image processing in MATLAB.

REFERENCES

[1] Rizvi Aliza Raza, Khan Pervez Rauf, Ahmed Shafiq, crack detection in tracks using MATLAB, International Journal of Advance Research, Ideas and innovations in technology(VOLUME3, ISSUE4).
[2] Gonzalez, R. C., R. E. Woods, and S. L. Eddins, Digital Image Processing Using MATLAB, New Jersey, Pearson Prentice Hall,2004.'
[3] Image Processing Toolbox User s Guide, version 5, by The Math Works, Inc.
[4] https://www..mathworks..com
[5] AnIntroductiontoDigitalImageProcessingwithMatlab,NotesforSCM2511ImageProcessing1,Semester1,2004,AlasdairMcAndrew,SchoolofComputerScienceand Mathematics,VictoriaUniversityofTechnology

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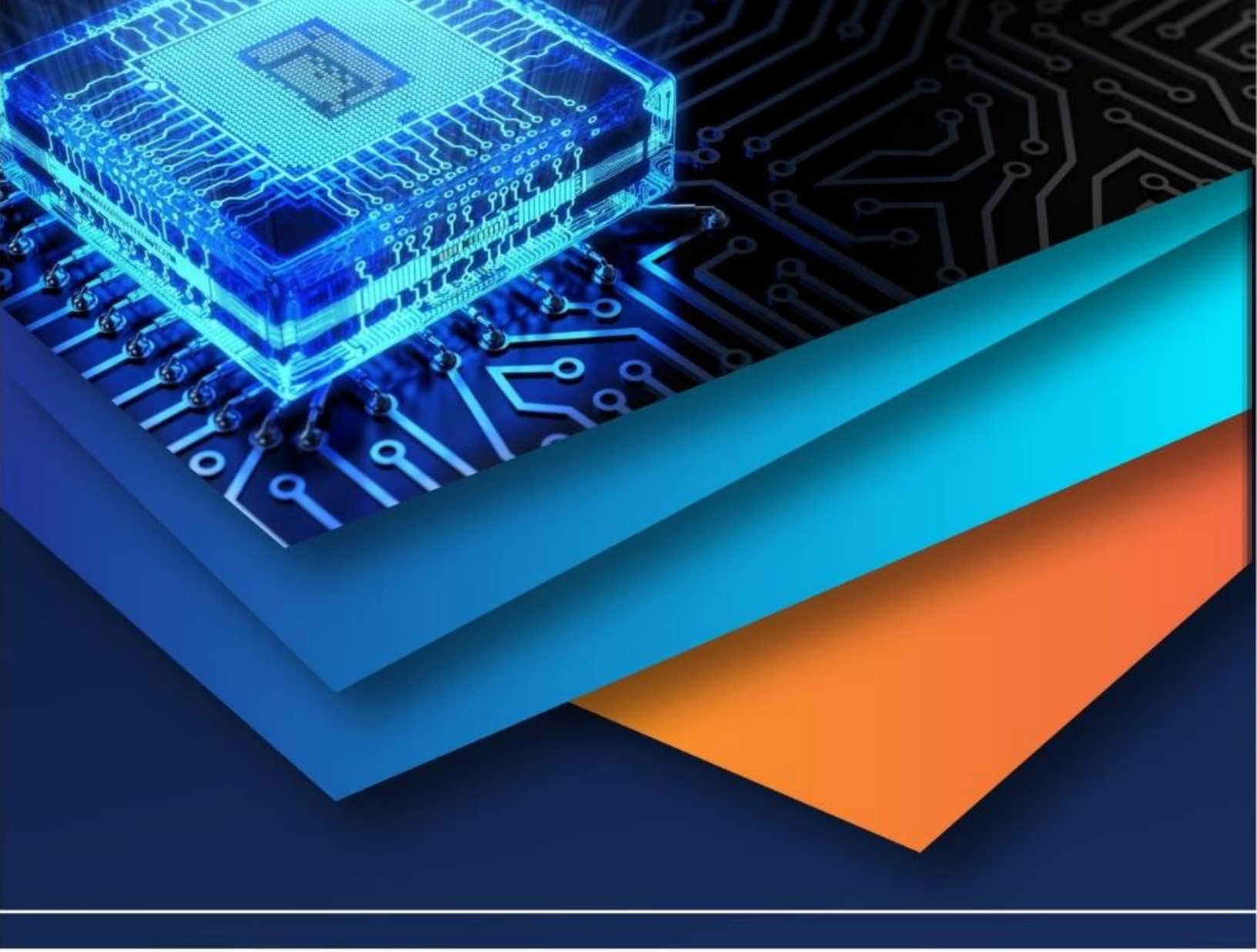

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