

# CRACK DETECTION SYSTEM

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## Abstract:-

In real time scenario, cracks are very common in building, bridge, road, pavement, railway track, automobile, tunnel and aircraft. Cracks on the concrete surface are one of the earliest indications of degradation of the structure which is critical for the maintenance as well the continuous exposure will lead to the severe damage to the environment. Manual inspection is the acclaimed method for the crack inspection as it is completely depends on the specialist's knowledge and experience. So, automatic image-based crack detection is proposed as a replacement. Final objective of this research is to develop a crack detection system that can analyze the concrete surface and visualize the cracks efficiently. Crack detection play a major role in finding the length and area of a particular crack which will determine the severity of crack. This method is useful for non expert inspectors, enabling them to perform crack monitoring tasks effectively.

**Keywords:** Concrete Crack Detection, Image processing, Construction Safety and Maintenance.

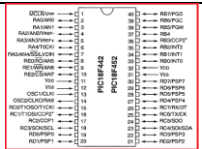


## I. INTRODUCTION

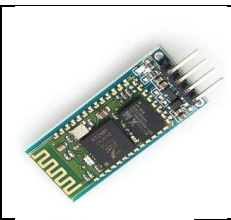

Cracks are of major concern for ensuring the safety, durability, and serviceability of structures. The reason is that when cracks are developed and propagate, they tend to cause the reduction in the effective loading area which brings about the increase of stress and subsequently failure of the concrete or other structures. Since there always exist constraints in reinforced concrete structures and buildings deteriorate overtime, cracking seems unavoidable and appears in all types of structures, for example, concrete wall, beam, slab, and brick walls. Particularly for concrete elements, cracks create access to harmful and corrosive chemicals to penetrate into the structure, which consequently damage their integrity. Crack detection is the process of detecting cracks

in building walls and also concrete surfaces. Crack detection can be done in two ways. One is destructive testing and another one is non destructive testing. Crack detection should be done accurately by measuring the dimensions of the cracks for reliability. Human inspection is time consuming and slower hence automatic crack detection methods is being adopted as it's processing speed is better than that of human inspection. Image based crack detection has been increased rapidly as it can find the length and area of a particular crack. Accuracy of results is the major reason behind adoption of image processing methods for crack detection. In this paper a survey is being conducted on crack detection using image processing methods that can be applied on images captured with camera.

The major advantage of using image processing techniques in crack detection is the accurate results when compared to manual methods.

## II. METHODOLOGY

| SR. NO | NAME                | OUTLOOK   |
|--------|---------------------|---|
| 1      | PIC 18              |  |
| 2      | Motor Driver L2393d |  |
| 3      | DC motors           |  |

|   |           |   |
|---|-----------|---|
| 4 | Bluetooth |   |
| 5 | Camera    |  |

**Table1. Basic components**



**Final Crack of which length and area is calculated**

1) First of all for detecting the exact location of the crack we need to move the bot with the help of a Bluetooth.

2) Image capturing is done with the help of the webcam which we can see on the laptop connected to it.

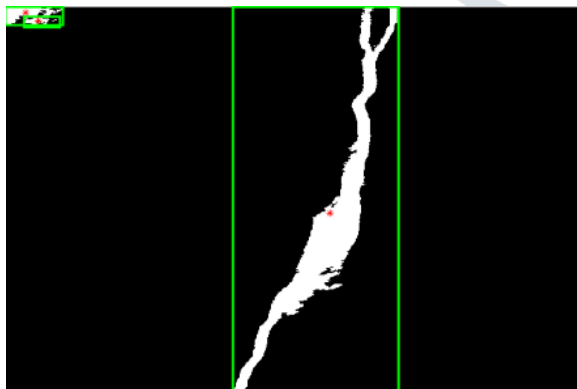
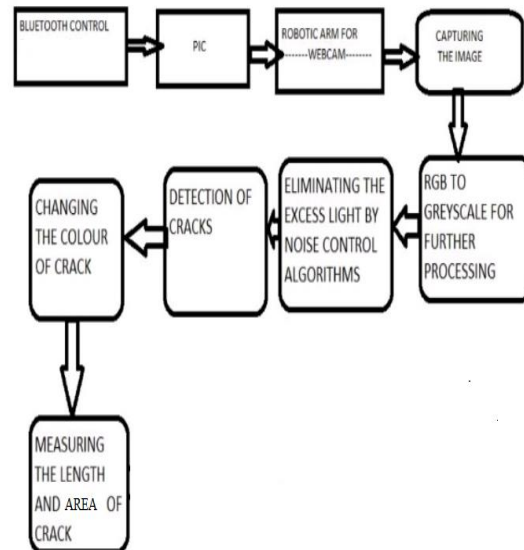
3) After Capturing the RGB Image it is converted to binary image (Black and white), negation of this binary image is performed. So, that the particular crack will appear white and background will become black.

4) Dilation is performed on image to increase the clarity of the boundary or to enhance a image.

5) Removal of Blobs (Noise) which are less than 30 pixels using area opening operation results into a segmented image.

6) A certain MATLAB steps are followed on this segmented image to find the length and area of particular crack using MATLAB functions.

**III. HARDWARE FRAMEWORK**



**Segmented and Cropped Crack**

**1) PIC 18f4520**

The proposed Crack Detection system is based on the operation of pic microcontroller. We have chosen PIC 18 microcontroller as it is more compatible for applications of this project.

It is an 40 pin,8-bit enhanced flash PIC microcontroller that comes with nanowatt technology and is based on RISC architecture.

**2) DC motor**

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism,

either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

### 3) Camera

Logitech specification consist of Max Resolution of 720p/60fps and autofocus with Lens technology of Full HD glass.

### 4) L293d Motor Driver

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. 1Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.

### 5) Bluetooth

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband.

## IV. ACKNOWLEDGMENT

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## V. CONCLUSION

In order to evaluate the safety of a concrete structure, a method to detect cracks from camera image was proposed. First, it was possible to visualize the concrete crack easily

through the image processing techniques such as improved Dilation method, filtering and segmentation method. Finally, the analysis is carried out on the basis of image processing. The results have to be analyzed using appropriate quantitative metrics of crack detection to find the length and area of crack.

## VI. REFERENCES

1. Dr. S. N. Geethalakshmi et al, "A survey on Crack Detection using image Processing Techniques and Deep learning Algorithms" International Journal of Pure and Applied Mathematics ISSN: 1311-8080 Volume 118, Issue 3, 2018
2. Sheerin Sitara N et al, "Review and analysis of Crack Detection and Classification Techniques based on Crack Types" International Journal of Applied Engineering research ISSN: 0973-4562 Volume 13, Issue 8, October 2018
3. Arun Mohan et al, "Crack Detection using Image Processing: A Critical Review and Analysis" International Journal of Innovative Research in Computer and Communication Engineering ISSN(Online): 2320-9801 Volume 3, Issue 14 Jan, 2017 Page No. [5247-5249]