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Pipeline Crack Detection System Using Raspberry Pi

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ABSTRACT: Most convenient mode of supplying fluidsachieved bypipeline. Still accidents are major concern in terms of undefined crack in pipeline. Due to the crack in pipeline results in loss of human life and economy. Therefore, we need to bring a new technology which can reduce the loss of major lives. This paper provides pipelinecrack detection system using raspberry pi, EM card module, webcam and Internet of Things. Raspberry pi plays vital role to coordinate the devices used in the system. The location information stored in Radio Frequency Identification tag by python programming in raspberry pi. The frequency from the Radio frequency Identification tag read by the reader module which is EM-18 reader module. RFID module emit low frequency (125KHz) which is harmless and enough to access the RFID tag. This way of finding the location provide better speed and accuracy irrespective of any signal problem.

KEYWORDS: raspberry pi,web camera, EM-18 card module, RFID tag

I.INTRODUCTION

In this project we are using Raspberry pi 3B, reader module, webcam, cloud server. Raspberry pi is the major component which is used to get the information from the camera and compared those images with the reference threshold value using image processing, and the raspberry pi receive the location of the crack by EM 18 reader module, and then it saves the location to the cloud server. The supervisor attains the crack location by referring the cloud server according to the cloud server data the corresponding work will be done. By doing this process we can get accurate information about the crack in pipeline. We can attach the reader module in the pipeline itself to get better accuracy.

pipeline is the biggest platform where multiple fluids flow to reach the destination with high speed.So,it'sessential to provide more concern in terms of security. If there is any fault, it takes more time to identify fault occurred in pipeline.In this case we have to solve the problem in short span of time with more concern. Hence to reduce this fault we use image processing-based crack detection system. In this way system increases efficiency of inspection reduces the required time and gives frequent information of the pipeline.

The main objective of our project is to:

- Design and develop an automatic pipelinecrack detection using image processing.
- Takes away the human errors such as automated inspection and replacement of the over – aged assets.
- Reduces the need for man power.
- Provides real time monitoring of crack on the pipelineand in case of any crack, the information with location send to the cloud server using reader module

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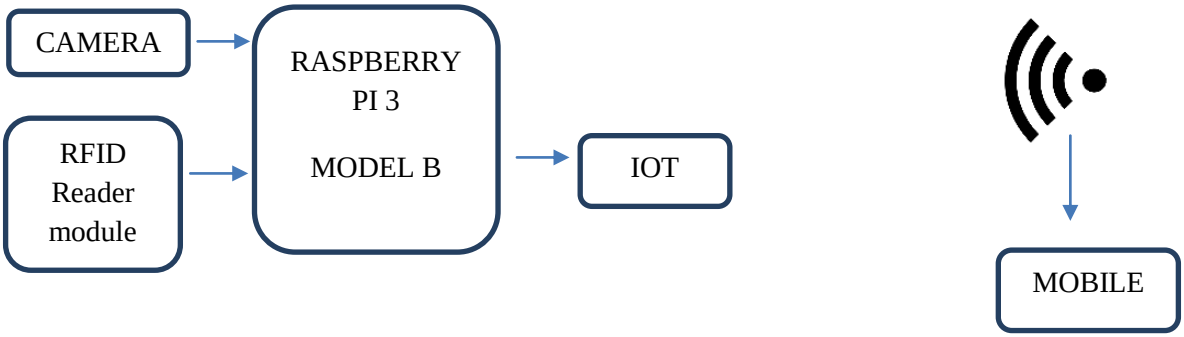
II.ALGORITHM FOR CRACK DETECTION

The pipeline crack monitoring vehicle activate the webcam when it starts. Once it starts it continues to access the images taken by the webcam by image processing edge detection method which analyze the image by screening the edge of the pipeline. If the crack is detected the RFID reader module readthe location information and store the information to the IOT and from the server the information about the crack is known to the supervisor in the pipeline department. If there is no crack detected then the RFID reader module does not read any RFID tag and the webcam continues to capture the images.

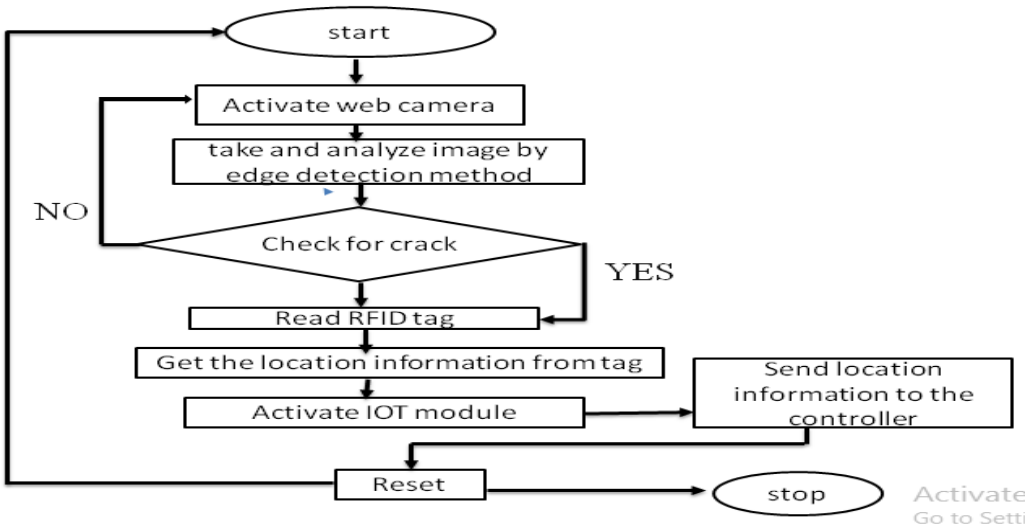
III.BLOCK DIAGRAM



IV.INTERFACING RASPBERRY PI WITH CAMERA MODULE

Raspberry pi is interfaced with webcam through USB.After getting the button pressed signal from the tracking vehicle the camera gets started .The image taken by the webcam is subjected to the edge detection method .In this edge detection method, The image gets scanned and indicate if the crack is present .This camera has night vision ability and it has maximum image resolution 320*480

V.FLOWCHART



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In our project we are using normal web camera that captures the images of the pipelineand sends it to the raspberry pi camera interfacing module. From there it reaches the raspberry pi, and then it checks for the crack if it is present it activates reader module from where we get the location and then it stores to the cloud server. Here, all the pipelineimages are detected from the web camera and the image processing occurs. If any crack is recognized, the location is marked on the server. Where, anyone in the supervising section can access and use it for the rectifying purposes

In this way, a lot of time is saved and this is highly securing process. No crack missed from the image processing. Location information is maintained on the server so anyone can access it for purposes like servicing and verifying

Firstly, the image captured by the camera is opened using the tool open from raspberry pi camera module. The images from camera are configured in a pixel by pixel manner. Each image is compared with the database images in the raspberry pi and the location message is stored in the server. And then the location obtained is send to the raspberry pi through GPIO and the raspberry pi send this location to the cloud server

VI.SECTION DETAILS

a). WEB CAMERA:

Web camera is used to take pictures of the pipeline. It can be connected with Raspberry pi using either through camera module or USB cable. The resolution of the image captured from the camera will be approximately 5MP. The camera is capable of 2592×1944-pixel static images. 15 pin MIPI camera serial interface plugs directly into the raspberry pi board. CSI bus is capable of extremely high data rates. it was especially designed for interfacing to cameras. It is fully compatible with raspberry pi.

Fig.1 Web Camera

b). RASPBERRY PI 3 B:

Raspberry pi 3 B is the minicomputer. It acts as the central component which we are using to interface all the devices in this project. Raspberry pi model B is used mainly because of the GPU which value is 400 MHz, it is comparatively higher than the rest of the model. it has 40 general purpose input-output (GPIO) pin. There are four USB channels, one HDMI port and one 10/100 Ethernet connectivity to the board,one 1.5 GB RAM and the ROM is directly proportional to the SD card present in the SD card slot.it has the camera module. Raspberry pi GPIO pins are most commonly used for pythons. It has an inbuilt WIFI and Bluetooth technology

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Fig.2 Raspberry pi B

c) RFID READERMODULE:

It refers to the Radio frequency Identification. It includes two types of components namely the Transceiver and a Tag. It consists of Radio frequency and it generates electromagnetic field. The tag is usually a passive device. It emits only a low frequency signal of 125KHz which is less harmful. The card only consists of a serial number which determines its location. The location is programmed using PYTHON. It is of low cost and which it can be easy to find the location. Here we are using an Active RFID card to get the location. Whereas the passive card involves theATM or Debit card. Active card acts as the power saver which can save the power by itself.

Fig.2 EM-18 reader module

VII.SOFTWARE IMPLEMENTATION

Steps to install Raspbian OS in Raspberry pi:

In order to install Raspbian OS in the raspberry pi3 model B, the next out of box software (NOOBS) has to be installed first of all

1.Allocate the drive for installing OS
2.Insert SD card by using the CARD READER or else insert in directly in the SD card slot provided in the raspberry pi and it can be of 16GB or else 32GB accordingly.
3.Download the WINDISK 32 utility from source forge project which is a zip type file
4.Extract and run the zip file.
5.Select the file and run as administrator.
6.Select the image file which was extracted above.
7.Click the drive letter of the SD card in the device box.
8.Select write and wait for write process to complete.
9.Exit the image and eject the SD card Steps to install VNC Viewer

Steps to interface raspberry pi:

1.Go to - https://www.realvnc.com/en/connect/download/viewer/ and download the vnc viewer
2.Goto downloads and run the VNC CONNECT setup.
3.Set up the password and user name once the installation is complete

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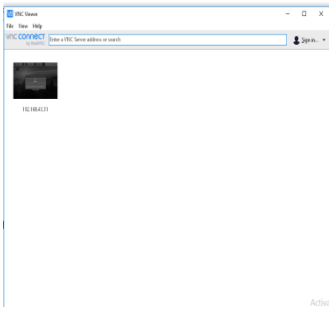
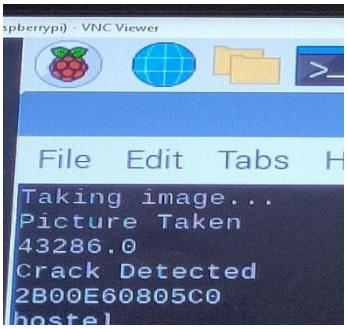
4.Open the VNC CONNECT using the password.
5.Connect the raspberry pi with the viewer using raspberry pi's IP address.
6.Now the viewer is ready for executing the output.

VIII.RESULT AND DISCUSSION



VNC ViewerImage captured by the Webcam



display crack value and location

By doing this project,the track status will be updated at any instant of time which is more accurate and it contribute the location of the track which plays the major role to correct it and protect us from the further losses. it can also alert the supervisor through message.

IX.CONCLUSION

This project aims to detect crack present in the railway track. In this paper crack is detected by image processing technique and get the location of the crack through reader module. This method replaces the manual inspection of the track section by automatic inspection. It reduces human error and provide more accuracy in detecting the crack in the railway track. This idea can be implemented in the large scale, in the long run to facilitate better safety standard for rail tracks. By using this technique, we can achieve better results in future.

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