# DETECTION OF CRACK UNDER VARIOUS IMAGE TYPES USING LOCAL RANGE FILTER

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**ABSTRACT:** The objective of this paper is to compare the results of crack detection using several image type. The goal is to determine which image type is suitable to get required information. Four image type has been tested, which are truecolor image, intensity image, cyan-magenta-yellow-key (CMYK) image and hue-saturation-value (HSV) image. The results shows that for each truecolor components, as well as key component of CMYK image and intensity image are capable to detect the crack.

**KEYWORDS**: *Crack Detection; Image Processing; Filter*

## 1.0 INTRODUCTION

Crack is a fracture or discontinuation in an infrastructures, such as bridges, roads and pavement. Crack is a results of deterioration due to environmental and loading effects (Dung & Anh, 2019). Therefore, an efficient maintenance strategy for deterioration detection is a necessity. With the rapid development of image processing techniques in recent years, image-based automatic crack detection methods have increasingly replaced the old-fashioned human inspection method to reduce the cost and increase the efficiency. The performance of an existing crack detection method is determined by two factors: the monitoring devices and the detection approaches. In the existing crack detection approaches, local features such as brightness and texture are popular, based on the hypothesis that the cracks are darker than their surroundings and continuous (Meng & Li, 2018).

In general, for image-based detection, commonly used image is grayscale image, which is also known as an intensity image. This approach can be observed in previous works such as Zou et. al. (2012), Cheng and Miyojim (1998), Zheng et. al. (2010) and Oliveira and Correia (2013). Manipulation on this image is implemented in order to gather useful information for detection process. However, there have a possibility to extract a useful information using other image type. Therefore, in this work, several image type has been tested in order to observe the capability of image type to capture such information. The details about the work is explained in the next section.

## 2.0 METHODOLOGY

In this work, used image sample is gathered from CrackForest Dataset prepared by Cui et. al. (2016). Chosen image is shown in Figure 1.

Figure 1: Crack

Image type as shown in Figure 1 is a truecolor image. This image is then been converted to other image type. Selected image types are popular image types which are intensity image, CMYK image and HSV image. For chosen image type, image type that consists more that single data array will be extracted into single data array, and evaluation on the image texture for these components will be conducted. Here, texture analysis function that will be used for further analysis is local range filter. The filter is defined as:

$$L = m - n \tag{1}$$

where $m$ is maximum value and $n$ is minimum value in defined filter array. The results gathered will be discussed in the following section.

## 3.0 RESULTS AND DISCUSSION

The gathered successful detection is shown as in Figure 2 to Figure 6:

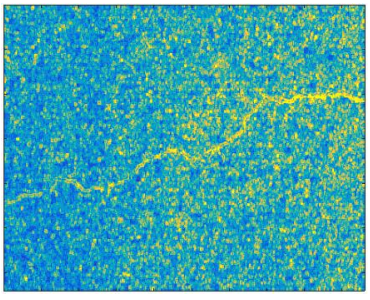

Figure 2: Truecolor image (R-component)

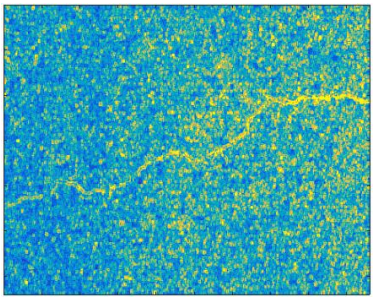

Figure 3: Truecolor image (G-component)

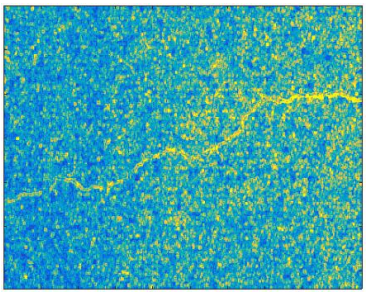

Figure 4: Truecolor image (B-component)

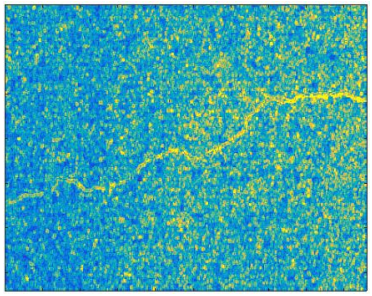

Figure 5: CMYK image (K-component)

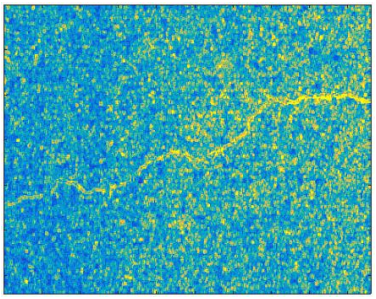

Figure 6: Intensity image

From gathered results, it is well understood that there have a possibility to extract crack feature using image type other than intensity image. In our case, for HSV image, it failed to show any feature related to crack. While for CMYK image, only key component can show the crack feature. For other CMYK image component, some features can be observed, but it is not related to crack. While for truecolor image, all components capable to show the crack feature.

## 4.0 CONCLUSION

In this paper, the testing on the sample image using different image type to extract crack feature is conducted. Based on the results, a conclusion has been made that other image type has a possibility to extract the feature related to crack besides using intensity image. In our work, each truecolor image components, as well as key component of CMYK image, are capable to extract this feature. It can be said that these image type can be used as a basis in extracting the detail feature related to crack.

## 5.0 REFERENCES

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