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Implementation of KNN Methods And GLCM Extraction For Classification Of Road Damage Level

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Abstract

Road damage that occurs on several road surfaces causes huge losses, especially for road users such as travel time, congestion, accidents and others , so it is necessary to assess the level of road damage. At this time, problems in determining the level of road damage such as detecting cracks, potholes, calculating the width of cracks, the percentage of cracks and generating the level of road damage are still carried out by slow manual calculations using the Surface method. Distress Index (SDI). In this study, the KNN and GLCM methods will be used to detect road damage. Based on the results of the tests carried out, the accuracy of the results of disease detection with the KNN method and GLCM extraction depends on the number of datasets contained in the system. The process of measuring the level of road damage to get the results of the level of damage to the road can be done quickly, namely by entering a road damage image into the application.

Keywords: digital image, KNN method, GLCM, road damage

1. Introduction

Roads are land transportation infrastructure which includes all parts of the road, including complementary buildings and equipment intended for traffic, which are on the ground surface, above the ground surface, below the ground and/or water surface, and above the water surface, except for roads. trains, lorries and cableways. The availability of good roads will provide services to vehicles that transport essential goods and can pass quickly, safely and comfortably to their destination. In addition to the construction of new roads, supervision and maintenance of existing roads must be carried out continuously so as not to experience damage before the calculated design life is reached [1],[2]. Road damage that occurs on several road surfaces causes huge losses, especially for road users such as travel time, congestion, accidents and others , so it is necessary to assess the level of road damage [1],[3]. At this time, problems in determining the level of road damage such as detecting cracks, potholes, calculating the width of cracks, the percentage of cracks and generating the level of road damage are still carried out by slow manual calculations using the Surface method. Distress Index (SDI). Surface The Distress Index (SDI) is the Bina Marga method used to calculate the Surface . value Distress Index (SDI), where the parameters needed are the total area of the crack, the width of the crack, and the number of holes [4],[5].

Digital image processing can be used to apply types of road damage levels in the form of applications so that existing image processing can be carried out to obtain the expected

information [6],[7]. Digital images on roads that will be carried out by the Image Processing process often get similar colors between the color of the road, the color of the cracks on the road, and the color of the holes on the road [8]. The interference obtained is in the form of the color results of the combined image so it is difficult to calculate the pixel value on the image. For this, it is necessary to carry out an image improvement process for object recognition and object classification.

In various reference reviews conducted to determine the level of road damage [4] by comparing 2 algorithms against the texture features of the Gray Level Co - occurrence Matrix (GLCM), namely Wrapper and Correlation. Based Features Selection (CFS). Accuracy and MAP generated from Wrapper method with d = 1 which are 55.61% and 0.710 respectively [4]. In another study [9] by comparing the algorithm to the texture features of Gray Level Co - occurrence Matrix (GLCM) and Threshold-based marking , the test shows that the accuracy of the road damage system is 91.67% with a processing time of 0.08% seconds for each frame carried out.

Gray Level Co - occurrence Matrix (GLCM) is one of the methods used to extract texture features in the image [10]. The angle formed from the pixel value texture feature extraction image Gray Level Co - occurrence Matrix (GLCM) is 0 o , 45 o , 90 o , 135 o . Based on research [11] that applied Gray Level Co - occurrence Matrix (GLCM) feature extraction and Neural Network method for road cracking detection can be applied properly. The use of 4 directions in the Gray Level Co - occurrence Matrix (GLCM), namely 0 o , 45 o , 90 o and 135 o greatly affects the accuracy and value of ASM, Contrast, IDM, Entropy and Correlation if averaged, the accuracy results will differ from the feature extraction value. whole. Gray Level Co - occurrence Matrix (GLCM) feature extraction and neural network methods can be used in the road evaluation system. Subsequent developments used different feature extraction to increase the accuracy to be achieved in this study [12].

Based on the description above, the authors are interested in applying the KNN and GLCM methods to measure the level of road damage by taking a thesis entitled" Implementation Of The Knn Method And Glcm Extraction For Classification Of Road Damage Level "

2. Theoretical basis

2.1 Image

Image is a picture or resemblance of an object [13]. The image has characteristics that are not owned by text data, namely the image is rich with information. There is a proverb that says "a picture means more than a thousand words" (a picture is more than a thousand words) [14]. The point is of course an image can provide more information than the information presented in the form of words. Viewed from a mathematical point of view, the image is a continuous function (continuous) of the light intensity in the two-dimensional plane. The light source illuminates the object, the object reflects back some of the light beam. This light reflection is captured by optical devices, such as the human eye, camera, scanner , and so on, so that the image of the object called the image is recorded. Image is divided into 2 types, namely analog image and digital image [13].

2.2 Method Gray Level Co - occurrence Matrix (GLCM)

Gray Level Co - occurrence Matrix (GLCM) is a method used for texture analysis/feature extraction. GLCM is a matrix that describes the frequency of occurrence of pairs of two pixels with a certain intensity in a certain distance and direction in the image [15],[16].

2.3 K-Means Metode Method Clustering

The K - Means algorithm is an iterative clustering algorithm that partitions the data set into a number of K clusters that have been set at the beginning. The K - means algorithm is simple to implement and run, relatively fast, adaptable, and commonly used in practice. Historically, K - means has been one of the most important algorithms in data mining. K - Means algorithm is the best algorithm in Partitional algorithm Clustering and the most frequently used among other Clustering algorithms, because of its simplicity and efficiency [17],[18].

2.4 K- Nearest Neighbor (KNN)

K- Nearest Neighbor is an approach to finding cases by calculating the proximity between the new case and the old case, i.e. [19] each new instance can be classified by a majority vote of k neighbors, where k is a positive integer, and usually by the number of small. K- Nearest Neighbor is an instance classification method based, selects a training object that has the closest neighborhood properties. Neighborhood properties are obtained from the calculation of the similarity or dissimilarity values. KNN will choose the K-nearest neighbors to determine the classification results by looking at the number of occurrences of the class in the selected K-neighbors [20]. The class that appears the most will be the class resulting from the classification.

3. Research Methods

Functional requirements analysis is a description of the information which is the core specification of the things that can be done by the system. Functional requirements analysis is implemented using use case as follows:

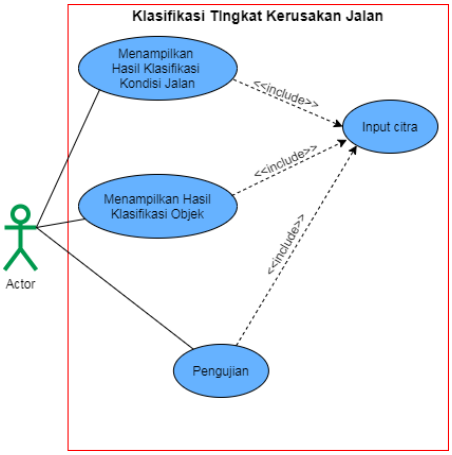

Figure 1. Use Case Measurement of Road Damage Level

4. Research Results

When implementing the KNN Method and GLCM Extraction for the first time, the form that will appear first is the 'Main' form , which can be seen in Figure 2 below:

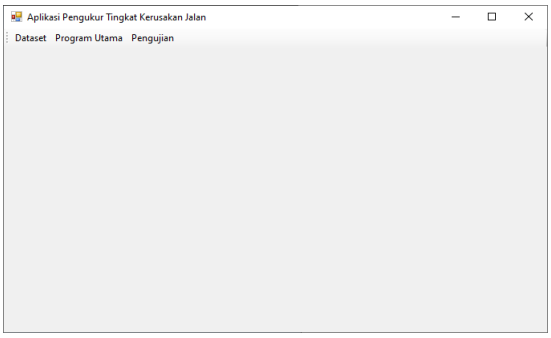

Figure 2. Display of the Main Form

To carry out the process of adding a dataset to the road damage detection system, the user can click the Training menu so that the system will display a form Training as shown in Figure 3.

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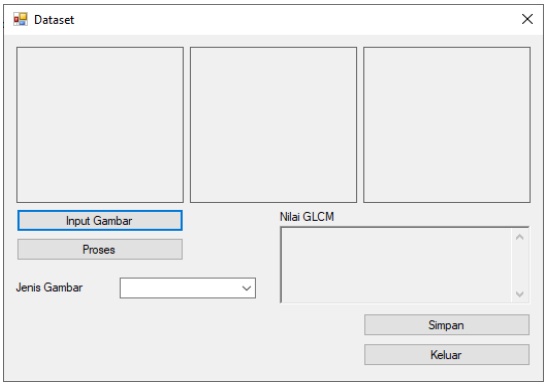

Figure 3. Display Form Dataset

To add a new dataset , the user can enter image type data. After that, the user can select the input image to be added for the relevant dataset by clicking the ' Input Image' button so that the system will display a browse dialog box as shown in Figure 4.

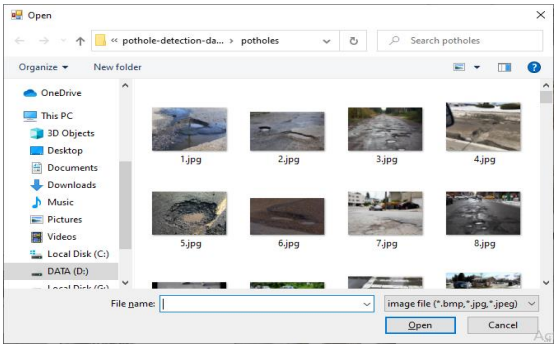

Figure 4. Folder Browse Dialog Open

The user can select the desired file and click the Open button to open the selected file . After that, click the Open button so that the form displays Training as shown in Figure 5.

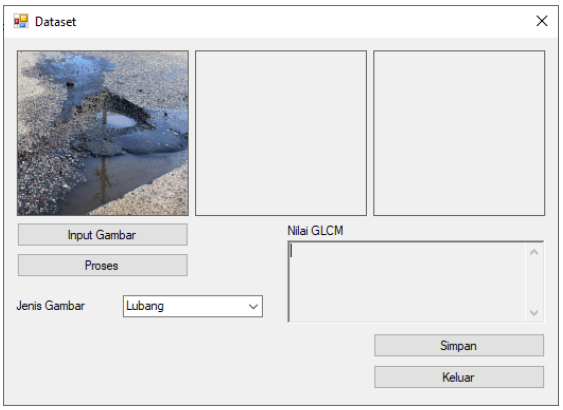

Figure 5. Display Form Dataset After Data Selection

After entering all the desired data, the user can click the Process button to carry out the training process . The results of the training process can be seen in Figure 6.

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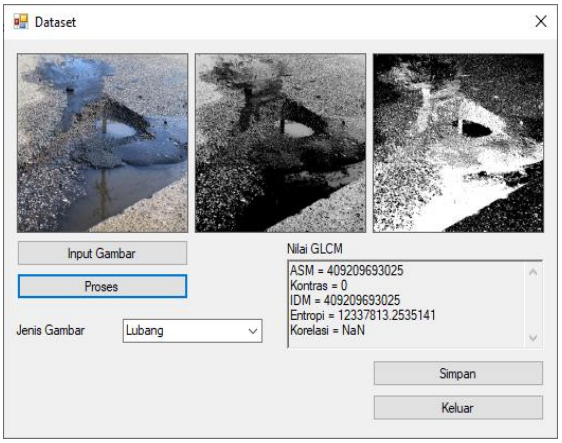

Figure 6. Display Form Dataset After Process

Click the Save button to save the data entered into the database . After that, the user can identify road damage. The trick is to click on the Main Program menu so that the system will display the Identification form as shown in Figure 7.

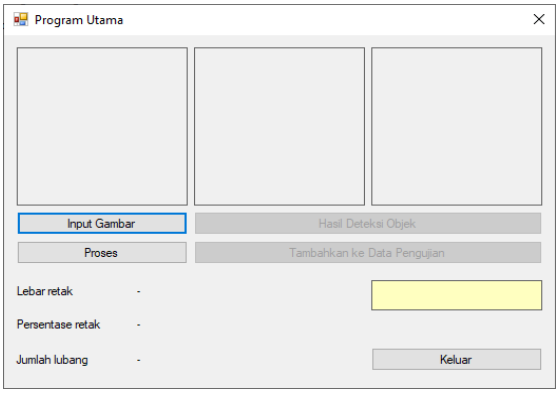

Figure 7. Main Program Form Display

The user can select the image file to be recognized by clicking the Browse button . After that, the user can click the Process button to start the identification process so that the identification form will look like Figure 8.

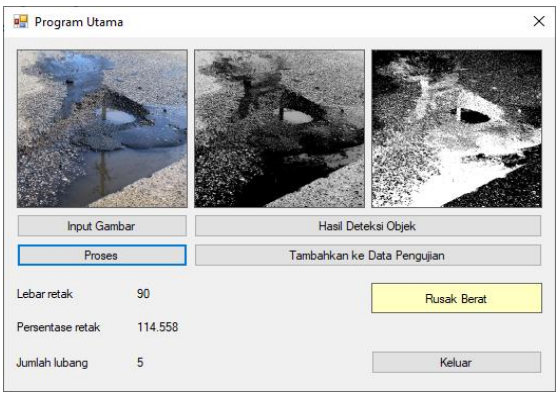

Figure 8. Display of the Main Program Process Form

Finally, the user can perform the test by clicking the Add to Test Data button so that the system will display the Testing form as shown in the following figure:

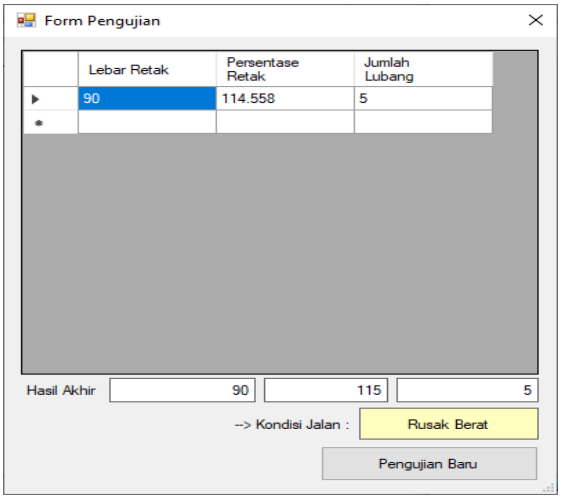

Figure 9. Display of the Test Form

5. Conclusion

From the discussion in the previous chapters, finally the research in this final project can be drawn with several conclusions, among others.

1. The DCCNN method can be used for KNN and GLCM extraction to carry out the process of classifying the level of road damage by taking into account the width of the crack, the percentage of cracks and the number of holes in the road image.
2. The accuracy of the results of disease detection using the KNN method and GLCM extraction depends on the number of datasets contained in the system.
3. The process of measuring the level of road damage to get the results of the level of damage to the road can be done quickly, namely by entering a road damage image into the application.

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