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Detection Model for Numbers on Recording Water Meter with Neural Networks and Backpropagation Algorithm

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Abstract

Water meter reader is very important to monitoring continuously the water consumption. The data processing can be ease with the digital image processing application system. The Digital Image Processing system constructed by using the Artificial Neural Network method and Back propagation training algorithm, it can recognize and analyse water meter recorder image. Artificial Neural Network method was developed in various ways in order to recognize the patterns that inserted into the network so if the picture numbers that shown on the meter of water was taken, then with Artificial Neural Network method the images can be instantly recognizable as an input as the data.

This application development goal is to design and implement a system that can recognize digital image and can detect the numbers on the water meter recorder. This application is built specifically for mobile, adjusted to users who are mostly located in the field.

The study was conducted using Artificial Neural Network method by applying back propagation training algorithm. The methods used for detecting the image number of water meter is Artificial Neural Networks with Back propagation Algorithm.

The first steps of data processing is take the images of the water meter recorder then send it to the server, then the images processed in research. The research phases starting from preprocessing. The preprocessing include cropping, process from rgb to grayscale and grayscale become biner. After the preprocessing of the image is completed then the image's character are segmented. The next results of segmentation trained and ditesting. After all the data has been completed testing, then the results of the study are presented.

The implementation system training to prepared the data used in the process of image recognition numbers. After preprocessing finished the data will be trained with artificial Neural Network to take on the characteristics of each image that will be used to form the network model. The data must be recognize the target number in the output training obtained. Then the data simulated with the same data input by the input training data. The training data processing must be recognize the target number in the output obtained, that then simulated with the same data input by the input training data. The training results above can be seen from the 1000 epoch that has been determined, epoch of data to achieve results on the 6th. Performance exceeded the epoch to-6 with values mse 0001 to get the achievement. When the training process is completed then the next step is doing testing water meter image recording devices. Testing data is also through the preprocessing phase. At the time of testing, the data that will used is data image testing and image data that is already in training. This is done to determine the level of accuracy of the testing on the image taken. The next testing process, the image data must go through a preprocessing phase. Testing processing are; preprocessing, cropping, process rgb to grayscale and grayscale to binary.

Binerisasi steps is the final steps before the data intraining. The image is converted to black and white images to simplify the detection process at a later steps numbers. In the segmentation process, the images characters will be separate. Characters that not been identified because many faktor, among other weights range between characters narrow one another. Additionally almost all forms of characters that have great about the same so that the system is less able to recognize the character correctly.

To make it easier to run a system that is already built, as well as to know the results of the training and testing on artificial neural networks backpropagation, then used the GUI to test it. GUI design of the numbers on the image detection system water meter recorder designed using Matlab.

The level of suitability and accuracy of recognition results depending on the variation of the parameters used in the learning process. From the test results, obtained the best parameter variations of backpropagation. Image recognition numbers on the water meter recorder with backpropagation artificial neural network method. The best accuracy rate of 92% of the number of training trials 15x with size of 25x25 pixel image. From the test results, obtained by artificial neural network method most appropriate for image recognition numbers in terms of accuracy and time.

Keywords: Water Meter Reader; Image processing; Backpropagation; Matlab
