

Abstract

Recognition of handwritten mathematical expression is a difficult problem in the pattern recognition field rather than basic handwriting recognition. Complexity of structure and large amount of symbols that make handwritten mathematical expression is difficult to be done by making process like segmentation symbols, recognition symbols, and structure analysis. Those processes are used for converting handwritten mathematical expression to be a digital text format like LaTeX. That three processes are depending each other to produce accurate digital text. One of them is symbols recognition. Result from symbol recognition is used for analyzing the structure and used by segmentation methods aim to segmenting symbols in handwritten mathematical expression, such as the stroke grouping method. Hence, be required a method which capable to recognize symbol accurately.

Convolutional Neural Network is a method which can be used for recognizing handwriting recognition accurately. In cases of handwriting recognition, CNN able to recognize almost all symbols. Hence, in this research, CNN will be used to recognizing symbols of mathematical expression and will be tested using Stroke Grouping as segmentation method and Baseline Structure Analysis as structure analysis method.

Testing which has been done, proving that CNN better in the case of mathematical symbol recognition than other methods, such as ANN, BLSTM-RNN, and SVM, with accuracy 87,72%. Yet CNN doesn't give significant results for mathematical expression's accuracy, due to segmentation's accuracy only 75,75%, symbols recognition accuracy which used testing data from the segmentation's result, only 65,19%, and expression recognition which is the result of structure analysis only 13,37%.

Keywords: *mathematical expression recognition, computer vision, convolutional neural network, stroke grouping, baseline structure analysis*