

KNN AND CNN BASED ANALYSIS ON DETECTION OF FAKE CURRENCY ANALYSIS

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Abstract

Nowadays, the prevalence of counterfeit money has grown dramatically, which has prompted researchers to look into digital imaging methods for detecting genuine currency or counterfeit cash. One of the qualities of printers whose ink is extremely good and can print money like the original makes the layperson more apprehensive of money ownership because of the technological sophistication of the printer. KNN (K-Nearest Neighbor) and CNN were used in this study to verify the currency's legitimacy (Convolutional Neural Network). The KNN algorithm has an accuracy rate of 87,75 percent. While CNN uses a detection accuracy of 96,67%. Pre-production on the set and the image utilised can help improve the results of these two procedures, as can sophisticated study. The same exposure level, image capture angle, and image size are used in the data set.

1. INTRODUCTION

Every country is grappling with the issue of counterfeit currency. Counterfeit money became more prevalent in the country due to technological advancements. As counterfeit money has become increasingly prevalent, the Bank of Indonesia has created new banknotes that make it easier to tell the difference between real and fake currency. The Bank of Indonesia provides a wide range of features, such as different paper sizes, different colours, and distinct designs, in order to differentiate legitimate currency. With these distinctions, it is believed that the community will be able to verify the money on their own. It is possible to perform manual procedures by performing three actions, namely seeing and touching. This procedure, on the other hand, isn't regarded efficient when dealing with large sums of money because cash transactions typically move quickly, whereas manual verification takes a long time [1]. Researchers have devised an algorithm that uses image processing as the core of a counterfeit money detecting system in order to solve these issues. This system's algorithm is expected to tackle the problem of counterfeit currency identification and be applicable to large financial transactions.

The researchers have taken use of this occasion to gather a wide range of relevant information. A textbook on digital image processing and programming [2] serves as an illustration for how to inspect a picture with the object of what has been reviewed from the texture of the items to be observed. An average of 74% accuracy may be achieved by using the contrast of colours to measure texture. Ginting [3] used a canny approach to discern between genuine and counterfeit money. Experiments indicate that the programme correctly recognises the watermark, whereas images of counterfeit banknotes and a clone of the application fail to do so successfully. Method KNN (K-Nearest Neighbor) and CNN were used in this investigation to detect the legitimacy of the money (Convolutional Neural Network).

In the KNN method (K-Nearest Neighbor) employing the colour feature on the introduction of banknotes' values, identification is made. Using colour to describe an object is an effective way to convey information and values about that object [4]. Red, green, and blue are the primary hues (RGB). The method of classifying the value of banknotes by employing the K-Nearest Neighbor (KNN) method of feature extraction and the extracted value of the RGB colour space is used to detect the value of banknotes. The Nave Bayes method [5] is one of several classification methods that utilises the probability or conditional probability. According to Suyanto,

instead of calculating distance to the nearest classification, the KNN approach calculates the distance to the nearest classification.

2. A BRIEF ON RELATED THEORIES

2.1. KNN (K-Nearest Neighbor) method

For the research using the KNN (K-Nearest Neighbor) method can be seen in figure 1:

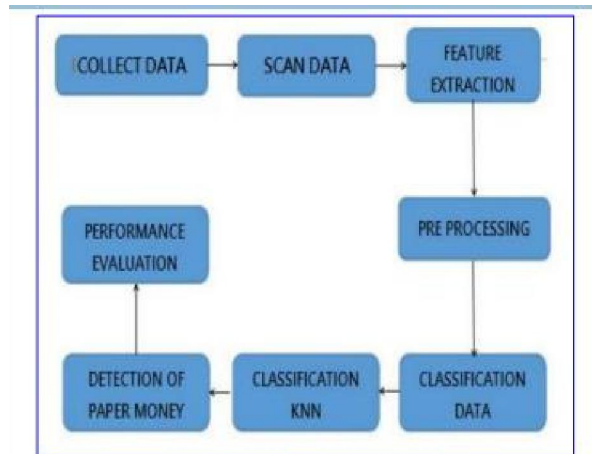


Figure 1.Process KNN method.

2.1.1. Data collection.

In this study, we used data from new and old banknotes in the amounts of IDR 2000 and IDR 2000, respectively. We also used data from new and old banknotes in the amounts of IDR 5000 and IDR 5000, respectively. Initially, the grade of a banknote is determined by its age or how frequently it is transferred from one person's wallet to another, and the number of each banknote is ten.

2.1.2. Scan data.

In order to capture the banknotes in their RGB colour, a stage scan is carried out. Make banknote authenticity and colour more visible by scanning with a scanner tool. Banknotes have two sides, the face and the back, thus scan against banknotes with two different sides. Three repetitions of the same action. Each stage of the scan is repeated three times to see if the results are different each time.

Feature extraction.

An image can only be deduced from its features. The method of feature extraction employed in order to obtain the RGB colour image (Red-Green-Blue). Graphic design apps that use RGB to retrieve colour information.

Preprocessing

The value of each red, green, and blue feature on a banknote is determined by the results of feature extraction. As a result, the data was cleaned by comparing it to the same data, and then processing it with the same class's draw patterns and distanced class patterns, allowing the patterns to be organised neatly and separately from one another.

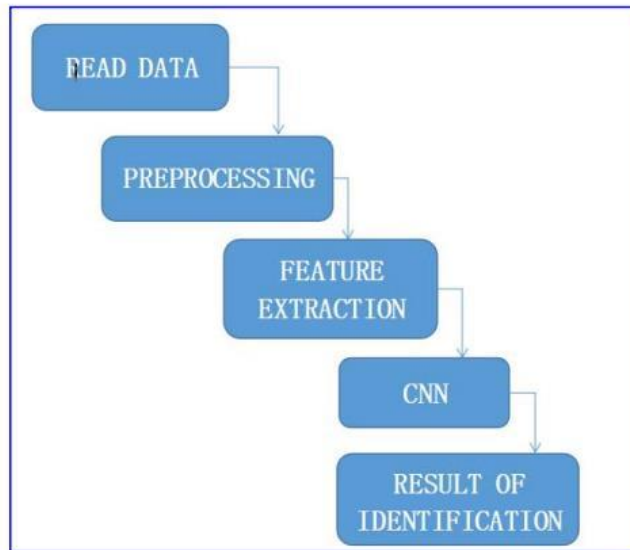


Figure 2.Process CNN method.

Authenticity banknotes were identified by converting colour images to grayscale and then extracting elements from the new image to serve as a reference in the detection of whether or not the genuine banknotes. To identify the surface texture of banknotes using the binary pattern, idr.50,000 and idr. 100,000 are the objects that are employed.

3. RESULTS AND DISCUSSION



Figure 3. Result of scan banknotes

Uang	R	G	B	Uang	R	G	B
	179	170	162		195	172	147
	172	164	156		184	154	129
	187	167	144		158	151	134
	187	168	147		144	142	130

Figure 4. Result of feature extraction.

Table 1. Scanned with the repetition of three times the same values that carried out a purge of the same value

Banknotes 5000 old money									
Money	Scan Data 1			Scan Data 2			Scan Data 3		
	R	G	B	R	G	B	R	G	B
Money 1 back	187	167	144	188	167	145			
Money 1 front	187	168	147	188	169	147			
Money 2 back	167	144	125	168	145	126			
Money 2 front	168	145	124	168	145	125	168	146	125
Money 3 back	171	152	133	172	152	133	172	152	134
Money 3 front	174	154	135	174	155	136	175	155	136
Money 4 back	185	163	142	186	163	142			
Money 4 front	185	163	141	184	163	140	185	163	141
Money 5 back	195	172	147						
Money 5 front	195	177	153	195	177	152			
Money 6 back	163	139	119				164	140	119
Money 6 front	165	143	122						
Money 7 back	193	171	148	195	172	148	194	171	148
Money 7 front	192	173	151	193	174	151	192	173	150
Money 8 back	171	148	129	170	148	128	172	149	129
Money 8 front	170	148	128	169	147	128	170	147	128
Money 9 back	186	166	145	188	167	146	187	166	145
Money 9 front	186	165	145	188	166	146	187	165	145
Money 10 back	192	172	150				193	173	150
Money 10 front	190	173	151	190	173	152			



Figure 5. Data money.

Concluding remarks

Results of experiments with KNN (Kindest Neighbor) and CNN (Closest Neighbor (Convolutional Neural Network)). The KNN algorithm yields an 87.75% success rate. While CNN's detection accuracy is 96,67%.. The pixel size and starting point of the image capture are important considerations for both systems.

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