Literature Review

1. 2017 - Banknotes detected using Image Processing Techniques

* Researcher: H.Masoumi and N.Panah
* Tool: MATLAB
* Methodology: In this paper, an automatic system is proposed. This system consists of two steps. First, the banknote image in the input will be read by the RGB color model. Then, applying image processing techniques, they get a numerical model that is between 1 and 10. Second, the input banknote image is in black and white models. Then by applying some image processing techniques on the banknote image, the value of money will be determined.
* Scope: Iranian banknotes
* The Result: During this process, they managed to eliminate some of the photo noise of input banknotes. It should be noted that the proposed algorithm is very flexible and by working on it much more noise can be removed from the input photo.

1. 2012 - Paper Currency Verification System Based on Characteristic Extraction Using Image Processing

* Researcher: Rubeena Mirza and Vinti Nanda
* Tool: LBP tool and MATLAB
* Methodology: The approach consists of a number of components including image processing, edge detection, image segmentation, characteristic extraction, comparing images. The image processing approach is discussed with MATLAB to detect the features of paper currency.
* Scope: Indian Paper Currency
* The Result: Approach suggested from the beginning of image acquisition to converting it to grayscale image and up to the word segmentation has been stated. The work will surely very useful for minimizing the counterfeit currency.

1. 2017 - Currency recognition system using image processing

* Researcher: Veda Samhita Abburu, Saumya Gupta, S. R. Rimitha, Manjunath Mulimani, and Shashidhar G. Koolagudi
* Tool: Unknown
* Methodology: This method works by first identifying the country of origin using certain predefined areas of interest, and then extracting the denomination value using characteristics such as size, color, or text on the note, depending on how much the notes within the same country differ.
* Scope: 20 banknotes in each country consist of Australian Dollars, Canadian Dollars, Chinese Renminbi, American Dollars, Danish Krone, Euro, Hong Kong Dollar, Indian Rupee, Indonesian Rupiah, Kuwaiti Dinar, Mexican Peso, Norwegian Kroner, New Zealand Dollar, Philippine Peso, Japanese Yen, Russian Rubles, Saudi Riyal, Singapore Dollar, Swiss Franc, and UAE Dirhams
* The Result: They have found that our system is able to accurately recognize most of the countries and denominations correctly (93.3% accuracy, where accuracy is defined as the number of notes correctly identified divided by the total number of notes tested).

1. 2015 - A High-Performance Banknote Recognition System Based on a One-Dimensional Visible Light Line Sensor

* Researcher: Young Ho Park, Seung Yong Kwon, Tuyen Danh Pham, Kang Ryoung Park, Dae Sik Jeong, and Sungsoo Yoon
* Tool: semidefinite programming
* Methodology: An algorithm for recognizing banknotes is required in many fields, such as banknote-counting machines and automatic teller machines (ATM). Due to the size and cost limitations of banknote-counting machines and ATMs, the banknote image is usually captured by a one-dimensional (line) sensor instead of a conventional two-dimensional (area) sensor. Therefore, they propose in this paper a novel method for pre-classifying banknotes’ direction for implementation in banknote recognition systems.
* Scope: United State dollar
* The Result: This report showed that the error rate for the proposed pre-classification method was lower than that of other methods. In addition, the banknote-recognition error rate after pre-classifying the banknote’s direction was as low as 0.114%. However, incorrect recognition occurred when part of the banknote was damaged or when contaminants were present in the upper or lower region of the banknote.

1. 2018 - Decision tree model for classification of fake and genuine banknotes using SPSS

* Researcher: Akanksha Upadhyaya, Vinod Shokeen, and Garima Srivastava
* Tool: The decision tree model is built using IBM SPSS tool.
* Methodology: This paper proposes an effective predictive model based on a machine learning technique for authentication of banknotes, which can predict with good accuracy that whether the given banknote is fake or genuine.
* Scope: Dutch, German, English, and US counterfeit banknotes.
* The Result: The model shows 91% of accuracy. This model can be used for the classification of fake and genuine currency of different countries. The work can be extended by comparing this model with other predictive models for the calculated values of different currencies notes in terms of four independent variables mentioned in the paper.

1. 2017 - Banknotes Recognition in Real Time Using ANN

* A thesis submitted to School of Engineering, Computer and Mathematical Sciences, Auckland University of Technology by Yueqiu Ren.
* Researcher: Yueqiu Ren
* Tools: MATLAB
* Methodology: BPMN Classifiers and other ANN classifiers
* Scope: New Zealand banknotes including 5 NZD, 10 NZD, 20 NZD, 50 NZD, and 100 NZD
* Result: As the recognition results of 500 test images, with 100 test images for each class, the average F-measure of every combination is beyond 0.88 when using the banknote images captured by webcam for training, while not all the combinations can achieve this when using the scanned banknote images for training.

1. 2016 - IMAGE PROCESSING BASED FEATURE EXTRACTION OF CURRENCY NOTES

Image Processing Based Feature Extraction of Currency Notes

* By International Research Journal of Engineering and Technology (IRJET)
* Researcher: MOHAMMAD ARIF
* Tools: MATLAB
* Methodology: Direction (front, rotated front, back, and rotated back) and face value, neural network based bill recognition and verification method, the learning vector quantization (LVQ) method
* Scope: Numerous Indian Currency notes of value 100
* Result: Approaches suggested from the beginning of scanning a document to converting it to binary image, thresholding, morphological filtering and word segmentation has been successfully stated In our current approach, the whole character itself was used as a feature. Selection of feature extraction method is the single most important factor in achieving high recognition performance.

1. 2019 - Perfecting Counterfeit Banknote Detection - A Classification Strategy

* By International Journal of Innovative Technology and Exploring Engineering (IJITEE)
* Researcher: Malladi Tejasvi, A.Nayeemulla Khan, A.Shahina
* Tools: Machine Learning
* Methodology: detect portraits in the banknotes using CNN.
* Scope: 1372 greyscale bank note images each of size 400x400 pixels,
* Result: Perfect classification (100%) was achieved using ANN, SVM and KNN. The logistic regression followed by decision tree and simple perceptron have also performed well by detecting fake notes at 99.27%, 98.91% and 98.91% respectively.

1. 2018 - Exploratory analysis for the identification of false banknotes using portable X-ray Fluorescence spectrometer

* Researcher: M.A. Zamalloa Jaraa, C. Luízar Obregónb, C. Araujo Del Castilloa
* Tools: portable X-ray Fluorescence spectrometer
* Methodology: detect portraits in the banknotes using CNN.
* Scope: the 200 Nuevos Soles banknotes
* Result: The results from the semi quantitative elemental analysis, using pXRF, show that the chemical composition of the ink used in the false banknotes is different to that of the original ones.

1. 2018 - Analysis of Banknote Authentication System using Machine Learning Techniques

* By International Journal of Computer Applications
* Researchers: Sumeet Shahani, Aysha Jagiasi, Priya R. L.
* Tools: Machine Learning
* Methodology: two supervised learning techniques
* Result: The results of training and test data do not show much difference except for sensitivity of SVM. The training sensitivity of SVM is 98.68% and the test sensitivity is 98.69%. BPN gives 100% detection rate and SVM gives 98.90% success rate.The result shows that back-propagation neural network outperforms support vector machine and gives 100% success rate.

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