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Identify the Counterfeit Bank Notes using
Support Vector Machine

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Abstract

With the advance of digital imaging technologies, color scanners and laser printers make it increasingly easier to produce counterfeit banknotes with high resolution. The proliferation of counterfeit banknotes in circulation leads to profit loss of traders and banks. Therefore, finding an efficient method to detect counterfeit banknotes is an imperative and demanding task for business transactions in our daily life. In this research, we propose a system based on support vector machines to identify Sudanese fifty pound notes counterfeit. A support vector machine (SVM) to minimize false rates is developed. Each banknote is divided into partitions and the luminance histograms of the partitions are taken as the input of the system using Principal Component Analysis and Optical Character Recognition. The system test based on multiple kernel support vector machine which Sudanese fifty pound counterfeit notes are identified by passing different number of features to which recognize the counterfeit with a percentage of 100%, the recommendation are use of greater number of Bank notes including both false and correct ones, usage of larger processors, memory and strong to improve the process of counterfeit bank notes recognition, the use of high resolution scanners integration of the program with this scanner and money counting machines.

المستخلص

مع تقدم تقنيات التصوير الرقمي والمساحات الضوئية وطابعات الليزر الملونة تجعل من السهل على نحو متزايد انتاج الاوراق المزورة ، إنتشار الاوراق النقدية المزوية في التداول يؤدي إلى فقدان الربح من التجار والبنوك. لذلك لا بد من ايجاد وسيلة فعالة للكشف عن الاوراق النقدية المزورة وهي مهمة ملحة في المعاملات التجارية في حياتنا اليومية. في هذه الدراسة اقترحنا نظام يعتمد على (Support vector machine) للتعرف على تزيف العملة السودانية فئة الخمسين جنية التي تعمل على تقليل معدل الخطأ. يتم تقسيم الاوراق النقدية الي وتؤخذ كمدخلات للنظام باستخدام تحليل المكون الرئيسي والتعرف الضوئي على الحرف. تم التعرف على تزيف بتمرير عدد مختلف من الخصائص كمدخلات للنظام ومقارنتها حتى تم التوصل إلى نسبة تعرف ١٠٠%. ويوصى في هذه الدراسة استخدام معالجات ضخمة وسعات تخزينية كبيرة واستخدام مساحات ضوئية ذات دقة عالية وربطها بماكينة عد النقود.



1.1 Introduction

Identification documents and official papers are highly protected by authorities and law in a different societies, because of its importance in a lives of all members of the community and authorities alike, as it includes most of the times a data or information with an implications and legal obligations. This requires that the criminal protection legislation to define the different forms of behavior to be criminalized and adequate the suitable punishment for this offense.

Since the beginning of human process in mutual benefit with others in day to day activities, the need of exchange tool became necessary. It start from bartering to cattle, cowrie shells, first metal money and coins, modern coinage, leather money, and paper money in 1455 in China [<http://www.pbs.org/wgbh/nova/ancient/history-money.html>].

In recent years counterfeiting of paper money has become one of the most serious crimes, and it has the global nature due to easy telecommunication and transportation methods available all over the world, and also due to so many types of economical relations between different countries. The important issue in counterfeiting paper money is that the counterfeiting can be done in one country and the money can be circulated in other countries, this point leads to Geneva Act 1929, which insure the protection of international paper money must be similar to the protection of national paper money [Prevention of Counterfeiting of Currency Act 16 of 1965].

There are several methods for detecting counterfeit paper money used. The general idea is to use two different sets of images data and then a third set will be tested to see to which group it belong.

1.2 Problem Statement

The research problem is to study the counterfeiting of paper money in Sudan(Sudanese fifty bound) which can be done by using computers and related accessories and the ways in which we can contribute to reduce the spread of counterfeiting in Sudan, by creating and adopting a new computerized system that can minimize the defects which are in internationally used systems.

1.3 Research Objectives

The main goal of this research is to highlight on paper money security features to avoid falling into the trap of counterfeiters. The counterfeiting itself is just a process of penetration of these security features. The objectives of this research details are:

1. To build a model that is applicable for detecting Sudanese paper money, which can be available at any place with very low cost, to contribute in reducing the risk of circulating counterfeit money in the economy
2. To build a new dataset for Sudanese counterfeiting paper money, this will help in researches in this area.
3. To clarify the support vector machines classifier used in detecting counterfeit paper money.

1.5 Research Methodology

The approach followed by the researcher is the historical method and the analytical descriptive method, by referring to the references and relevant research and the help of persons working in institutions relevant to the counterfeiting of paper money (banks - financial institutions – Sudanese currency press - the security services - General Administration of Forensic Evidence - computer technicians).

Our research methodology is based on four steps, which are briefly described below:

1. Identifying genuine Sudanese paper money security features.
2. Obtaining counterfeited Sudanese paper money.
3. Building model for identifying genuine and counterfeited Sudanese fifty pound using support vector machines algorithm.
4. Testing the accuracy of the model for identifying genuine and counterfeited Sudanese fifty pound.

1.6 Research structure

This research consist of five chapters chapter two Basic Structure of Pattern recognition systems, pattern recognition methods , characteristics of money and money ,counterfeiting method,chapter three basics of SVMs and multiclass SVM ,advantages and disadvantages of svm ,chapter four introduction, dataset , svm Multiclassification steps ,result ,chapter five, conclusion, recommendations ,and future woks.