Counterfeit Bank Note Detecting System

Dr. K. Umapathy, V. Sai Swaroop, P. Viswam, T. Bala Swami Sairaja

Abstract: In our day to day life internet has become a part of our time. People easily can access and accomplish their tasks using the internet. Using the concept of Internet Of Things, we can control and monitor our activities and we can able to take necessary actions if we needed. This paper clearly explains about the counterfeit bank currency detection system which provides the accurate difference between true and fake notes. This system is easily accessible and economical friendly.

Index Terms: Enlightened, Raspberry pi, Small vendor's application, Smart-programmed, Internet of things

1 INTRODUCTION

Nowadays Banking sector has experienced a major issue on 'Counterfeit Notes', which gives loss to the particular economy of the country. With minimum human work Internet of Things become more smart day by day with the help of smart systems and smart programs, digital systems completely boosted up the usage internet for people's activities through which we can be easily accessed to a scheduled activity. Continuous scanning of the matrix of an image i.e. a note or paper and feeding is pictorial properties is called "Image Detection". In Image detection, Internet of things collect the data of the scanned note and compares it with a pre-programed data. If, the matching is above the prescribed percentage the bank note is original. Else, the note is counterfeit. Hence, a counterfeit bank note can be detected

2 LITERATURE SURVEY

This paper [1] signifies the color recognition of a note using matrix properties of an image. This paper [2] briefly explains about image black and white comparison and image pigment comparison also, describes about the resolution of the scanned images. It uses advanced techniques like camera, detection streams etc. and also real-time comparing technology. Observing the real images comparing to saved one explores the changes in pigment, orientation of pixels etc. Here image processing technology we are about to compare the picture in 3 modes including negative mode, sepia mode. Scanning also depends on the pixels of recognizing camera. "Feature point extraction algorithm" from matlab mathworks which helps in maximum resolution detection, i.e. in matlab the matrix formation and processing speed is very high, here the image is reversed and compared in inversion mode. Hardware support package in matlab describes the package installation matlab.

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Though the installing in the raspberry pi is complicated, but the processing of tasks and functioning of I/O ports in pi is very speed and accurate. Compared to python matlab have more precision and accurate values of comparison of images

3 PROPOSED WORK

The main function of the system is Raspberry pi; it is acting like detector and also as the controller. The system receives the information from the camera and saves the data in required format (it is completed by coding). The camera is for both detection and also for pixel recognition.

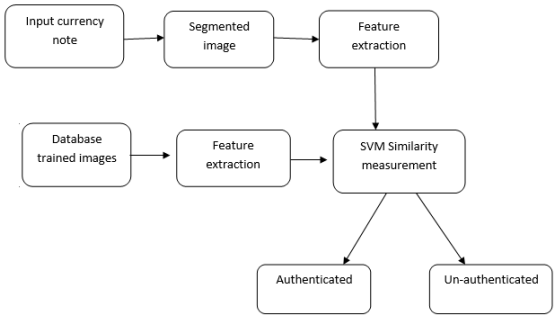

Fig 1. *Proposed System*

When an image is detected through camera module, the recognition, happens and the image is processed for further checking the system checks with the pre-loaded image, if there's a matching between the images as per the prescribed matrices of the image and therefore the note is original, when the processing unit observes any difference between the scanned one and saved one, then the note is a fake one, then an alert is made to a buzzer or LCD screen. So an immediate alert is made that the counterfeit currency is detected at the particular instant

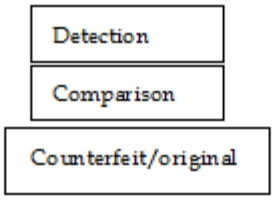

Fig 2. *Structure of Detecting Application*

Raspberry pi is a cheaper debit card sized computer. The Raspberry pi utilizes the architecture of an RISC Machine processor, It is more used in mini computer applications like, detection, controlling and surveillance.

Fig 3. *Raspberry Pi*

Fig 4*. Camera module*

	Pi3 Model B	Pi3 Model B+	Pi4 Model B
Processor	Broadcom BCM2837A1(B0), Quad-core Cortex-A53 64-bit SoC@ 1.2GHz	Broadcom BCM2837B0, Quad-core Cortex-A53 64-bit SoC@ 1.4GHz	Broadcom 2711, Quad-core Cortex-A72 64-bit SoC @ 1.5GHz
Memory	1GB LPDDR2 SDRAM	1GB LPDDR2 SDRAM	1GB, 2GB or 4GB LPDDR4 SDRAM
Connectivity	2.4GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.1, BLE 4 x USB 2.0 ports	2.4GHz / 5.0GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE 4 x USB 2.0 ports, Gigabit Ethernet over USB2.0 (max. 300MPS)	2.4GHz / 5.0GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 5.0, BLE 2 x USB 2.0 / 2 x USB 3.0 ports delivering true Gigabit Ethernet
Access	Extended 40-pin GPIO header	Extended 40-pin GPIO header	Extended 40-pin GPIO header
Video & Sound	1 x full size HDMI, 1 X MIPI DSI display port 1 X MIPI CSI camera port 4 pole stereo output and composite video port	1 x full size HDMI, 1 X MIPI DSI display port 1 X MIPI CSI camera port 4 pole stereo output and composite video port	2 x micro HDMI, 4k video 1 X MIPI DSI display port 1 X MIPI CSI camera port 4 pole stereo output and composite video port
Multimedia	H.264, MPEG-4 decode (1080p30), H.264 encode (1080p30), OpenGL ES 1.1, 2.0 graphics	H.264, MPEG-4 decode (1080p30), H.264 encode (1080p30), OpenGL ES 1.1, 2.0 graphics	H.265 decode (4kp60) H.264 decode (1080p60), H.264 encode (1080p30), OpenGL ES 1.1, 2.0, 3.0 graphics
SD card support	Micro SD format for loading OS & data storage	Micro SD format for loading OS & data storage	Micro SD format for loading OS & data storage
Input Power	5V/2.5A DC via micro USB connector 5V DC via GPIO	5V/2.5A DC via micro USB connector 5V DC via GPIO PoE enabled	5V/3A DC via USB type C connector 5V DC via GPIO PoE enabled

Fig 5. *Raspberry pi versions*

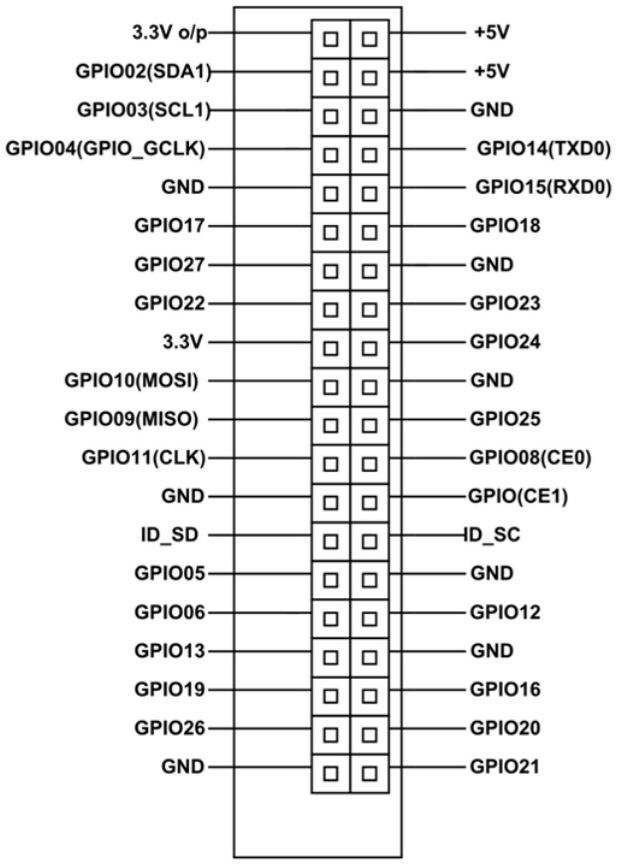

Fig 6*. Pindiagram of raspberry pi*

1. Raspberry Pi 4 with Camera Module.
2. The lens which is Capable of recording 4K, 1080P, 720P, 8MP.
3. Active Pixel Count is 3280 (H) x 2464 (V).
4. Power Supply of 2A is Recommended.
5. Inputs must be designated to proper pins
6. Proper code must be applied for better results
7. Software installation is precise
8. Python/matlab must be installed for proper detection.

Camera specifications		
Power supply	Photo diode I/O	2.5 V +/-0.2 V
	A/D converter Digital	1.5 V +/-0.1 V
Temperature ranges	Storage	-30 to 85 °C
	Operational	-20 to 60 °C
Module size	6x6x4.5 mm (WxDxH)	
Camera mass	0.18 grams	
Lens specifications		
Optical format	1/6 inch	
Total pixel numbers	698(H)x502(V)	
Field of view	Horizontal	57.4 degree
	Vertical	44.5 degree
	Diagonal	69.1 degree
Map resolution h=250 km	Pixel size	344 meters
	Area	240x173 km
Structure	Double lens	

Fig 7.*camera module datasheet*

4 RESULTS AND IMPLEMENTATION

After the detection of note, the Raspberry pi fragments every pixel of the image into binary patterns and many number of matrices, these patterns are more spitted up and divided into pigments, and the image is compared in 3 modes, negative mode, sepia mode, and color detection. The process continues by extracting the image's pixel matrix to LBP result (local binary pattern) and then finally compared with the saved one.

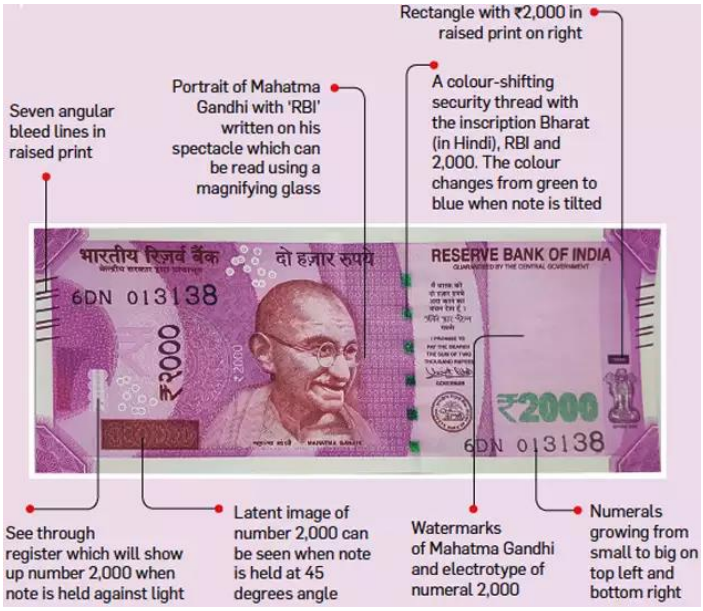

Fig 10. *Attributes for a bank note*

Fig.10 gives the Attributes of a specific note and shows small identifications in a bank note . Fig.11 shows the module of the espective bank note and the Fig.12 shows the matlab processing of the bank note.

Fig11. *Bank Note marks*

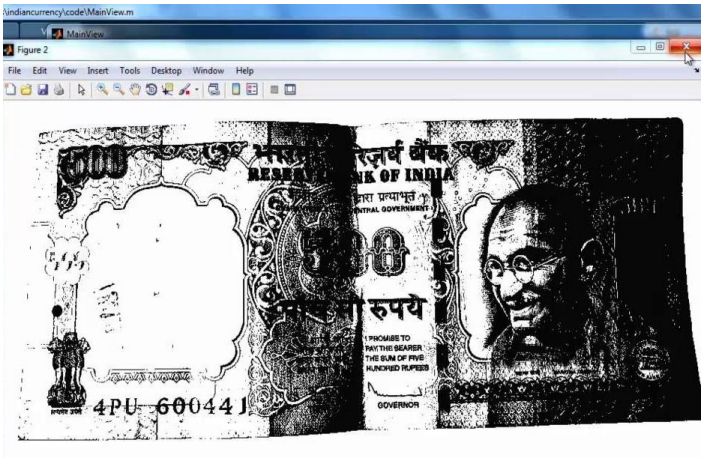

Fig12. *Matlab Processing*

5 CONCLUSION

Thus, this paper is useful for small vendors and some banks in identification of counterfeit bank notes, It is Economically acceptable for most of International societies around the globe. In future this system may be overtaken, but the basic image processing techniques are same. Image process algorithms are applied to extract the options, for different modes of detection.

6 ACKNOWLEDGMENT

The authors wish to thank Ms. T. Srruthilaya, MTech (EDT), Trainee Engineer, National Institute of Electronics & Information Technology (NIELIT), Chennai.

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