# A Survey on Indian Currency Recognition System

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***Abstract:*** The recognition of banknote by blind people is very difficult despite Indian banknotes has some special identical features like (RBI mark, number etc.) which is recognized by our Indian banks and ATM's.This paper conducts a new methodology for currency recognition by using size and colour parameter of banknote. To measure the size of banknote, encoder will be used which will generate pulses according to the length of banknote which is to be tested and then recognized. Despite that, colour sensor will be used to test the colours. These generated pulses by encoder and colour is compared with the database of microcontroller and then result is conducted by speaker. This device will be very helpful for blind and visually impairedpeople.

***Keywords***— *banknote, currency recognition, blind and visually impaired*.

## I. INTRODUCTION

The World Health Organizationestimated that in year 2002, the counting of visually impaired people were 161 million that is 2.6% of the total population. Among these statistics, low vision people were 124 millionand blinds were 37 million [1]. While interacting with environment,visually impaired people suffer from many problems.One specific problem is to recognize the value of currency he or she is holding in their hand. Currency system of India has the values Rs. 1, Rs. 2, Rs. 5, Rs. 10, Rs. 20, Rs. 50, Rs. 100, Rs. 500, and Rs. 1000.Each banknote has their own different features. These features can be colour, size or some other marks of identification. To recognize these features is easy for seeing persons but for blind people it is very difficult. Applications of Currency recognition system is bank system, Automatic selling goods system, and for blind people.

Blind people cannot recognize the banknotes. To help such people different technologies were developed to recognize banknote but these are costly and not portable. Sometechnologies used Camera [9]. By using camera, system has to face some problems like storage problem and positioning of banknote. Some other technologies are based on edge detection, but the system is not handheld [4].

Banknotes can be recognized by differentparameters like

- Face diagrams atbacksides.
- Length and width of banknote.
- Differentcolours of banknotes.
- Text number printed at centre and corners of notes.

In this work, parameters like colour and length of banknote will be used as a recognition purpose. Based on these two parameters, newly designed device will be easily handled by blind person. The methods for detection of currency whether it is counterfeit or not, has been discovered already. For example, banknote can be detected by checking the metal wire present in a desired banknote. Ultra violet rays can be used for detection whether it is counterfeit or not. Dollar bills are fluorescent when UV light is shined on them.

## II. RELATED WORK

To recognize the currency, many technologies have developed. Some of them are discussed below:

XiaodongYanget al. proposed a component-based framework method to recognize banknote using SURF technique [1]. But this technology was complex. An idea to recognize currency based on size, colour and texture of banknotes by using image histogram was given by Hassanpour [2].Currency can be recognized based on the electromagnetic detection. The basic principle of this technology is pulse eddy current technology [3].Researchers has also discussed about the process of recognition, in which the image is converted into grey scale image. To discard the unwanted noise in the grey scale image median filters are used. Canny edge detector and sobel edge detector are used for edge detection. To measure edges of the horizontal and vertical axis present around the text region in grey scale image, canny edge detector is used. To measure edges of the overall boundaries of the horizontal and vertical axis present in the grey scale image, sobel edge detector is used [4].but the system is not handheld. Support vector machine can be used to recognize the banknote number with the help of algorithm which is proposed by Shan Gaiet[5]. There is system, which contains 2 sections: hardware and software. Hardware section consists of 3 main parts: input part, processing part, and output part. The input part will get image from the camera (CMU cam l). In the processing part banknotes and coins are classified by microcontroller. The output part consists the voice recorder IC and speaker to give output of microcontroller in the form of voice of banknote and coin value [6].One paperrepresents the fast edge assisted adaptive binarization technique for improved extraction of text from license plate images captured by mobile phone camera [7].

Based on colour clustering method researchers represent a technology for extraction of text and segmentation of document image captured by camera. The limitation of this method was locating the large size texts with severe illuminations changes [8].and this system is very complex.Jian Yuan et al. published a paper which represents the extracting text from the sign boards by capturing the image with the help

of mobile camera [9].There occurs positioning of banknote and storage problem because of camerausage.In another paper, two types of mechanism to identify counterfeit currency are included. One of them is Ultra Violet (UV) detection using lab view and another is the polarization of light when passed through the currency. The output will be positive if both the results are positive [10].Malaysian bank notes are easily recognized based on their different colours by a device which is designed by Mohamed et al. [11].But the result is not much accurate.

A system was designed which was reliable for ambient light and banknote positioning. Simply lean the banknote to be tested on a flat glass, and the system detects whether the banknote is counterfeit or not, as well as recognizes the value of banknote by using near infrared camera [12]. Currency can be detected and recognized by using neural technologies [13]. Words in printed text can be recognized by using handheld pointer that looks like pencil. A micro camera is attached on the pointer. When the user drops the pointer then voice synthesizer will give the result. In this firstly with the help of pointer, region is analysed. If there is any text above the pointer then image is splitter into blocks. Each block is classified as 'character'. Then next step is to binarize the 'character' blocks. Further step is to analysis of image polarity. If the polarity is negative then binarized image pixels are inverted [14].Based on Java platform, text reader system was designed to help visually impaired people. In this the text is converted into speech [15].

The text from the image can be detected by using sparse representation, Novel edge based method and Unsupervised feature learning method [18, 17, and 16].T.A.More et al. has proposed embedded technology.In which ARM 11 microcontrollercan be used for image and video data extraction. [19].SiddharthMody et al. developed a portable "Text-to-Speech Converter".Speech processor converts the valid text at the input via keyboard into speech [20].

Fig.1: Bank Note Reader [21]

Polymer Canadian banknotes consists three key elements from which the blind persons and visually impaired people can recognize the Canadian notes by touching, sight (visually impaired people can see large numerals), electronic signal. Polymer Canadian notes are differentfrom paper note as polymer notes are smoother and lighter than paper notes.
By using this bank note reader, the blind person has to just put two fingers on banknote and then to slide it inside the machine. But this machine recognizes only Canadian banknote [21].

In the previous work as it is discussed above, some technologies were using cameras, some worked on software like lab view, and some technologies were based on colours. But someproblemsare encountered like storing of imagewhile using camera and other limitation is that if the blind person put the banknote in device other than the defined position then it will create problem. And the devices using other technologies like sparse representation, edge detection etc. is more complex and not handheld. If the technology is based on only colour parameter then it is not more effective and it will not give accurate result. By measuring the size of banknote as well as testing the colour of it, is very efficient method and will give accurate result. So this device is based upon colour and size parameter of banknote. This device will be more helpful for blind people because it is handheld and not expensive.

## III. PROPOSED WORK

This paper proposed an idea to recognize the banknote to assist blind people. The recognition of currency is conducted by two features that are colour and size. The proposed system consistsof two rollers. In which one roller helps to provide the banknote into machine and second roller, to back it to the user, respectively. These two rollers help's to keep the banknote straight inside the device. To rotate these rollers,DC motor is used and encoder is used to generate pulses. As the roller starts rotating, encoder will also start working and will generate pulses. Generation of pulses depends upon the length of entered banknote in these rollers. IR sensors can be used to indicate the microcontroller that thebanknote is entered. Afterward, encoder will start generating pulses according to dimensions of that banknote. When banknote is entered between transmitter and receiver of IR sensor through roller, the IR sensor will give feedback signal to microcontroller that is '1'.DC motor and roller will start rotating simultaneously and encoder will start generating pulses.When the banknote is ejectedby other rollerfrom the device then the IR sensor will give '0'feedback signal to microcontroller. And finally DC motor and encoder will stop working.

To detect another parameter that is colour of banknote, colour sensor is used. Colour sensor will detect the colour of banknote which is to be analysed and then microcontroller will compare this data with its embeddeddatabase. On other side, the encoder will generate the number of pulses according to the dimensions of banknote. For each banknote it will generate identicalpulses because of different sizes.

To convert the microcontroller output into speech form APR 9600 can be used, so as to enable the blind people to hear the result. This portable device can be easily handled by the blind person.

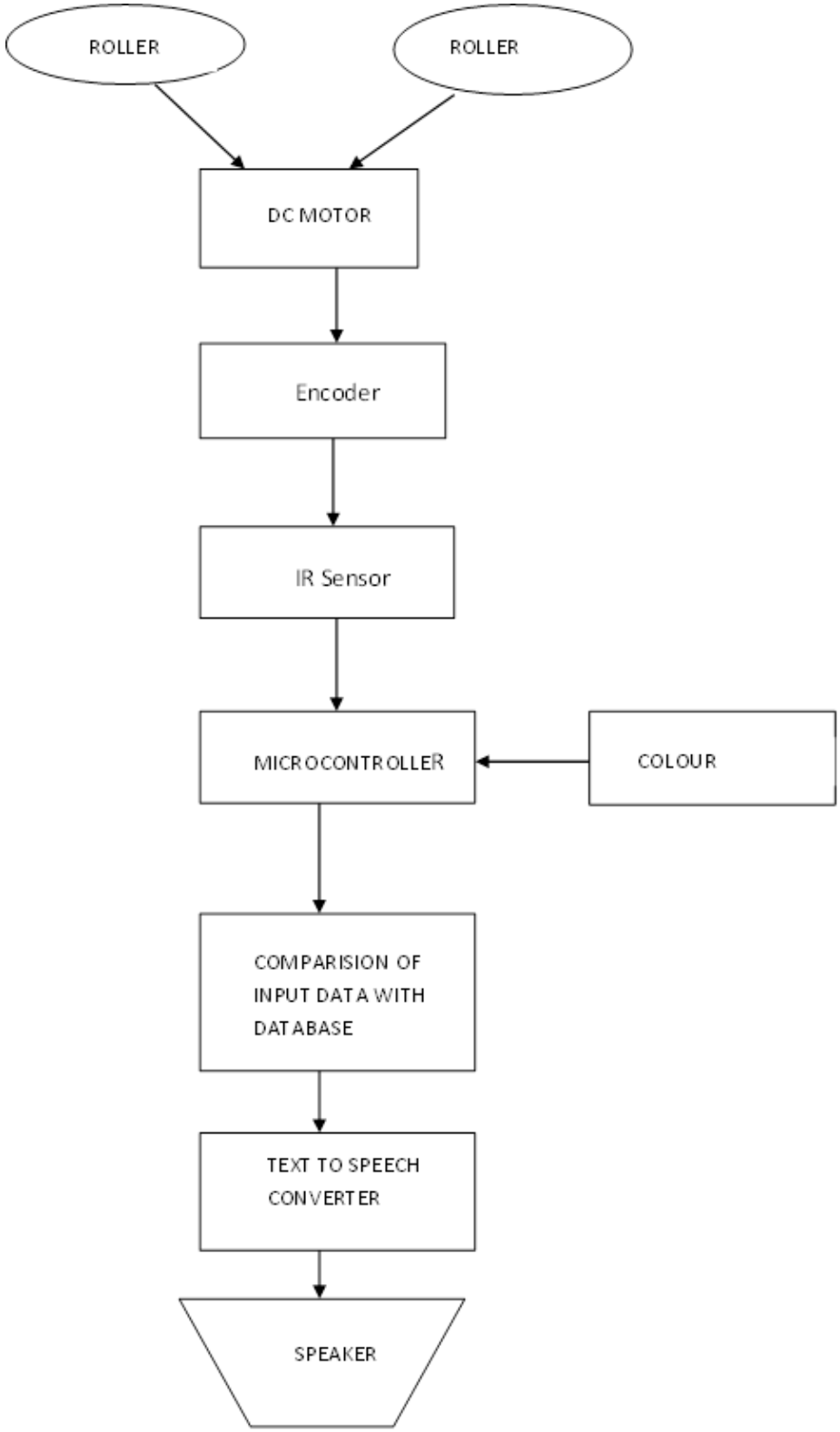


Fig.2: flow chart of currency recognition system

In above flow chart when banknote is ejected by roller then IR sensors will give signal to microcontroller that the entered banknote has ejectedoutside. Then encoder will stop generating pulses because length of the banknote has come to an end. Simultaneously, the colour sensor will detect the colour of entered banknote. In microcontroller, the database of every banknote about its colour and size will be embedded. The input data of entered banknote (colour, size) will be compared with embedded database of microcontroller. If the input data matches with any banknote according to the embedded database, then microcontroller will give output of currency recognition to APR 9600. This IC will convert the output of microcontroller into speech form. This system will

recognize only Indian banknotes of 10 Rs, 20Rs, 50Rs, 100Rs, 500Rs, and 1000Rs.

## IV. CONCLUSION AND FUTURE SCOPE

This handheld device will recognize only Indian notes that are 10 Rs, 20 Rs, 50 Rs, 100 Rs, 500 Rs, and 1000 Rs.

The colour sensor and encoder will give the reading of entered note (which is to be analysed) about its colour andsize respectively.Encoder will generate the pulses according to the size of banknote that is measurement of size of banknotewhereas colour sensor will detect the colour of the banknote. Furthermore microcontroller will compare this input data with its embedded database, than speaker will give the result about the banknote value.

Currently, this device can recognize only Indian currency but furthermore it can be enhanced to recognize currency of all countries. And this technology can be further implemented on android application using mobile phones.

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