MAT JOURNALS
Journal of Image Processing and Artificial Intelligence
e-ISSN: 2581-3803
Volume 5 Issue 3

Mobile Based Smart Currency Detection System for Visually Impaired

Abhishek Pathak[1], Sagaya Aurelia[2*]
[1]PG Student, [2]Assistant Professor
[1,2]Department of Computer Science, Christ University, Bangalore, Karnataka, India
***Email:** *sagaya.aurelia@christuniversity.in*
***DOI:** http://doi.org/10.5281/zenodo.3354669*

Abstract

India holds the largest population for visually impaired people which keeps on increasing day by day. In this study, I would like to suggest an implementation of a system that deal with currency recognition for visually impaired using image processing techniques such as segmentation and feature extraction. In addition to this, K-nearest neighbor and canny edge detection algorithm is also used.

Keywords: *Currency detection, demonetization, image processing, visually impaired*

INTRODUCTION

In earlier times, the visually impaired people in India used torecognize a currency note with regarding to its size, but with the recent demonetization of currency, the visually impaired are actually facing difficulty as no provision is provided for them to recognize the new currency notes; whether it is a 10 rupee note or a 2000 rupeesincethe new currency notes are similar in sizes.This paper deals with a system that will allow the visually impaired to hold up their devices against a currency note which would allow them to recognize and give the output as an audio signal and vibration format. The vibrations could be counted and then give an idea to the device holder aboutthe actual value of the currencycurrently held by the person as shown in Fig. 1 [1,2].

OUTPUT SIGNAL	RESEMBLENCE
0 vibration	Invalid currency/ less than 100 rupees note
1 vibration	100 rupees note
2 vibrations	200 rupees note
3 vibrations	500 rupees note
4 vibrations	2000 rupees note

Figure 1: *Resemblance value for output signal.*

SMART CURRENCY DETECTION SYSTEM

The basic flow structure of this system would be as follows, as this will allow the system to detect the currency from someone's hand andtell us the value in a real time environment. The block diagram for smart currency detection system is shown in Fig. 2 depicting the basic flow of process that will happen while implementing the system.

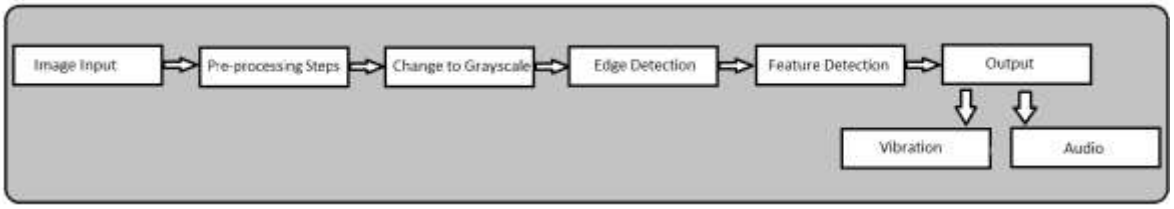

Figure 2: *Smart currency detection system.*

Image Input
The image input will come from the mobile phone of the user as he would click the photograph of the desired currency [3].

Image Pre-processing
Various pre-processing techniques would to even out the brightness and contrast and deblur filter for the image [4,5].

Change to Grayscale
This step is taken so as to change the image from an RGB image to an image with just shades of grey making it a 2-dimension matrix.

Edge Detection
We can detect the edges of the image and its various techniques using various edge detection techniques to filter out the noise in the image.

Feature Detection
We can use a point feature matching algorithm to detect if the image that was inputted by the user has the same result as of our pre recorded currency database and would try to find the most suitable result.

Output
Depending upon the above result, we would send out the respective output in audio and vibration formats.

SYSTEM IMPLEMENTATION
The process starts with the user holding the devices camera against the currency in his hand as depicted in Fig. 3.

Figure 3: *Input currency image.*

Our very first step would be to take the image input from the user, whether by clicking a photo from the devices camera or by capturing a single frame from the video terminal and then perform a deblur filter on it [6,7]. After deblur, the job would be to pre process the image to make it ready for the original process as the image would be having a lots of different objects like hand and other objects that would be caught in the camera; we have to only focus on an rectangular object at the center of the image which will help us in extracting the image of the currency out of the hand and focus on checking what is the value of the currency or whether the currency is valid or not [8].

Figure 4: *Output from K-Means clustering.*

We could also use K–Means Clustering algorithm to track different unique color as shown in Fig. 4 and using the color of the center of the screen we could easily identify the currency by taking the unique object and finding out its edge by canny edge algorithm. Now, we can easily use feature detection of a valid currency from the database of valid currencies and the processed out image of the currency and match them using Point Feature Matching algorithm provided in MATLAB which would allowto know how similar an image is and would only show the result if the match is more than 75 percentage otherwisewill prompt it to retake the image from the user. Using Point Feature Matching algorithman output would be as depicted in Fig. 5. We can actually see that it detects the currency borders pretty well and gives a positive result as per now [9, 10].

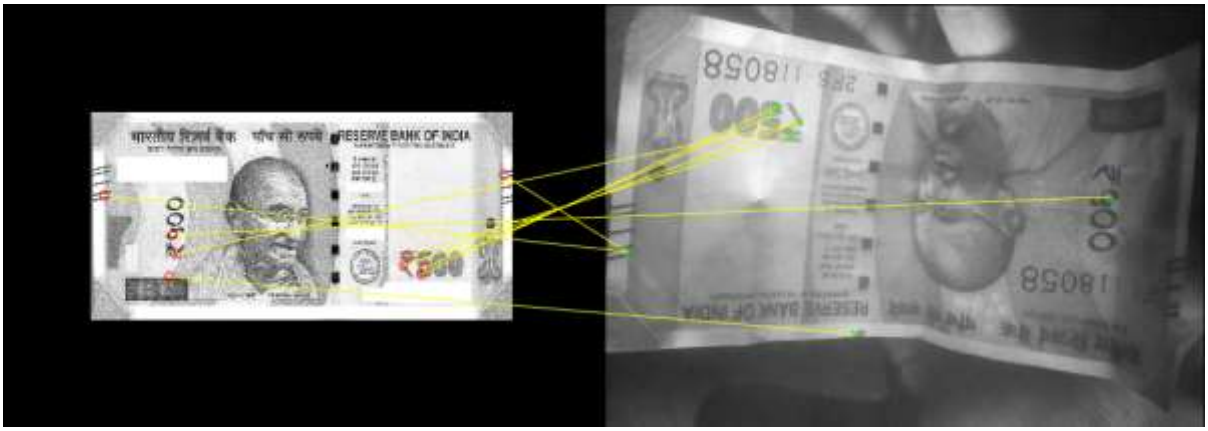

Figure 5: *Screen capture of point feature matching algorithm.*

CONCLUSION

Currency detection plays a major rule in day to day life of people as people have to use currency to pay for there various needs and requirement. In this paper, design and development of a system that would allow the visually impaired people to detect a currency note and get to know about the amount of it. This will help visually impaired people in there day to day life. The implementation of the system would be done in MATLAB as it is a very powerful tool for image processing.

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Cite this article as: *Abhishek Pathak, & Sagaya Aurelia. (2019). Mobile Based Smart Currency Detection System for Visually Impaired. Journal of Image Processing and Artificial Intelligence, 5(3), 1–4. http://doi.org/10.5281/zenodo.3354669*