Recognition of Indian Currency Denomination for Visually Impaired People

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Abstract— Currency denomination recognition is one of the basic tasks in our day to day transactions. However, it is difficult for blind people to identify the currency. Therefore automated recognition of currency denomination system would be of great significance to relieve their agony. In this paper a robust framework for Indian currency note recognition which would effectively recognize the various Indian currency denominations (10, 20, 50, 100, 500, 1000) thus benefiting the visually impaired and also counterfeit detection of currency. Here firstly preprocess the image of currency notes acquired by a digital camera and then extract and analyze three unique features of each denomination while considering complexities caused by degradation of color and dimension of notes due to wear and tear and handling. Based on these unique and discriminating features, classify and recognize of these currency notes can be done. The experimentation results showed good classification results and the success-rate of the counterfeit detection with properly captured image is 100%. An audio feedback is given for every test case scenarios.

Key words: Visually Impaired People, audio feedback, Currency Denomination

I. INTRODUCTION

World Health Organization (WHO) approximates that there are 161 million visually impaired people around the world, about 2.6% of total population. Among these 124 million had low vision and 37 million are blind. Blind people face great difficulties in there day to day life monetary transaction. Also the present day financial self-services have an ardent need of an automated currency recognition system. Automatic methods of banknotes recognition are required in many applications, such as automatic selling goods and vending machines.

Each currency has its unique colour, dimension, and identification mark because of which it is easy for the sighted people, but not for visually impaired. A large number of works has been done in this regard by researchers worldwide. An approach suggested for the feature extraction of Indian currency notes considered the whole character itself as a feature. Selection of the feature extraction method was single most important factor in achieving high recognition performance. In this project three parameters of a currency notes are considered, such as aspect ratio, dominant colour of a note and colour histograms, instead of focusing only on a single parameter, for proper identification of denomination. A framework for robust detection of Indian currency notes and its hardware has been proposed in this project. Based on analysis and experimentation, certain unique features are considered such as the dimension, dominant colour, histogram of dominant colour of a note, instead of focusing only on a single parameter unlike other previous work. And then based on these unique features, classifying algorithm has been developed.

II. IMPLEMENTATION

India has a net population of blind people of approximately 3.5 million and 30,000 new cases are registered every year. These blind people face a lot of obstacles in their daily life during monetary transactions. So, in this modern world where every sector is moving towards automated and intelligent technology, there is a pressing need for an automatic currency recognition system. Each currency has its unique colour, dimension, and identification mark because of which it is easy for the sighted people, but not for visually impaired. A large number of works has been done in this regard by researchers worldwide. An approach suggested for the feature extraction of Indian currency notes considered the whole character itself as a feature. Selection of the feature extraction method was single most important factor in achieving high recognition performance.In this project three parameters of a currency note are considered, such as aspect ratio, dominant colour of a note and colour histograms, instead of focusing only on a single parameter, for proper identification of denomination. A framework for robust detection of Indian currency notes and its hardware has been proposed in this project. Based on analysis and experimentation, that considered certain unique features such as the dimension, dominant colour, histogram of dominant colour of a note are implemented.

And then based on these unique features, classifying algorithm has been developed. Here currency is captured by camera, which acts as image acquisition unit. Then currency is recognised so currency reorganization is divided into two parts. The captured image is first preprocessed by reducing data dimensionalities and extracting its features by using image processing toolbox in MATLAB. According to the HSV (Hue, Saturation,Value)colour space, the work of color feature extraction is finished. Feature extraction is the most challenging task in currency recognition system. It is a pivotal procedure for currency recognition, which effects on design and performance of the classifier intensively. The features that we have considered include the estimation of aspect ratio, extraction of dominant colour and histograms of R, G and B components.

1) Aspect Ratio: Each Indian denomination has a unique dimension. So we have considered this as one of the unique feature of a currency note. However wear and tear and handling may reduce the original size of note, so we consider a threshold value based on experimentation for each denomination. Here we calculate the aspect ratio of each note. Unlike height and width, the aspect ratio of a note of particular

denomination is independent of the distance from which the photo of the image is clicked. The aspect ratio is given as: Aspect ratio=width of note/height of note

2) Dominant Colour: The dominant colour of the note has to be found after determining the aspect ratio of the note. The component having the maximum occupancy is declared as the dominant colour of that denomination. For example Dominant colourof 10 rupees note is red.
3) Histogram: Then histograms of the RGB components of currency notes have to plot. After plotting, the correlation coefficient was calculated for histograms of different colour components of the images. If the testing currency and the original currency have the same denomination, the correlation value came out to be very near to 1.

The second one is recognition, in which the core is neural network classifier and finally the result of recognition will be displayed.

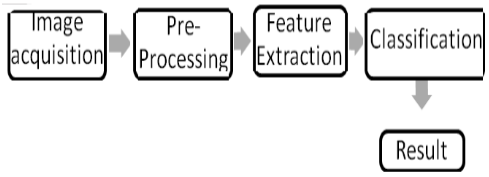

Fig. 1: Block diagram of currency recognition

III. RESULTS

The currency is taken as input which is already stored in the system, the currency image is then processed using the MATLAB operations which produces the output i.e, value of the currency. This output is as shown below,

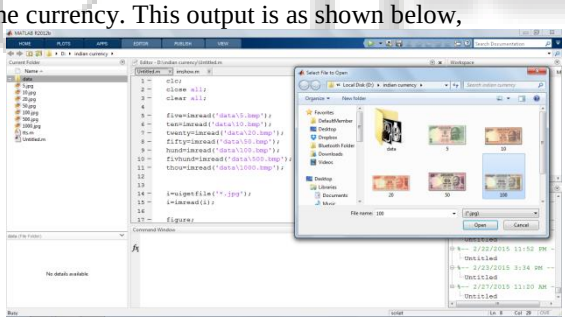

Fig. 3: Snapshot of the path to select currency note

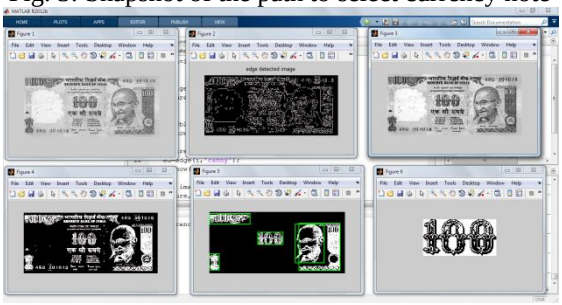

Fig. 4: Snapshot of the intermediate result

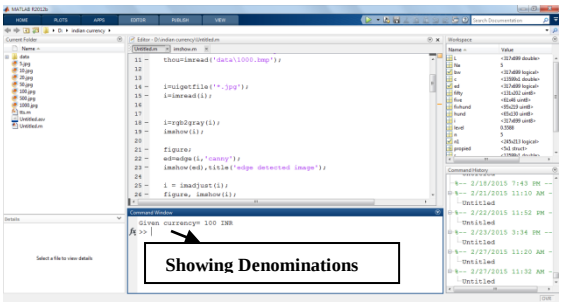

Fig. 5: Snapshot showing the output of the program

The output with Hardware Implementation with Voice Output telling the exact denomination of the currency notes. The hardware connection is as shown below,

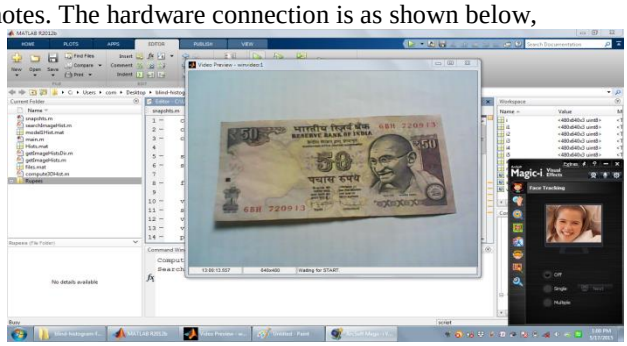

Fig. 6: Currency note to be detected

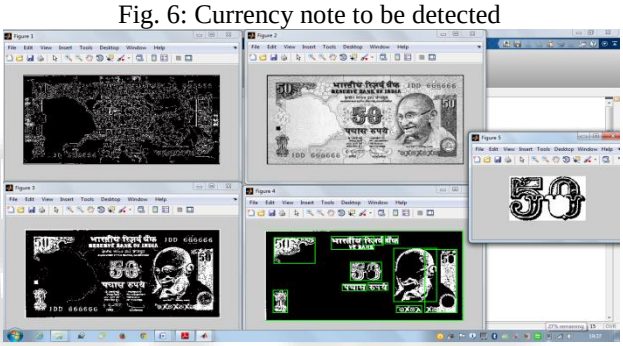

Fig. 7: Image processing part

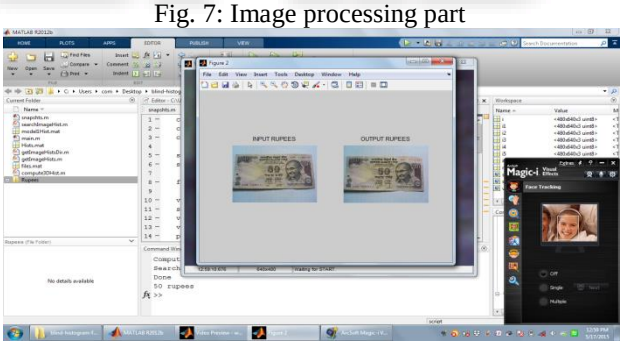

Fig. 8: Output of the denominations

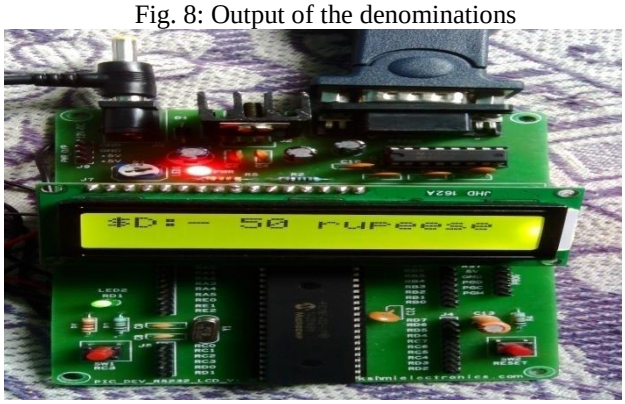

Fig. 7: Denomination Displaying in the Hardware

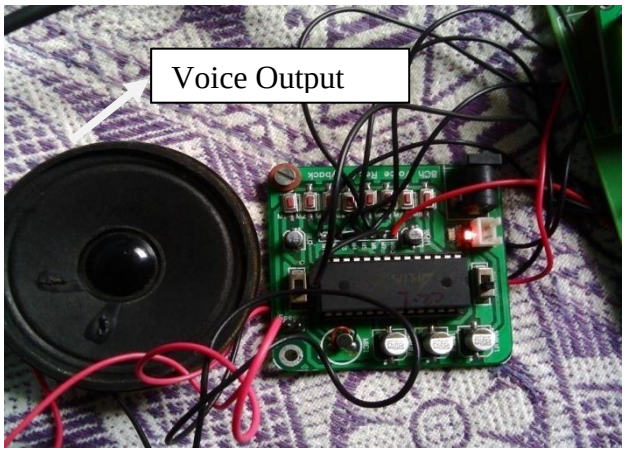

Fig. 8: Denominations Voice output

IV. CONCLUSION

In this project, a proposed methodology is used which extracts unique features like Hue, Saturation and intensity from the Indian currencies. These are preprocessed to acquire the image which is used to recognize and extract potential feature of Indian Currencies. A neural network classifier is used for the purpose of classification accurately. A hardware which is associated with MATLAB software is used for devising audio indications and other interfacing units. The programming part of recognizing the currency note is completed using the MATLAB software and the same is implemented using the hardware. The simulation results are as sown above. From this it can be concluded that recognition of Indian currency denomination for visually impaired using image processing concepts in MATLAB.

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