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A Survey on Currency Identification System for Blind and Visually Impaired

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ABSTRACT

-At present the currency recognition for visually impaired and blind people has becomes a vital topic for the researchers in the different applications. The money exchange is an important part of our daily life activities. But it becomes very difficult for visually impaired and blind people to recognize the currency values in the financial exchanges and they easily betrayed by the other people. Accordingly, there seems an urgent requirement to scheme a framework that is useful in recognizing paper money notes accurately. There is a huge area for currency differential detection and it has evolved over many years. The paper explores currency identification and provides a comprehensive overview of the current literature on techniques for identifying currency notes, encouraging the survey effort to provide an effective system for blind and visually impaired people.

Key words: Banknote, Currency recognition, blind and visually impaired, Computer Vision, Feature Extraction, Image Processing.

1. INTRODUCTION

Now days, the technology is growing fast. By using of the technology, the people clear up their problems within the small passage of the time. Some applications are used in the real life which includes currency monitoring system, currency counting machines, currency exchange machines and currency recognition systems to help for blind or visually impaired people.

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Imaginative and prescient no longer only facilitates us to carry out each day activities however also impact the behavior of the individual. Blindness affects psychological conduct of a human being, someone has imaginative and prescient or someone with everyday imaginative and prescient likely having much less depression than a blind individual.

Most of the blind or visually impaired people suffer from anxiety and they also lack of the social relationships. Recognizing the objects which are around the blind people is one of the main problems. People can recognize and detect the objects and they can trust on their environment. The main problem for the visually blind people is to recognize the currency values. The normal people can easily recognize the currency, but it becomes very difficult for the blind people to accurately recognize the currency. The blind or visually impaired people need to recognize and also adapt difference among the note currencies.

As stated by World Health Organization (WHO), around 2.2 million people be afflicted by the problems of vision impairment. 188.6 million People suffer with a gentle sight deficiency, 218 million people suffer with mild imaginative and prescient impairment and the number of sightlessindividuals is 36 million. Most of the people suffer with the problem of visually impaired over the age of 50 years. The most reasons behind the visual weakening are Glaucoma, uncorrected refractive errors, Diabetic Retinopathy, Trachoma, Cataract, Corneal Opacity and Age connected macular deterioration.

Most of the people use many types of techniques for the recognition of the currency which includes

color, textures and size of the banknote currency. Latest computational strength and the availability of the digital camera, it makes easy to construct a system for the recognition the Pakistani currency banknotes. The Pakistani currency consist of seven types of paper notes which are different in color and size. The method which is proposed can easily recognize different types of Pakistani paper currency (10, 20, 50, 100, 500, 1000 and 5000).

At present there are Rs.10, 20, 50, 100, 500, 1000, 5000 notes in the currency system in Pakistan but they are unique in one way and others. These features can be shades, sizes or some prominent proof imprints etc. It is not difficult for ordinary people to understand these features, but not for the sightless and visually diminished people. These blind and visually impaired people can be identified in the two different groups that use the specific size of the note, so far the type of single size alone is not enough to focus on the error of the currency note. In fact, there is no difference in the size of consecutive categories, which is why they cannot recognize cash notes from each other. Cash notes only provide stamps with some exceptional proof of discrimination to the blind so that they can know this category effectively.The upper right end of each cash note is affected by a map that is delicate to the touch. The imprint disappears even after the note has been available for a long time. This again makes it difficult for the blind to focus properly on the note age category.

This article surveys the currency identification framework for the visionless and visually lessened people and also focuses on the advantages of using a color identification system. Many techniques are used to recognize the image but in many cases the neural network is used to recognize the currency notes which consists of several stages i.e. some based on texture and pattern. The trick is to translate the combination of these shapes into a single article, such as autos on the road, magnifying image tool slides on the carpet elevator, and carcinogenic sales on the carpet lift. An object can look very different when viewed from or under a different light. An alternative problem is to choose which features fit with which object and which bases or shadows etc. The human visual framework Performs actions unknowingly, but a machine is bound to reach the load of skilled programming and handling force human execution. The rest is arranged in the following order: Section 2 defines the work related to the currency identification classification. Section 3 describes some of the important phases in the currency identification scheme. Section 4 describes the evolution of the currency identification system algorithm. Section 5 elaborates the outcomes of the survey in the currency identification system.

2. LITERATURE REVIEW:

There are many recognition systems which are proposed. An application of mobile is proposed by Suriya et. Al [1] in which segmentation stage is used for eliminating noise from the pictures. She used a method which is called visual bags of words. This method behaves well on the images which are capture from a phone. This system is applied on the Indian currency with using a SIFT descriptor and this system report 96.7%.

The author in [2] proposed a system which was built on bionic eyeglass is used to recognize currency. The image is captured from the camera of the phone then the morphological filter and thresholding function extracted relevant shapes from the image. In which two types of level are used for different kind of patches.

A mobile application [3] which is Ideal currency identifier used to recognize dollar of U.S for blind and visually impaired. It is easily recognize the note. It captures pictures from the mobile camera. It takes a short time in processes to recognize the note and the user is notified by the voice. Using the audio in this app is very useful for the users to understand the value of the note. This is a good app but it not work with dim lightning and low quality.

In this paper Noura A.et al [4] have described the proposed system is working on the process of image segmentation, histogram equalization, ROI, Otsu thresholding and template extraction. They have developed the system in MATLAB and open CV library in android platform is also used.

The proposed system [5] is developed by Ahmed et al an ORB algorithm. ORB is applied to achieve binary descriptors. This new algorithm is enhancing the previous ROI extraction and template matching results with better accuracy and results. An android application platform for visually impaired persons is also developed.

The proposed study by Imad et al [6] is using Deep CNN, Firstly Training the System Using Alex-net architecture then Pakistani currency notes main features are extracted using some live input webcam. SVM algorithm is classifying the mage

features and HOG is using for extracting the discriminating features.

In this paper snehal et al [7] has used scale invariant feature SIFT algorithm is developed and implemented , which extracting the main features i.e. the color discriminatory feature among the currency notes data sets, this is producing more robust and accurate results with an audio output feature.

In this review paper kishan et al [8] have described different developments in currency recognition have been shown with respect to image acquisition, edge detection, boundary subtraction and feature extraction. Artificial neural network and ensemble neural network have helped for currency recognitions valueably.

A mobile application [9] LookTel money reader which operate on iOS. Its basic purpose is to help that people which are blind and visually impaired. But with this application they easily identify the currency. A large dataset is used which support currencies of 21 countries.

An android mobile application [10] Via Opta Daily which provide six services for the blind. The first service is to help the blind for knowing the weather. A magnifying glass is used which allow the mobile camera to capture the image and zoom it. It also read the text in audible form from the image. The third service is a timer.

In [11], the authors use computer vision to classify and detect 4 different currencies. The features which are used to dig out useful data are on the basis of shapes, color and texture of 4 multiple currency notes. In classification they use artificial neural network. The regularCorrectness was 93.8 percent.

The developer Iyad et al. proposed a phone money detection schemespending a dataset for Jordanian currency notes. They used Jordanian currencies dataset which are based on feature SIFT algorithm [12]. The accuracy produced for coin and paper money was 25% and 71% respectively.

The author in [13], proposed system that recognize paper currency from mobile phone that utilize Saudi Arabian currency. Note currency system recognition is depending on the correlations of the images and interested features of the images. It makes use of Radial Basis Function Network for arrangement. The Accuracy of system acknowledgement is 95.37%.

Sungwook et al. plannedfirm and well-organized algorithm which are used for categorizing different nationwide banknotes which are founded on materialsize and association of different templates [14]. Multiple bank notes have variable size so they are the important features. The result of this was 100% classification accuracy of the normal notes and the accuracy of classification is 99.8 percent of the notes.

This method is developed in [15] which are used for the identifying different paper currencies. This method is primarily is depend on non-parametric model which is used for recognition of the currency. This model is received many samples of one note. For getting a good result currency is captured by the camera and currency note should be aligned horizontally. This technique is utilized to 3categories of Saudi Arabian banknotes and examined on huge variety of currencies and the correctnessranges to 100%.

After studying different papers regarding currency identification and recognition it was recognized that a vast technological enhancements have been done in deep learning specifically in the field of neural networks and deep neural networks. Visually impaired persons are getting a huge help with the help of these applications all across the globe just to make sure that people are getting right currency notes every time.

Blind people are basically in a need by modern technology makers to make a vast attempt in this field and make an expert system or a an application for the individuals who are having a deficiency in the global world.

TABLE NO 1 COMPARITIVE ANALYSIS OF DIFFERENT STUDIES

Sr.	Year	Authors	Problem Statement	Dataset of	Methodology	Result
1	2017	Noura et al	Currency Recognition System for Visually Impaired	Egyptian currency	pre-processing, segmentation, ROI	89%
2	2018	Ahmed et al	Currency Recognition System for Blind people using ORB Algorithm	Egyptian currency	DEEP CNN,ORB ALGORITHM	95.37%
3	2020	Imad et al	Pakistani Currency Recognition to Assist Blind Person Based on Convolutional Neural Network	Pakistani currency	deep CNNs ,ALEX NET ARCHITECTURE	96.851%
4	2019	SNEHAL et al	Currency Recognition System For Visually Impaired	Indian currency	CNN, Sift algorithm	90 %
5	2016	Kishan et al	Recent developments in paper currency recognition system	Indian currency	Ensemble neural network , propagation neural network	95.00 %
6	2014	Suriya et al	Currency Recognition on Mobile Phones	Indian currency	pre-processing, segmentation, BOW method, SIFT descriptor	96.7%
7	2016	Jyothi et al	Paper currency recognition for color images based on Artificial Neural Network	200+different currencies	Artificial neural network	93.8%
8	2017	Iyad et al	Currency recognition using a smartphone: Comparison between color SIFT and gray scale SIFT algorithms	Jordanian currency	SIFT algorithm	71%
9	2015	Sarfraz, et al	An intelligent paper currency recognition system	Saudi Arabian currency	Radial Basis Function Network	95.37%
10	2015	Sungwook et al	Efficient multicurrency classification of CIS banknotes	EUR, KRW, RUB, CNY, and USD	pre-processing, segmentation, SIFT descriptor	99.8%
11	2015	Fattouh et al	A non-parametric approach for paper currency recognition	Saudi Arabian currency	non-parametric model	100%
12	2017	Larisa Dunai et al	Euro Banknote Recognition System for Blind People	Euro currency	Viola and Jones algorithms ,SURF	97.5%
13	2020	Shweta Yadav et al	Currency detection for visually impaired	Indian currency	pre-processing, FAST and YoloV3 algorithm	91.2%

3. METHOD OF CURRENCY IDENTIFICATION

In the currency identification system some important steps are shown in Figure 1 and described below.

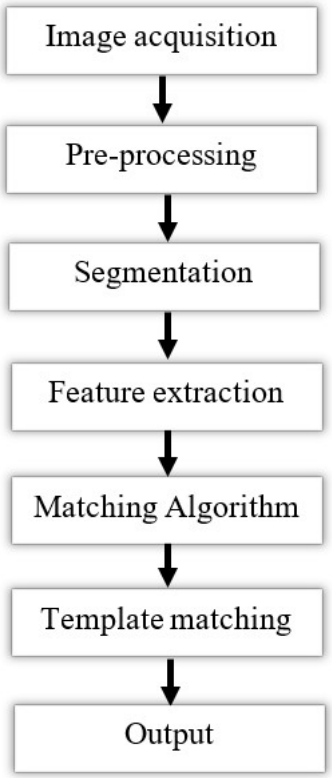

Fig 1: Steps in The Currency identification System

3.1. Image acquisition

There are different ways to get an image, for example, with the help of a digital camera or a scanner. The resulting image must contain all features and the image will be taken as RGB image.

3.2. Pre-processing

Purpose of pre-processing is to increase the visual expression of images and improve the effect of datasets. Image pre-processing is a task that is usually required first to extract important data and extract information. Image pre-processing, is also called image restoration which includes noise correction, degradation and distortion which are introduced during the process of imaging. Image pre-processing can increase the accuracy of optical inspection.

Adjustment of image is completed with assistance of the image exclamation. Interpolation is a method that is mostly recycled for operations such as spinning, reduction and zooming. Noise removal is an significant phase when handing out images. Conversely, noise can disturb pattern matching and segmentation. Continue smooth processing on the pixel, and the pixel neighbor is used for some conversions. Then the pixel becomes a new value.

3.3. Image Segmentation

Combined with the state of the light and the background, the images are captured in a widespread diversity of environments, whereas the currency in the image itself is damaged. Image segmentation is important for implementing data and removing unwanted features (background region) that will involve decision-making. We start with a rectangular region of interest (ROI) that is 40 pixels smaller on all four sides than image. We suppose that a large portion of the currency will be located within the region. Once this region is received, it should be scaled up to a segmentation of the whole image. We're using the Grab cut algorithm here to remove the unwanted background.

3.4. Feature extraction

Feature abstraction is a exceptional kind of the dimensional lessening. When the algorithm contribution is too much huge to be processed and it is not needed then the input data will be converted to a low illustration of features. Changing input data to a set of topographies is called the feature mining. If the extracted features are carefully selected, it is assumed that the set of these features will perform the desired function using the information related to the input data as an alternative of complete input.

3.5. Matching algorithm

This phase identifies or categorizes the currencies of the dissimilar denomination which are grounded on the different features extracted.

3.6. Template matching

For the confirmation of the image similarity, we check whether key points of the test image are in local consistency with the recovered images. The popular method of geometric verification (GV) is used to determine the number of key points of the test image by fitting the original matrix which is compatible with the recovered images. In the voting

procedure, each recovered image adds votes to its image class (bill type) using its proportional number of permanent key points (compiled in the previous step). The class with the most votes is declared as a result.

3.7. Output

Familiar textual codes are listed in the script files. Then we implement text to speech converter to compile the files and show audio result of the textual information. Visually impaired people can adjust their volume, speech rate and the language according to their preferences.

4. EVALUATION IN THE ALGORITHMS:

For the past years, different researchers have projected different algorithms for identifying trustworthy currencies. After acquiring the characteristics of currency notes, it becomes important to identify the shape of currency notes based on specific characteristics, which are introduced through an operational coordination that gives practical status. It is the most common classification technique used by artificial neural networks recently.

Several algorithms expected by numerous researchers for the permanent identification of the consistent currency. Given the bizarre status of economic standards, it is important to understand the currency paradigm based on characteristics that have to be polished by a successful classification identification system. The artificial neural network, which was used of late, is one of the most popular grouping strategies. The neural network-based identification structure was implemented. These neural networks consist of 3 layers: 1. input, 2.hidden, 3.output. In the system, the captured appearance is an RGB image and is then transformed to gray scale. The entire gray scale image was then edge detected. At the detection of the edges, the four features of the paper money were modified and separated. After breakdown, the features of currency notes were excluded. Contrary to the features of the experimental image and the previous storage image in the framework. If it equals, then the currency is usually much better with a counterfeit. On this occasion it revealed the head and immersion for image propagation and assessed the neural system for these features on the possibility that the limits of head and immersion from the nervous system were not the limits of the current image, then the current. The photo was viewed as fake because it was viewed.

And next, the comparative work was done when he used a picture histogram which looked around and calculated the multiplicity of specific colors in the paper money and vice. He also used the Markov Effect Idea to model the level of paper currency and as a regular method of monetary alignment with negative relationships for the last time to align. The nervous system (ENN) was used. Further work has been done to provide an alternative nervous system based on the currency order framework using a negatively connected enabled neural network. In evolution, they focused more on ROI, using shape acknowledgment and neural network toning methods.

The Pattern identification and the Neural Networks Matching Strategy were recycled to counterpart or discover the value of cash or the worth of a documentation of a paper. The work has been extended to neural network-based classification and is used in neural systems that use histogram-based extraction and multilayer perceptual models for ordering. All three layers of feed forward propagation algorithms have been introduced for currency note classification notes. Evolution is used to increase efficiency and short-term use in real-time applications.

On the contrary, it has begun to enhance the brightness of the heuristic features. Estimation of work depends on the external factors of the sensor in which various works are done in color maps. And further investigation is towards finding the monetary order using light reliant resistor sensor management, and light producing diode illuminations that have been modified to understand the shadow examples of verified receipts towards the next evolution filter. It is like the wiener filter used. Increased emissions reduction and at the same time histogram technique is used in many currency recognition techniques.

Focused, speedy and Revolved Brief (ORB) algorithm is implemented to achieve the succeeding tasks for upright presentation. It is a profligate algorithm used to locate angles and sockets of interest in a map and incorporates the resulting features for improved show. In one paper, it uses a Harris Corner Detector to assign scores to each point of interest based on variations of intensity around the corner point. It calculates the intensity of the centroid for the neighborhood of places of interest. It calculates the direction of the vector and assigns it

based on the point of interest using the interesting point and centroid.

The algorithm" You only look once" that uses the authorized neural network to detect objects. When you talk about finding something, you only look once, or Yolo, is one of the most widely used algorithms. Although YOLO is not the most accurate item detection algorithm, it is a great choice when it comes to real-time detection. There is no greater loss of accuracy than other algorithms. The VGG16 is a CNN model. It itself draws deep features from banknotes. Conventional networks are simply neural networks that use convexity rather than multiplying the general matrix by the maximum of any of their layers.

5. DISCUSSION:

Regardless of deep investigation in this area, numerous subjects connected to the currency identification classification are still unreciprocated and provide a wide ground for researchers to discover in the upcoming era. Founded on our education, we bring into being that currency classification based on artificial neural networks is one of the greatest widely recycled approaches. Different categories of neural networks such as feed forward, network, back propagation neural network, assembled neural network. Likewise, some researchers have used the RBF network because it has assets close to the appropriate data, which is a good way to dispel unknown data. Experts have identified paper currencies. They have developed various different models. One of them is that the Markov China perception is used by various researchers as a unplanned process to idealize the structure of paper currencies. The GMRF model was implemented by researchers in image fragments. RGB color-based cataloguing was also implemented by numerous researchers to categorize currencies, grounded on the circumstance that in every note, only one of these colors is noticeable. Few authors, however, considered classification grounded on examination of color histograms, color, inundation, and strength values. He recommended that the benefit of HSV color space is that it is close to man’s theoretical indulgent of colors and has the aptitude to differentiate between color and achromatic modules. While many currency recognition methods have been industrialized to date, familiarizing a robust background model to adapt to variations in different environments is still an encounter.

6. CONCLUSION:

New innovative apparatuses and advances in technological machinery show that the individual difficulties of the blind and visually diminished can be solved in present era. In this article, we have surveyed the technologies that are considered to be strong and computational for the currency note recognition system, especially for the sightless and visually damaged people. This article provides a brief overview of the evolution of existing techniques and algorithms. The work makes it more efficient to understand the methods and algorithms which are involved in the system.

REFERENCES:

[1] S. Singh, S. Choudhury, K. Vishal and C. V. Jawahar, Currency Recognition on Mobile Phones, 22nd International Conference on Pattern Recognition (ICPR), Sweden, (24 August 2014), pp: 2661- 2666, IEEE

[2] Z. Solymár, A. Stubendek, M. Radványi, and K. Karacs, "Banknote recognition for visually impaired," in Circuit Theory.

[3] http://www.wirelessrerc.org/node/160

[4] Semary , Gad, A. F. ”Currency Recognition System for Visually Impaired: Egyptian Banknote as a Study Case,” In the 5th International IEEE Conference on Information & Communication Technology and Accessibility (ICTA), pp. 1-6 ,2015.

[5] Ahmed Yousry. , Mohamed Taha and Mazen M.Selim.”Currency Recognition System for Blind people using ORB Algorithm”. Article in International Arab Journal of Information Technology · January 2018.

[6] Muhammad Imad1, Farhat Ullah ., Muhammad Abul Hassan. & Naimullah.”Pakistani Currency Recognition to Assist Blind Person Based on Convolutional Neural Network”. Department of Computing and Technology Abasyn University, Peshawar, Pakistan.

[7] Snehal Saraf.,Vrushali Sindhikar.,Ankita Sonawane.,Shamali Thakare.”Currency Recognition System for Visually Impaired”.Snehal Saraf, Information Technology, MCOERC, Maharashtra, India.

[8] Kishan Chakraborty., Jordan Basumatary2, Debasmita Dasgupta.”RECENT DEVELOPMENTS

IN PAPER CURRENCY RECOGNITION SYSTEM". Dept. of Electronics and Communication Engineering, Don Bosco College of Engineering and Technology, Assam Don Bosco University, Guwahati, India.

[9] http://www.looktel.com/moneyreader

[10] http://viaopta-apps.com/ViaOptaDaily.html

[11] Jyothi, Ch Ratna, Y. K. Sundara Krishna, and V. Srinivasa Rao. "Paper currency recognition for color images based on Artificial Neural Network." In Electrical, Electronics, and Optimization.

Techniques (ICEEOT), International Conference on, pp. 3402-3406. IEEE, 2016.

[12] Doush, Iyad Abu., et al. "Currency recognition using a smartphone: Comparison between color SIFT and gray scale SIFT algorithms." Journal of King Saud University-Computer and Information Sciences 29.4 pp. 484-492 , 2017.

[13] Sarfraz, et al. "An intelligent paper currency recognition system." Procedia Computer Science Journal, Vol. 65, pp. 538-545, 2015.

[14] Youn, S, Lee, C, Chulhee Lee "Efficient multicurrency classification of CIS banknotes" Elsevier Neurocomputing, Vol. 156, pp. 22-32, May 2015.

[15] Fattouh, AM Ali. "A non-parametric approach for paper currency recognition." International Journal of Computer Science and Software Engineering vol. 4, no. 5, pp. 121-125, 2015.

[16] ShwetaYadav., Mr. Zulfikar Ali Ansari., KaushikiGautam Singh."CURRENCY DETECTION FOR VISUALLY IMPAIRED".2020 JETIR May 2020, Volume 7, Issue 5.

[17] Vivek Sharan., Amandeep Kaur."Detection of Counterfeit Indian Currency Note Using Image Processing".International Journal of Engineering and Advanced Technology (IJEAT).

[18] Larisa Dunai Dunai ., Mónica Chillarón Pérez ."Euro Banknote Recognition System for Blind People". Research Center in Graphic Technology, Universitat Politècnica de València, Camino de Vera s/n, 5L,Valencia 46022, Spain; gperis@upv.es (G.P.-F.); ilengua@degi.upv.es (I.L.L.).