NOTE TO COIN EXCHANGER USING IMAGE PROCESSING

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Abstract: **Now days, we have to suffer a lot for the change in various public places in daily life. The need of change has been increased. Rather coins are used more instead of note in various places like bus station, railway station, malls, parks, even in rural areas where nowadays also coin telephone system is used. For these many application places coins are used extremely, so we thought to develop an exchanger machine which will give us coins instead of notes. As there are lots of techniques to detect the Indian currency note, these are texture based, pattern based, checking by the watermarking, checking the micro lettering, color based recognition technique .The most preferable technique along all these is color based recognition . It is constructed by counting the number of pixels of each color. For detecting kind of note the mat lab algorithm runs and the result is given to the controller which will manipulate the coin container through relays and motors, the user simply press the keypad for which type of change he wants whether one rupee coins or five rupee or mixed and hence in the output we get coins as user requirement.**

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INTRODUCTION OF SYSTEM

BLOCK DIAGRAM:
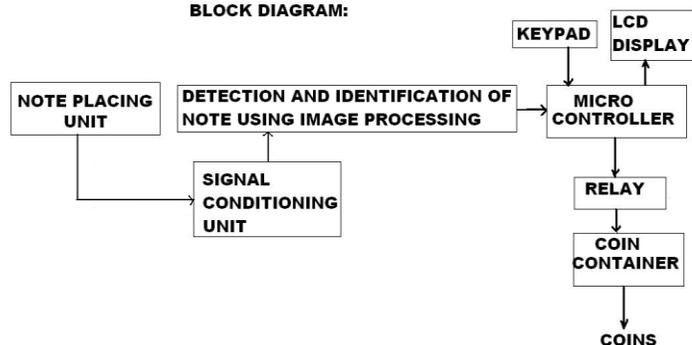
1. NOTE PLACING UNIT:

It will accept note from the user.it consists mechanical Design of relays to take the respective note from the user.It takes 12v to drive the DC motor of 10RPM.There will be 3 relays and 2 DC motors at the user side to take the note inside the machine.This information is sent to the microcontroller for further processing.

2. SIGNAL CONDITIONING:

To identify whether the note is fake or real: The speciality of a currency note is that it absorbs the UV light and a fake note reflects the UV light.this work is done by the UV LED transmitter and UV receiver or detector.The UV LED source transmits the UV rays.If the note is real it will absorb the UV rays.If the note is fake then the rays will be reflected towards the receiver or the detectorBPW34.This output of the UV detector is give to the INVERTING TRANSCONDUCTANCE AMPLIFIER CA314.This output is amplified and then given to the single supply comparator LM 311.The output of the comparator is then given to the micro-controller for further processing.

FAKE NOTE DETECTION, CURRENCY NOTE LOCALIZATIONAND CURRENCY NOTE RECOGNITION USING IMAGE PROCESSING:

Image processing technique is a vast in this there are lots of technique to detect a note these are texture based, pattern based, checking by the watermarking, checking the micro lettering, color based recognition technique .The most preferable technique along all these is color based recognition . It is constructed by counting the number of pixels of each color. Histogram describes the global color distribution in an image. It is easy to compute and is insensitive to small changes in (VP) viewing position. The computation of color histogram just involves counting the number of pixels of specified color. Therefore in an image of resolution m*n, the time complexity of computing color histogram is O (mn). It is quite insensitive to small change in VP this feature is particularly desired in this project as the VP from which the image of currency note will be acquired can change.

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Color Fake note detection which is not perform by general LED illumination because the UV pattern is not reflected under general LED illumination.To inspect paper money using UV-LED, the paper money image must be separated into a pattern and a background.There is a method of separating an image into a pattern and a background using a threshold value. This method finds a histogram of the image, determines the threshold value, and classifies the image. Histogram-based threshold value decision methods exist such as Otsu's method[1] and Huang and Wang's method[2]. This methods are used in separating an image into 2 objects. However, this methods are difficult to separate more than two objects. Because, computational complexity increases exponentially as the number of objects increases. Therefore, in order to separate an image into many objects, a suitable method is necessary.The method using Gaussian mixture model(GMM) cansegment an image into many objects. This method synthesizes n of normal-Gaussian PDF to segment the image.

The method is explained briefly, first, we obtained a UV-image of the paper money using UV-LED illumination.The UV image was separated into the RGB value and we selected the G value. Next, find the gray-histogram of the Gvalue and then find optimum mixture component number selection by using BIC and standard deviation. Then, UVimage segmentation by using GMM. As shown in Fig. 8, the UV-image was segmented into five parts. Then, It was classified as the background from the first part until the third part. And the fourth part and the fifth part were classified in the ultraviolet pattern. However, this classification is little by little difference. Because, the shape of fluorescence pattern is different for each kind of paper-money. When the fluorescence pattern of the paper money was big, the UV pattern existed in the fourth part and fifth part. However, when the fluorescence pattern was small, the UV pattern only existed in the fifth part.Therefore, in order to segment the UV pattern using GMM,we have to choice the part from segmented UV-image. This judgment was performed according to the characteristic of the paper money. Fig. 9 shows the segmented image of the UV pattern according to the characteristic of the paper money

The colour detection algorithms scan every frame for pixels of a particular quality. To recognize a pixel as part of a valid object, its Y, U and V components must fall within the ranges defined in the Thresholds section of the colour definition file. The latter is a regular text file with at least two sections, Colors and Thresholds. The Colors section has an entry for each object to be detected. It defines an RGB colour triplet, a merge parameter (0 … 1), a colour identifier (0 … 31) and a colour label (text). Every entry in Colors must have a corresponding entry in Thresholds. The latter defines

ranges for a pixel's Y-component (brightness), its U-component (first colour attribute) as well as its V-component (second colour attribute). A typical colour definition file has the following structure. A suitable choice of these ranges can easily be made using the camera training utilities trainCamera (working of live images).

A video camera is designed to capture an image – either a single "frame," or a series of frames, over a period of time. Prior to solid-state cameras, video cameras used photosensitive "tubes," similar to television or *cathode ray tubes* (CRT), to convert incoming light into an electronic signal that could be sent to a monitor or transmitter, or to video recorders which used magnetic "heads" to capture images on coated (magnetic) tape. Modern solid-state cameras can capture images in a broad range of light conditions. It is possible to produce an image using a shutter speed of less than 1/800,000 second, or to leave a shutter open for many seconds to accumulate necessary light. Cameras are designed to work in both of theses extremes. Examples would be a time exposure to photograph a dim star, or an extremely quick shutter speed to capture a bright explosion. the sensitivity of its cameras using the *lux* unit of measure, which is based on the amount of light falling on a given area (1 lux = 1 lumen per square meter). This rating provides an indication of the minimum illumination level at which the camera can produce a reasonable image, and is determined by JAI without a lens attached to the camera. A lens with an aperture of f/1.4 reduces the specified sensitivity number broughly a factor of 10.

ALGORITHM:

A. Color histogram (CH) method for an image:

It is constructed by counting the number of pixels of each color. Histogram describes the global color distribution in an image. The computation of color histogram just involves counting the number of pixels of specified color. Therefore in an image of resolution m*n, the time complexity of computing color histogram is O (mn). It is quite insensitive to small change in VP this feature is particularly desired in this project asthe VP from which the image of currency note will be acquired can change. Color histogram method will suit when the segregation is to be done between a range of colors and a prominent color. Color histograms describe which colors are present in the image and in what quantities; color histograms provide no spatial information. Color coherence vector is a refined approach of coherence histogram. In this approach, the local properties of images are taken into consideration as contrast to CH method

that is a global one. In this method, regions are based upon the coherency. The color-indexing algorithm uses the back-projection of binary color sets to extract color regions from images
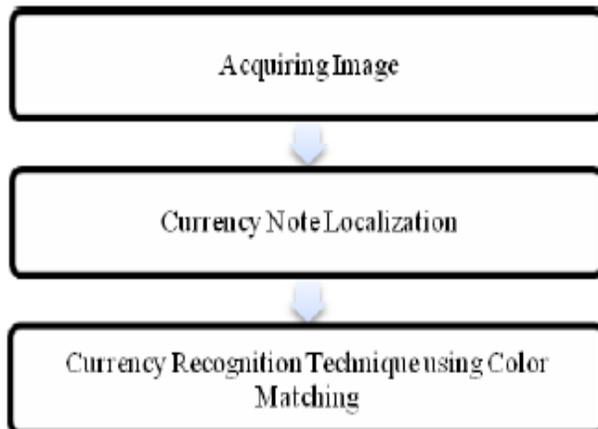

Figure 1: Currency Localization System.

The image is taken from a webcam and is stored in a 3D array. The coordinate of the pixel in 2D image is given by the first and second index of the array and the third index stores the RGB (Red-Green-Blue) intensities for each coordinate. Each element of array stores an unsigned 8 bit integer (0-255). The limit of first two indices of array determines the resolution of the image. In our current scenario, this limit is set to be 640 for the first index and 480 for the second index.

- The images are taken under following assumptions:

- No occlusion or shadowing is there and image is taken in a clear environment.

- Distance of camera is nearly fixed from the object and within a small range of variation.

- Resolution of the image is fixed to be 640 X 480 so that any basic camera can be used for the purpose of taking image.

- The orientation of the currency notes was such that the sufficient amount of data required for further processing of even a single face was at least visible.

- The currency notes are of good quality i.e. they are not very much full of stains.

B.CURRENCY NOTE LOCALIZATION:

The image obtained from the camera may not be directly used for localization and requires enhancement. It involves applying some procedures like "Noise Reduction" "Normalization" and "Contrast Enhancement".Next we subtract the background from the image and convert it from RGB to gray. After this conversion of the image, we detect the edges present in the image using some edge detection techniques present in the Image Processing Toolbox of Matlab.Canny operator is selected in our technique to detect the edges prominent in the note.

Currency note localization is done by applying scan line algorithm on the image after edge detection. The number of pixels present in each line is counted while the image is scanned from left to right line by line. The line that contains the number of pixels greater than the set threshold is highlighted (marked). Likewise is applied from top to bottom.
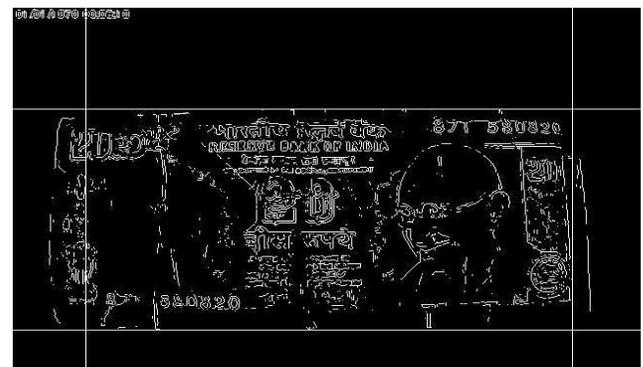

Original image taken by the Camera.

Image after applying localization technique.

C.Currency Recognition Technique using Color Matching:

After the localization of Indian currency note, our next step in the algorithm is color matching. The Color Threshold module is used to remove parts of the image that

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fall within a specified color range. This module can be used to detect objects of consistent color values. The interface displays the Red, Green and Blue histograms. Histograms chart has pixel value (0-255) on the X axis and number of pixels (0-image size) corresponding to that color value on the Y axis. Using histograms, we can filter pixels with those values out of the image leaving the desired object in view.

If R<R_min_thres or R>R_max_thres then R=0

If G<G_min_thres or G>G_max_thres then G=0

If B<B_min_thres or B>B_max_thres then B=0

Here the min_thres and max_thres for the three RGB components is the minimum and maximum threshold limit present in any currency note and is determined by experimenting on various different values.The image resulted after applying localization technique in shown.
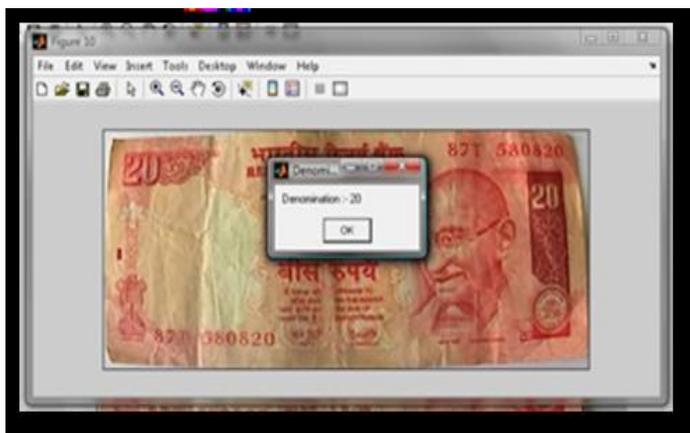

Image obtained after successful application of
currency note recognition System.

         If the note is original then the web-camera will takes its picture and passes the information to the PC MATLAB. Program in the matlab scans the note by colour.As we know that the colour of the 10 Rupee note and 20 Rupee note are different.This mechanism is used by the PC MATLAB algorithm.It will assign 2 to the 20 Rupee note and 1 to the 10 Rupee note.This data of 2's and 1's is sent to the controller 89V51RA2.

3. CONTROLLER 89V51RA2:

         The work of controller is to identify the data sent by the PC MATLAB in the form of 2's and 1's.The controller knows that

a.1 = 10 rupee NOTE.   b.2 = 20 rupee NOTE.

    The controller knows that now it has to generate coins in the multiples of 5 and 1 or mix coins.

 4.KEYPAD:

         Keypad is the user interface.There are 4 keys on keypad:

    1.start
    2.1rupee coins
    3.5rupee coins
    4.mix coins

 Now the user can select the combination in the form of 5's,1's or 5's and 1's.

5.COIN COTAINER: This unit consists of 2 relays.

1.Relay 4: Relay 4 is used to drive the motor 3

2.Relay 5: Relay 5 is used to drive the motor 4

Motor 3 will let out the 1 rupee coins to the user and motor 4 will let out the 5 rupee coins to the coins to the user.Incase of mix coins,the controller will check for availability of coins in the coin container and then as per the wants of the user from the keypad,the mix coins will be let out to the user.If the coins as per the need of the user are not present in the coin container then a message will be displayed on the LCD "INSUFFICIENT COINS".

FLOWCHART:

2. Reliable

3. Requires less power supply .

IDEA OF UR PROJECT IN SHORT:
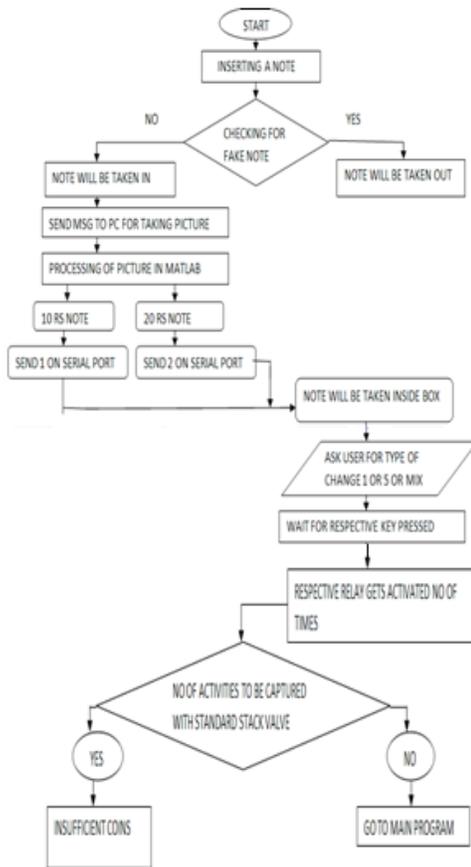
APPLICATIONS:

1.Railway Stations Where people need change for the tickets.
2.Bus stations
3.Mall's and Parks
4.To make call from the coin box

FUTURE DEVELOPMENTS:

In the future we can extend note and coin capacity upto 100 rupee notes and can make provision for the system to recognize the difference between 1 and 2 rupee coin.This will make the system equipped with 2 rupee coin.

ADVANTAGES :

1. User friendly

CONCLUSION:

We are going to develop an interactive system that generates currency recognition system using localization and colour recognition with the help of MATLAB. The proposed system will be useful in day to day life of every common man where people have to suffer for change at many public places.As mentioned in the applications this project is an real time application for all real time places.In the future this system can also be applied in the buses itself.This will be a relief for the conductors and passengers .