

Implementation of Automatic Ticket Dispenser System with Retrieval of Balance

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Abstract- In this progressive world, Transporting is a hefty expanding business across all countries and people desire to use the public conveyance than of their personal transports because of the upswing in petrol cost and other pecuniary reasons. The passenger requirements from a ticketing system based upon the data collected from the device. To make the system as automatic we are going for automatic ticket vending system using PIC Controller. This project will return coins for the given note, and for this purpose we have developed mechanical coin dispensing model and also sends the ticket for the amount. By using image processing technique, the note is identified. In this way we are trying to design an efficient machine which will be having low production cost as compared to other existing machines. In this project we have developed a MATLAB coding for image binarization to detect the value of note.

Keywords- Automatic Ticket Vending Machine, Image Processing, PIC Controller, MATLAB

I. INTRODUCTION

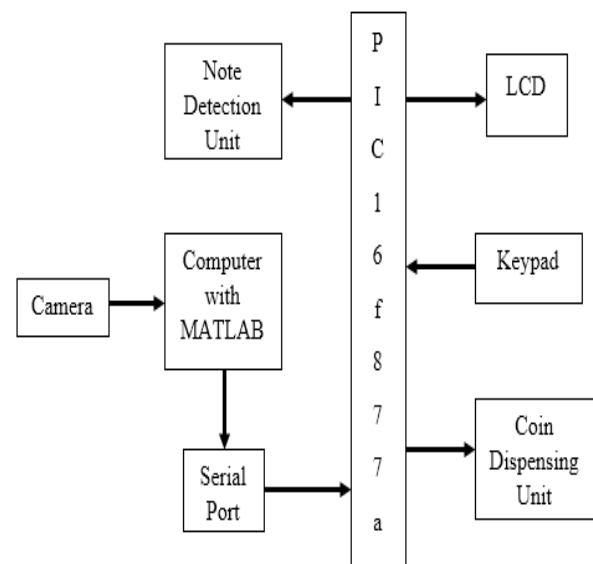
The most popular means of transportation is train which is increasingly becoming a tool to support a city's development over the long term. Transport ticketing is under review and there are plans to introduce a multi-modal, multi-operator ticketing system. The purpose of this paper is to examine what passengers require from their ticketing system with regard to the means and method of payment and the kind of information they require from an at-stop ticketing vending machine. In our machine, the passenger can select the source and destination of the place where they have to be. So after the destination has been selected, the ticket amount will be displayed in the LCD. Our Machine is designed only to accept ten rupee note and based on the distance the remaining amount will be returned back in the form of coins which is done by the motor used. Once the user feeds these details the system will operate to sends the ticket which is readily available. The proposed concept is to replace the manual work in traditional ticket system into embedded based ticket system. To make the system as automatic and also to ensure the comfort journey we are going for automatic ticket vending system using Image Processing Technique. Ticket friend solution mainly proposed to overcome the tricky problems in traditional ticketing

method like transferring tickets from one person to another, sharing of tickets, to avoid confrontation i.e. mesh between the supervisors and passengers and safer handling of data. It also supports cancel feature means a user can withdraw the request any time and entered money will be returned back.

II. METHODOLOGY

The Machine has microcontroller and motor unit to perform the operation given and it accepts note and camera takes picture of note. With help of computer having MATLAB program checks which note it is. Once the note is recognized, coins for the balance amount will be dispensed out of the holder by using the motor. The original image taken from the camera is in RGB format and it is converted into HSI image format. S-Plane image is extracted from HSI image format for calculation and threshold purpose. Then according to MATLAB coding, Output is generated and sent over serial port. And same is shown on command window. Once the value is received by controller from PC, the remaining change will be given out by the motor unit according to the program fed to the controller. Motor rotates to dispense the coins. After dispensing of coins motor actuates to drop the note inside the machine.

A. Block Diagram



B. Construction

The circuit uses microcontroller with mechanical structure which have motors to perform requested tasks. Microcontroller is provided with 5 volt supply and Motor with 12 volt supply. Coin Stack holds the number of coins and depends upon the response from the controller, remaining balance will be sent out it. LCD displays the source and destination of the passenger, amount for the travel according to the distance and also the remaining balance to be given.

III. PROJECT DESCRIPTION

The Hardware consists of

1. Microcontroller development board to control overall working of project. Microcontroller controls all motor operation and it communicates with MATLAB running on computer.
2. Drawer to place a note.
3. Camera to take picture of note
4. Coin stack to store coin inside a machine.
5. Motor driver board. Three motors, two for coin dispensing of Rs1 and Rs2 and one for ticket dispensing.

The Machine consists of three main parts

1. Note Placing Unit
2. Coin Dispensing Unit
3. Ticket Dispensing Unit

Note Detection Unit that will identify the notes which is inserted into the machine. The Camera placed in this unit takes the picture of the note and find out its value using image processing technique. Thus to detect the value of the note, we have developed a MATLAB coding for image processing. Depend upon the value, the controller says whether it is ten rupee note or not.

Coin Dispensing Unit has coin stack which stores the coins inside the machine. Through the serial port, the output of the MATLAB coding from the PC is given to the controller. Then according to the value given to the microcontroller, it will find the remaining amount to be given out. For that PIC microcontroller is already pre-programmed to do the operations. Thus to dispense the coin out of the holder, motor is used.

Ticket Dispensing Unit has a ticket stack which stores the ticket inside the machine. After the balance amount is given back, the ticket will be send out of the machine by using the motor.

Table 1. Various features present in Indian Currency Notes.

Currency	Color Component in the currency note	Size	Identificati on mark in the left middle section of the note
Rs. 5	Green.	117x63 mm	-
Rs. 10	Orange-Violet.	137x63 mm	-
Rs. 20	Red-Orange.	147x63 mm	Vertical Rectangle.
Rs. 50	Violet.	147x73 mm	Square.
Rs. 100	Blue-Green at center, brown-purple at two sides.	157x73 mm	Triangle.
Rs. 500	Olive and Yellow.	167x73 mm	Circle.
Rs. 1000	Pink.	177x73 mm	Diamond.

A. Image Processing

There are various methods available for the detection of rupee note denominations. Some of them are Histogram, Edge Detection, RGB model, CMY model and HSI model.

An image histogram is a type of histogram that acts as a graphical representation of the tonal distribution in a digital image. Image histograms are present on many modern digital cameras. The horizontal axis of the graph represents the tonal variations, while the vertical axis represents the number of pixels in that particular tone. The left side of the horizontal axis represents the black and dark areas, the middle represents medium grey and the right hand side represents light and pure white areas. The vertical axis represents the size of the area that is captured in each one of these zones.

Edge detection is an image processing technique for finding the boundaries of objects within images and aim at identifying points in a digital image at which the image brightness changes sharply or, more formally, has discontinuities. Edge detection is a fundamental tool in image processing, machine vision and computer vision, particularly in the areas of feature detection and feature extraction.

The RGB color model is an additive color model in which red, green, and blue light are added together in various ways to reproduce a broad array of colors. The model is based on a Cartesian coordinate system

- RGB values are at 3 corners
- Cyan magenta and yellow are at three other corners
- Black is at the origin
- White is the corner furthest from the origin
- Different colors are points on or inside the cube represented by RGB vectors

The main purpose of the RGB color model is for the sensing, representation, and display of images in electronic systems, such as televisions and computers, though it has also been used in conventional photography.

The HSI (Hue, Saturation, and Intensity) color model describes a color in terms of how it is perceived by the human eye. The HSI model is also a more useful model for evaluating or measuring an object's color characteristics. The HIS model uses three measures to describe colors:

- Hue: A color attribute that describes a pure color (pure yellow, orange or red)
- Saturation: Gives a measure of how much a pure color is diluted with white light
- Intensity: Brightness is nearly impossible to measure because it is so subjective. Instead we use intensity. Intensity is the same achromatic notion that we have seen in grey level images

The hue is determined by an angle from a reference point, usually red. The saturation is the distance from the origin to the point. The intensity is determined by how far up the vertical intensity axis this hexagonal plane sits.

B. Image Acquisition

This step is one of the most important and crucial phase for obtaining a good result. Camera will take picture of every incoming note and will forward it to processing unit. The captured images are converted to HIS Image. Raw images obtained from camera are larger in size. Hence, we need to have some resizing methods so as to lower the size of images and as well to make all images of equal size. The raw images were resized using bilinear interpolation.

C. Rupee Detection Module

The machine is designed to detect the ten rupee note by using the image processing technique with the help of MATLAB coding. The steps for detection of rupee note denomination are

1. Initialize.
2. Set COM port for serial communication.

3. Get snapshot of note by using camera.
4. The captured image is sent into the matlab as an input image
5. Convert the original image to gray image
6. Resize the image and remove the small components from the image using bwareaopen command.
7. Then convert the gray image to binary image and find its size.
8. By using its size, the denomination of rupee note is found.

D. Microcontroller Module

The communication between PIC microcontroller and MATLAB takes place through serial communication between UART module of PIC and serial port of PC. The result from matlab is sent for the identification of rupee note. The controller is already pre-programmed to give the change for certain denomination. The steps for microcontroller are

1. Initialize
2. Set coin counter as per stack of Rs 1 and Rs 2.
3. Wait for eject key to be pressed.
4. When eject key is pressed motor actuates and tray comes out.
5. Send "*" to serial port.
6. Then MATLAB code is executed to check denomination.
7. If 1 is received by controller from PC, Controller checks coin counter which indicates coin sufficiency.
8. If coins are sufficient then motor rotates which dispenses the coins.
9. After dispensing of coins motor actuates to drop the ticket inside the machine.

IV. CONCLUSION

It was observed through different scenarios, that PIC controller based vending machine give fast response and low power consumption and easy to use by an ordinary person and also provides an interactive system that generates currency recognition system using color model and binarization technique with the help of MATLAB. Our results clearly indicate that PIC controller based solution increases the efficiency and accuracy of vending machines. Also we can monitor the PIC based vending machine with the main frame computer. Its algorithm is very flexible and reliable as the vendor can easily enhance the algorithm for large number of different denominations at low cost vending machine.

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