

CONVEYOR LINE OBJECT SORTING BY IMAGE PROCESSING

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Abstract- The main aim of this project is to simplify how different products manufactured in a industries. It can be put on a single conveyor for its proper distribution in a random sequence. To improve this process, image captured by the web camera can be processed with image processing techniques using software like MATLAB. This image processing technique and color detection techniques are applied for the taken image and the proper output is obtained in this project. It aims in sort the objects by color, which is coming on the conveyor by picking and placing the objects in its respective defined place. Thereby eliminating the complicated work done by human, achieving accuracy and speed in the work.

Index Term: Webcam, MATLAB, Image processing, Atmega16, conveyor belt, DC motor.

I. INTRODUCTION

Color is one of the most important features of an image, if color in a live video or in a digital image can be detected, then the results of this detection can be used in various industrial applications. In this paper Image processing toolbox in MATLAB is used for detection of a particular color in a given image. Image Processing Toolbox provides wide variety of referenced algorithms, methods and applications for image processing, visualization and segmentation. MATLAB based Image Processing is most commonly used platform for implementation of an image based algorithm. An image can be represented using many color models like gray-scale, RGB, HSV, CMYK etc. Here RGB model is used to detect the colors in an image. RGB model is a color model in which red, green and blue lights are added together in various ways to produce wide range of colors. Color and size is the most common feature to distinguish between objects, sorting, recognizing and tracking the components. Image processing captures a two-dimensional image as the input of a system and producing a modified image. Image processing is a type of signal dispensation, which outputs as an image or gives characteristics associated with that image. Image processing basically includes 3 steps (a) Importing the image with an camera, (b) Observing and manipulating the image which includes data compression and image enhancement and at last, (c) Output can be image or report that is based on image analysis. The Image processing techniques are cheap and are less time consuming.

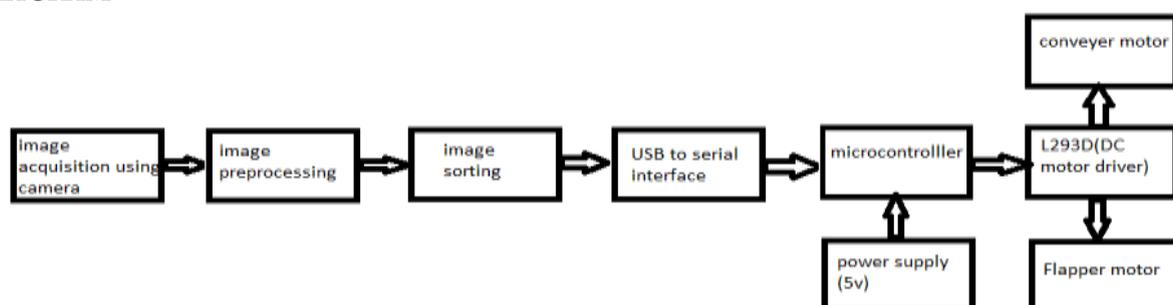
II. RELATED WORK

Dhanoj M, Reshma K V, Sheeba V, Marymol P, "COLOUR SENSOR BASED OBJECT SORTING ROBOT USING EMBEDDED SYSTEM", Vol. 4, Issue 4, April 2015. This paper presents an application to sort colored objects with a robotic arm. We have a robotic arm which picks different colored cubes and sorts them placing in different boxes or containers. The detection of the particular color is done by a light intensity to frequency converter method. The robotic arm is controlled by a microcontroller based system which controls DC servo motors. This robot is used for pick the object from one place and place that objects in required boxes with respect to its color. Some industrial works are harmful for humans this robot is mainly used for reduce the risk process and consuming time and avoid labors. It is build by microcontroller, DC motor and color sensor. The arm's end, reflector, is capable of picking and releasing both wet and dry objects.

Taniksha Singh, Pradnya Kadam, "Object Sorting by Robotic Arm Using Image Processing", Volume: 03 Issue: 04 | Apr-2016. In this paper, computer vision is carried out with assistance of Open CV and the robotic arm, which is motored by microcontroller. Different algorithms build in microcontroller, enables the robotic arm to either sort the objects based on fault like missing drill holes, improper shape or some other faults. The robotic arm used in this project work is used to sort the object moving on moving disk. Depending upon faults detected into predetermined categories.

Snehal Shirgave1, Aishwrya Salunkhe, Khadija Shirgave, S. Y. Upadhye, "Color Sorting Robot", Vol. 6, Issue 3, March 2017. In this project the developing of a color sorting robot has been achieved by using Color sensor. The color sensor TCS3200 gives precise output. It can be improved by using different advanced color sensors and microcontrollers. TCS3200 color sensor detects reflected light from an object which is in the range of visible light spectrum and converts it into frequency with the help of inbuilt current to frequency converter and gives us output in the form of frequencies of RGB components.

III. BLOCK DIAGRAM



Block Diagram Description:**Image acquisition**

Image acquisition in image processing can be broadly defined as the action of retrieving an image from some source, usually a hardware-based source, so it can be passed through whatever processes need to occur afterward. Performing image acquisition in image processing is always the first step in the workflow sequence because, without an image, no processing is possible. The image that is acquired is completely unprocessed and is the result of whatever hardware was used to generate it, which can be very important in some fields to have a consistent baseline from which to work. To start with the object on the conveyor, image is captured by the camera and is sent to the MATLAB workspace. The input image obtained from the webcam cannot be directly given for processing.

Image pre-processing

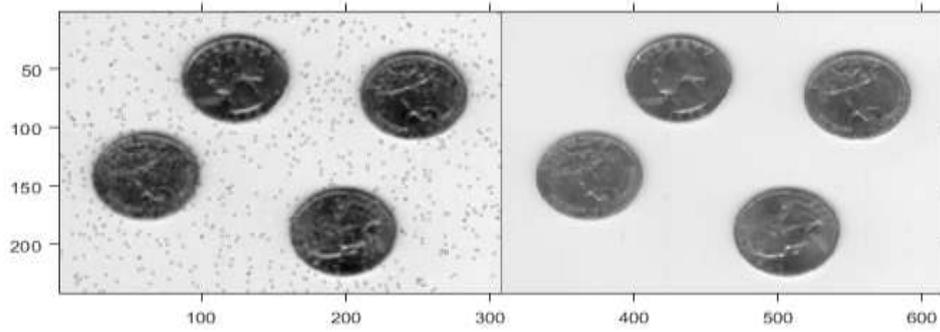
Pre-processing is applied on images at the lowest level of abstraction and its aim is to reduce undesired distortions and enhance the image data which is useful and important for further processing. It is usually necessary and required for improving the performance of image processing methods like image transform, segmentation, feature extraction and fault detection.

Image pre-processing refers to operations done before a key processing step, such as:

- 1) Filtering
- 2) color transforms

FILTERING

Noise reduction plays an important role as the pre-processing method in image segmentation. Digital images are prone to various types of noise. Noise is the result of errors in the image acquisition process that result in pixel values that do not reflect the true intensities of the real scene. There are several ways that noise can be introduced into an image, depending on how the image is created. For example: If the image is scanned from a photograph made on film, the film grain is a source of noise. Noise can also be the result of damage to the film, or be introduced by the scanner itself.

**Color transformation**

In image preprocessing, color transformation is most important. In color transformation, the color image is converted into grayscale image and further it is converted into the binary image i.e. in black and white image.

Image sorting

After the preprocessing the image data send to microcontroller. Program run on image and the desired output send to sorting mechanism. The sorting mechanism consists of a flapper motor and a conveyor assembly. According to the size and color the flapper motors with help of linear actuator places the objects in their specified place.

SYSTEM COMPONENT:**1. CONVEYOR BELT**

It is mechanically movable belt usually made of polyester which is used for transporting the object. It has two or more pulleys, with a continuous loop of conveyor belt - that rotates about them. The drive pulley is the powered pulley while the idler pulley is unpowered pulley.

2. CAMERA

Web camera Intex IT 306WC is used to capture images of colored objects. These images are used by MATLAB for detection of color and according to the basis of that color objects are getting sorted. With a simple clip-on mechanism, we can connect it to the laptop. It has an 8MP camera; it delivered sharp, crisp image quality with image resolution 3280*2460.

3. MATLAB

The system describes a visual sensor system used in the field of robotics for identification and tracking of objects. The program designed to detect and capture an object through PC based camera using MATLAB software. It describes image capturing processing technique, followed by an introduction to actual robotic application to track the object using serial COM port of the computer. The whole system follow object can divide into four blocks: image acquisition, processing image, decision-making, and motion control. Acquisition can be achieved with a computer-based camera or digital video camera. This device will capture the image and send it to the processor for further processing in the computer. Image processing involves the conversion of RGB colored image into grayscale images, setting threshold levels and setting of cut-off values to remove noise from the binary image. Decision making is done with help of software program

4. DRIVING UNIT

A driving unit consists of a motor which is coupled to a laptop for feedback. A dc motor is a closed loop mechanism that uses feedback to control its motion and final position. The input to its control is a signal which is representing the position commanded for the output shaft. We used 12 volts DC gear motor to drive the pulley. Polymer bar is used as the coupling between the motor and shaft of pulley.

5. CONTROLLER

We are using atmega16 microcontroller for our sorting system. It is the brain of our system. It has 40 ports. Each port can perform different kind of functions as per coding.

6. POWER SUPPLY:

We are using self-made power supply. The power supply we made can take 240 volt and can convert it into the 5volt and 7volt.

IV.WORKING

Step I. Object Placement: It is the first part of the system in which all objects that are to be sorted are placed on the conveyor belt. Objects having different size, and color are to be placed on the conveyor belt. After placing an object on the conveyor belt, start conveyor for further processing.

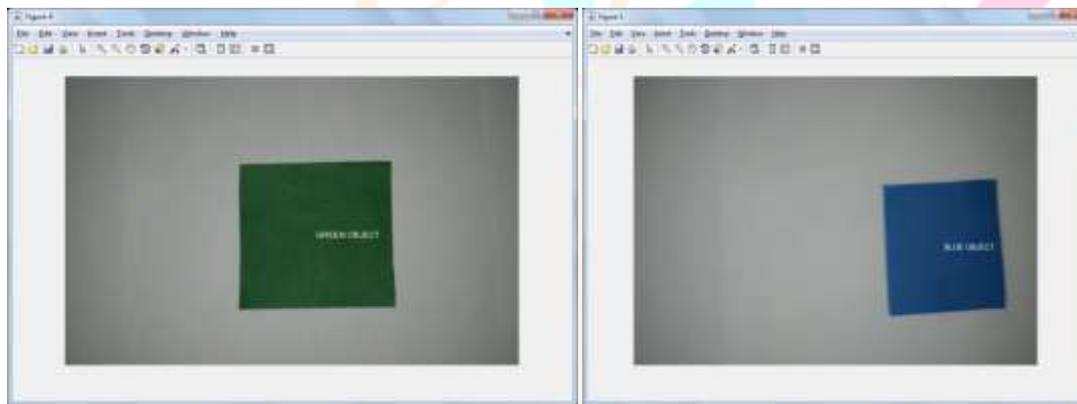
Step II. Image Capture: After placing the object on the belt, the belt is takes a stable position. The camera used in this case will be overhead and it will take the snapshot of the object for sorting purpose. With the help of camera real time image of an object is taken. This image should be good quality and which is send to PC with MATLAB software.

Step III. Image Processing: The image captured by the camera is then transferred to the PC in which different image processing algorithms are applied on it. Important terms related to image processing: *Pixel*: Pixel is the building blocks of an image. In other words, a pixel is the smallest possible image that can be detected on your screen. RGB Image: An image is composed of the three primary colors, Red, Green and Blue. Hence is called as RGB image. Binary Image: An image that consists of mainly black and white pixels. Grey scale Image: It contains intensity values ranging from a minimum to a maximum and in between varying shades of grey. Typically, this range is between 0 and 255.

Firstly, the image, that is captured by the camera is send to the PC via microcontroller, is a RGB image. This RGB values are converted into grey scale values. Then this grey scale image is converted into binary image using thresholding. Thresholding is the simplest method of image segmentation. From a grayscale image, thresholding can be used to create binary images. Thresholding replace each pixel in an image with a black pixel. This converted image is saved as a new image and using binary image segmentation the object is sort on color basis.

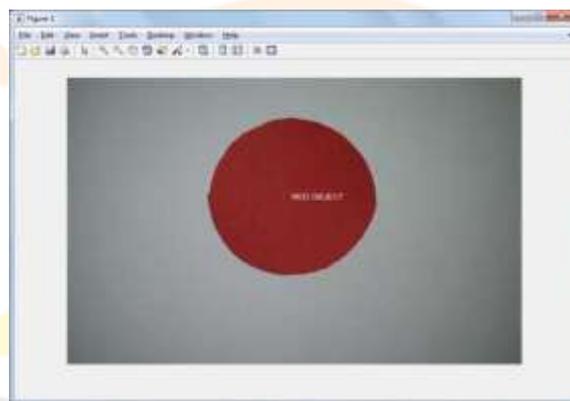
Step IV. Instruction to L293D: Once the object is detected, the PC via microcontroller sends commands to the dc motor present on the conveyor. This motor rotates the pulley in a circular motion. By rotating the belt, the object is moved from the camera and bought in front of flapper. Thus the dc motor helps move the object where the sorting takes place.

V.RESULTS:



1. Detection of Green Color

2. Detection of Blue Color



3. Detection of Red Color

VI. ADVANTAGES:

- 1) In small and large scale industries.
- 2) Time saving than the manual method.
- 3) Failure rate is low with long life.
- 4) Speed of operation is high.
- 5) Highly productive.

VII. APPLICATIONS:

- 1) Medicine and wine industry.
- 2) Food industries.
- 3) In agriculture industries.
- 4) In robotics application.

VIII. FUTURE SCOPE:

- 1) Replacing DC motors by stepper motors to increase accuracy.
- 2) Modifications can be done to inspect cracks, defects on the surface of the object etc.

IX. CONCLUSION

According to this review paper, I have concluded that by using image processing application we can easily sort out different color objects from each other like a red, blue, green. By using this system time required for sorting objects from the each other decreases than conventional separation system. It is also helpful to minimize labour cost, time and power. It is very useful for small and medium scale industries. It improves the accuracy.

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