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Review on Object Sorting Robot Base on Shape

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Abstract:

In present days, all industrial systems are fully automated. Object sorting is one of the popular system for industrial applications. In past days humans are used for the object sorting but it was the time consuming process for large number of objects in industries. Replacement of human operators with robotic arm will reduce human efforts and also provides high accuracy & efficiency. Robotic arm operating using ARM7. Detection of shape is using image processing in MATLAB. Robotic arm is control by microcontroller with DC motor. This paper presents review on object sorting base on shape of object using image processing. Image is captured by using camera, then image processing is perform for shape identification. This project deals with fully automatic industrial material handling system. The aim of this object is the separate out objects according to it's shape.

Keywords **— ARM7, robotic arm, image processing, MATLAB, DC motor.**

I. INTRODUCTION

A **process automation** or **automation system** (PAS) is used to automatically control a process such as chemical, oil refineries, paper and other factories. Today's world is the world of technology as well as science. Due to automation, life has become fast and luxurious. As the technology is growing most people are adopting the new technologies rather than using the old.

The progress in technology is making people more demanding towards the things they use and consume, this is the reason why everything is automated. The use of Image processing techniques for separation of grain. It is inexpensive and is less time consuming.

Object sorting Robot is one of the useful, costless and fastest systems in Industrial applications to reduce manual working time and provides less human mistake when manual system is undertaken. The objective of this project is to design an efficient, microcontroller based system that pick up right shaped objects and put it down at right place to optimize the productivity, minimizing the cost of the products and decreasing human mistakes.

Shape based sorting is extensively used in many industries for sorting purposes to ensure the quality of the object is up to the mark e.g. Food processing industries, pharmaceutical industries, automotive industries, agriculture industries. Such sorting reduces the human effort, labour cost and also time of operation. Most of errors caused by humans due to their limited potential are eliminated due to use of automated system supported by shape based sorting using image processing.

The field of robotics is growing with a faster rate in recent years and many advanced technologies are coming up with their own advancements. Robots due to its ease of operation used in domestic, industrial and military purposes thus the horizons of this field are increasing day by day. The roboarm used in this project work is used to sort the objects depending upon its shape properties into the predetermined categories.

This robotic arm is controlled by the controller used i.e. ARM 7 which is a 32 bit microcontroller having RISC architecture. This controller is programmed to move the dc and servo motors used in roboarm. The roboarm is manufactured using aluminium brackets which are durable and lightweight. The gripper is used to hold object which is fitted at the tip of the roboarm.

The software development is the vital task in the proposed project development. The software is entirely coded in MATLAB to check the shape of the object used for sorting purpose. Thus by using fully automated system the time required for the sorting process is reduced to the great extent, so

proposed system is fast, accurate, economical, robust and cost efficient.

II. PROPOSED METHOD

Fig. 1 shows the block diagram of the proposed method.

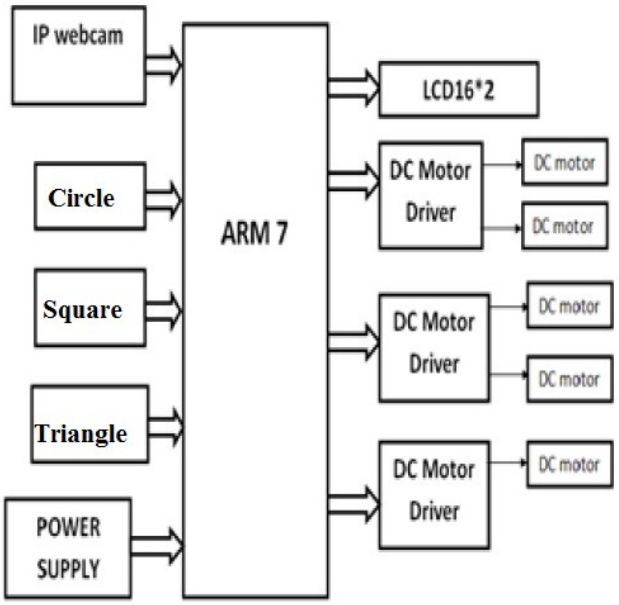

Fig.1 Block diagram of praposed system

Microcontroller is the central processing unit, used to control all the functions of other blocks in this robot system.Microcontroller takes or read data from colour from MATLAB software and controls all the other functions of the system by manipulating these data. Microcontroller control the motor on the robotic arm to pick a particular shape object, as per the signal from image processing microcontroller can understand the shape of the object, it control the arm motor to move towards the specified location, again control the gripper motor to release the object into that particular location.

Microcontroller cannot drive a motor directly, so a motor driver is used here. The motor drive section accept the low level signal from the ARM controller and to provide sufficent voltage and current excitation to the motor. Motor driver is require to provide an interface between the 5V logic signal from the microcontroller & the high current high voltage power is used to drive the motor, because motor is an electromechanical device, which converts electrical energy to rotation or mechanical energy. For this energy conversion large amount of current is required. This amount of energy cannot be provided by the microcontroller. Therefore motor interface is used here. The motor drive section should be able to accept all the low level logical signal from the microcontroller and to provide necessary voltage and current excitation to the motor. Motor is used to drive the robotic vehicle. DC motors are well suitable because which have lesser rpm like 30 or 45 and have sufficient torque which is able to drive the all kind mechanical load. A 12V motor is preferable because which can be easily connected to 12V battery. Hence we use dc motor for drive the robotic vehicle.

Fig.2 gives the flow of image processing.The input image taken by the input device is first converted to hue, saturation, and lightness (HSL) color space where only *L* value will be processed. The processed *L* component will be used as template to determine the shape to produce the final output.

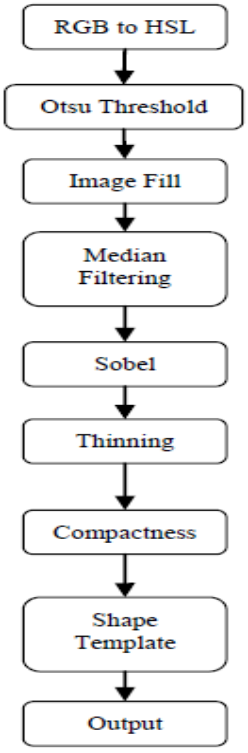

Fig.2 Flow of Image Processing

III.LITERATURE REVIEW

A.Object Shape Recognition in Image for Machine Vision Application

Mohd Firdaus Zakaria, Hoo Seng Choon, and Shahrel Azmin Suandi

This paper proposed shape recognition method where circle, square and triangle object in the image will be recognizable by the algorithm. This proposed method utilizes intensity value from
the input image then thresholded by Otsu's method to obtain the binary image. Median filtering is applied to eliminate noise and Sobel operator is used to find the edges. Thinning method is used to remove unwanted edge pixels where these pixels may be counted in the parameter estimation algorithm, hence increase the false detection. The shapes are decided by compactness of the region.

B. Design and Implementation of A Robotic Arm Based on Haptic Technology [1]:

According to Abidhusain Syed, H, Agasbal and Zamrrud Taj, this paper deals with designing a haptic robotic arm, which can be used to pick and place the objects. In this paper, a robotic arm with four degrees of freedom is designed and is able to pick the objects with a specific weight and place them in a desired location. To facilitate the lifting of the objects, Servomotors with a torque of 11 kg are used. The programming is done on ATMEGA-328 Microcontroller using Arduino programming. The Microcontroller along with input pins is soldered on a PCB board.

C. Object Sorting Robotic Arm Based on Colour Sensing [3]:

In this paper Mr.Aji Joy, proposed to separate the objects from a set according to their colour. This can be useful to categorize the objects which move on a conveyer belt. The proposed method of categorization is based on colour of the object. In this paper the system categorize balls of three different colours. The detection of the particular colour 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.

D. Automation of Object Sorting Using an Industrial Robo arm and MATLAB Based Image Processing [7]:

According to Prof. D. B. Rane and Gunjal Sagar S, in recent years the importance of process automation has been increased as the growth of any industry is directly depends on it. For precise output and accuracy of industrial process robots with sophisticated sensors are used. In modern era application of image processing in many industrial processes has proven its prevalence and dominance. This paper present color based object sorting system which uses the machine vision and the operations in image processing. The proposed work is to develop compact, easy and accurate objects sorting machine using real time color image processing method to continuously evaluate and inspect the color deformity using camera based machine vision. After the evaluation of quality the object is sorted into predefined quality groups with the help of pick and place roboarm. If the inspected object fails to follow quality norms it is rejected out by the system. The proposed system will have broad areas of applications in many fields where continuously evaluation of the quality is required.

IMAGE PROCESSING SURVEY

Primary & prominent process of computer technique comprises of processes defined for image processing also known as digital image processing. Image processing captures a two-dimensional image as the input of a system and producing a modified image . Present image processing tends to refer to the digital domain where the color of each pixel is specified by a binary digits. But many techniques are common to analog signals and even optical images. Image processing is a type of signal dispensation, which outputs as an image or gives characteristics associated with that image. Image Processing forms research area within engineering and computer science. Image processing basically includes 3 steps (a)Importing the image with optical scanner or by digital photography, (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 purpose of image processing can be divided into 5 distinct groups' viz. (1) Visualization - Observe the objects that are not visible. (2) Image reshaping and restoration - To create a better image. (3) Image retrieval (4) Measurement of image pattern –Measures various objects in an image. (5) Image Recognition – Distinguish the objects in an image

IV.ADVANTAGES

1. High precision.
2. High accuracy.
3. Time saving than manual method.
4. It gives high degree of intelligence if used with PLC control.
5. Good quality level.
6. Low failure rate with long life.

V.APPLICATIONS

1. In small scale or large scale industries to sort out products based on the shape.
2. In any type of store.
3. In malls and small shops.
4. In various industries to sort the bottles or boxes or bags of various sizes such as medicine and wine industry.
5. Artificial robotic intelligence.

VI.CONCLUSIONS

According to this review paper, I have conclude that by using image processing application we can easily sort out different shape objects from each other like square, triangle, circle. By using this system time required for sorting objects from the each other decreases than conventional separation system. It is also helpful to minimize labor cost, time and power. It is very useful for large scale industries. It improves the accuracy.

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