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A Systematic Approach To Segregate Different Products Using Machine Vision System

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Abstract : In this study, we present an application of image processing techniques for detecting and classifying the industry products, using image pixel value and feature extraction model. In order to sort out different parts, computer vision is used. It recognize parts and find out the features, compare with input data and sort it according to the condition. As per the use of machine vision, the design of computer vision toolbox, image processing toolbox and methods of pattern recognition in matlab are used to recognize object. In this project the system of combining specialized machine vision software platform (matlab image processing) proposed to recognize and sort out mechanical parts on the production line, so as to betterment the development efficiency as well as running speed of the system. In the end of this paper, an experimental example is displayed to sort various mechanical parts by calculating image pixel value and feature extraction model and interfacing between module and camera.

Keywords : Feature Extraction, Computer Vision, Segregation, Matlab Programming, Conyevor System

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I. INTRODUCTION

Machine vision is a science which simulates human vision with the computer. The primary objective of it is to use images to create and restore real world model, then understand the real world. The development of machine vision has been for decades. In the early 1950s scientist name Dr. Roberts studied three-dimensional machine vision. Now machine vision is very interesting and related disciplines such as image processing, computer graphics, pattern recognition, , artificial neural networks and artificial intelligence. Detection system of part size is a modern test technology based on optics, computer images, information process, pattern recognition and optoelectronics. It uses the part of image to detect and transmit information which can extract useful signal to obtain the parameters detected. In this project segregation of industrial products is done. This process is carried out using image processing and computer vision toolbox in matlab.

Image Processing Toolbox provides a combined set of standard algorithms and functions for image processing, analysis, visualization and development . You can perform image segmentation, image analysis, noise reduction , image enhancement, and   geometric transformations Computer Vision System Toolbox provides functions and algorithms, for designing and simulating computer vision and video processing systems. You can perform extraction, feature detection, and matching ; object detection and tracking; motion estimation; and video processing. For 3-Dimensional computer vision, the system toolbox supports camera calibration, stereo vision, 3-Dimensional point cloud processing and 3-Dimensional reconstruction,

A conveyor system is employed for the distribution of products on which the mechanical parts are placed which are analyzed with the help of machine vision system and image processing is done for distribution.

II. 0BJECTIVE

Objective of this project is to create a conveyor system which not only transfers the mechanical parts but also segregate them with respect to their requirement.

III. LITERATURE REVIEW

[1] Immanuel Edinbarough in his paper presented a neural network-based vision inspection system interfaced with a robot to detect and report IC lead defects on-line. It consists

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software that contains a neural network data base for inspecting ics on pcb.

[2] M. Weyrich, Y. Wanga, J. Winkel, M. Laurowsk in there paper they used mahine vision system to inspect potato slices on the moving conveyor using digital image processing and lab view software.

[3] in another paper Dongik Shin worked on inspection of ball stud using image processing and ccd sensor for detecting outlines and 3-D images for proper dimensioning of stud.

[4] Majid Dowlati in his paper on fish quality assessment using machine vision and digital image processing for sorting 7 different species of fishes with the efficiency of 99 percent. He used ccd sensor for image processing.

[5] Kuo-Yi Huang in his paper for Detection and classification of areca In it he used DL algorithm and image processing. He used ccd sensor for capturing images of areca nuts and classified in three grades as Excellent, Good, and Bad grades

IV. PROBLEM DEFINATION

Now a days production in the industries are increasing very rapidly. Due to this one of the major problem they are facing is product handling and distribution . This paper is an attempt for reducing this problem . Currently in industry two type of segregation system are used, these are manual segregation system and segregation by barcode reader system. In manual segregation system product are sorted with the help of human. Humans personally sort out the required product from the group of products and place them on the required conveyor. In barcode system different completed products are sorted by use of barcode technology. In both the segregation techniques there are some drawback , in manual segregation technique human intervention is there but if the industrial atmosphere is hazardous , then in such conditions this type of segregation can't be used . In barcode system barcode can be placed on the product once it is completed , and then by using barcode scanner or barcode reader system they can be segregated. But if company needs to sort components before assembling then the use of barcode system is very tedious to employ.

V. SOLUTION METHODOLOGY

In this approach with the help of matlab, segregation is carried out. To carry out segregation of machine parts using matlab the image processing tool box and computer vision tool box is employed. To carry out this segregation process a conveyor system along with sensors and camera is been used. The mechanical part after its process is preceded on the conveyor system when it comes in contact with the sensor, the sensor will send a signal to matlab through interfacing system. After receiving the signal matlab will send the signal to the camera to capture the image of the mechanical part. After receiving the signal camera gets activated and it captures the image. This captured image is sent back to matlab in which it is compared with standard set of images using computer vision tool box. For comparison of image with standard set, feature extraction (FR) technique is used. In feature extraction technique two images are compared using strong points. The strong points are generated by the program itself taking in consideration some threshold value given by programmer. The program used here compares inline strong points of the image

with the inline strong points of standard set of images. When maximum inline strong points of both the images matched thus that is the required object. After comparison matlab sends a signal to interfacing system. Further the object is proceeded to the respected stations. In this way segregation is carried out.
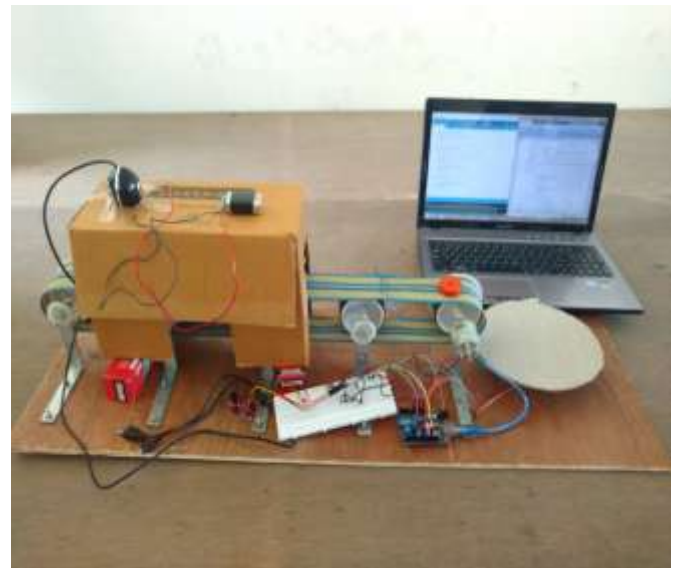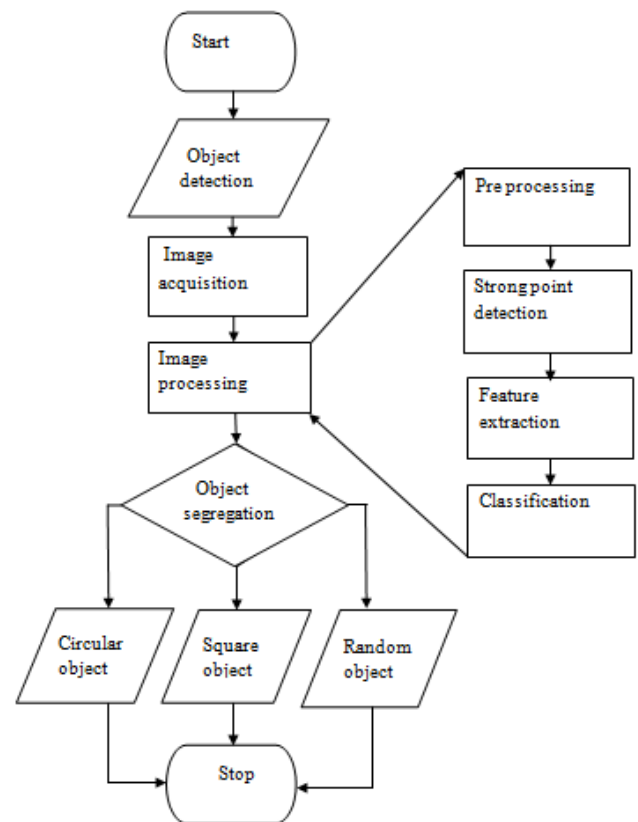

Fig (1) Final Assembly

Fig (2) Work Flow Of The Project

VI. ALGORITHMIC APPROACH

We have tried to follow an non-mathematical approach to simplify the problem of sorting. Instead of analyzing and improving complex and tough mathematical algorithms we have tried to develop simple algorithms which has the following steps.

VI.I. HARDWARE REQUIRED

on the hardware level we have used custom built conveyor system which consists of two two coveyor belts for material handling. it is harnessed with two proximity sensors() which controls the action of conveyor system. for controlling conveyor system, arduino uno r3 dip atmega328p based development board and motor driving circuit is built using is used *l293d motor driver* ic for driving conveyor system

A. Arduino Uno (Atmega328p Based Development Board)

It is a microcontroller board based on the atmega328p. It has 14 digital input/output pins, out of which 6 input analog pins, a 16 Mhz quartz crystal, a Usb connection, a power jack, an also a reset button. It has everything required to assist the microcontroller; simply connect it to a computer with a Usb cable or power it along with the help of battery to get started.

Fig. (3) Arduino uno

B. Proximity Sensor

This sensor can detect metallic products approaching the sensor, without any physical contact with the product. High-frequency magnetic field is generated by coil L throughout the oscillation circuit. When a product approaches the magnetic field, electromagnetic induction takes place by the virtue of induction current (eddy). As the product approach the sensor, the induction current flow increases, which results in increase in load on the oscillation circuit , then oscillation stops. The sensor detects the change in the oscillation state with the amplitude detecting circuit, and produces a detection signal.
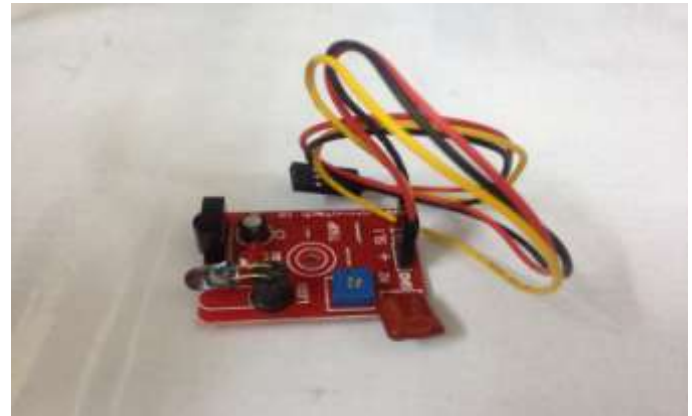

Fig. (4) Proximity sensor

C. *Stepper Motor*:

Stepper Motor has a rotor; it is a permanent magnetic shaft. Also it has electro magnets at stationary positions that surround motor known as stator. Stepper motor is a electromechanical device that converts electrical pulse to distinguish mechanical movement. The shaft of motor rotates with discrete step with incremented electrical pulse applied in proper sequence. Motor movement has various direct relationships with the applied input. Motor shaft rotation is directly related to sequence of input. Speed of motor depends on the frequency of input pulses and length of rotation is related by number of inputs.

D. Camera:

A camera is a optical device having a lens system set along a light-sensitive film for recording images, which can be stored locally or transmitted to another location. Images may be individual still photographs , sequences of image compromising videos or movies. Selection of camera is based on the resolution of the camera and ones need according to our need we have chosen camera resolution of 640x480 pixel.

Fig. (5) Machine Vision Sensor

VIII. ACKNOWLEDGMENT:

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project. We would also like to thank for his patience and belief in us as mentor. We would also like to appreciate the contribution of each member of this group towards the project.

IX. CONCLUSION

This paper presents before you an well versed development approach, that is used for the improvement of a vision-based automatic sorting for processing conveyed objects. This method is based on technologies and application of it which are already present. By using the described system, significant savings time and capital can be achieved. The approach has been implemented and tested on various mechanical parts. The system is able to automatically sort the products. The setup consists essentially of a conveyor system, camera, and control and interfacing unit.

REFRENCES

[1]   Immanuel Edinbarough a,*, Roberto Balderas b, Subhash Bose.-H., 2011, A vision and robot based on-line inspection monitoring system for electronic manufacturing, Int. J. of Sys. Appl. Eng. & Dev.Issue 4, Vol. 5, pp. 561-569

[2]   M. Weyricha, Y. Wanga,*, J. Winkela, M. Laurowskib 45th CIRP Conference on Manufacturing Systems 2012.

[3]   Dongik Shin,a,* Changsoo Han,a Young Shik Moonb, Ball stud inspection system using machine vision, ISA Transactions 41 ~2002! 3–11

[4]   Majid Dowlati, Seyed Saeid Mohtasebi, Miguel de la Guardia, Application of machine-vision techniques to fish-quality assessment, Trends in Analytical Chemistry, Vol. 40, 2011

[5]   Kuo-Yi Huang, Detection and classification of areca nuts with machine vision, Computers and Mathematics with Applications 64 (2012) 739–746

[6]   Wilson, A., 2011, Machine-vision-based inspector sorts oranges and mandarins in: Vision Systems Design, Volume 16, Issue 10.

[7]   J. Oehlenschlager, G. Olafsdottir, J.B. Luten (Editors), Quality of Fish from Catch to Consumer: Labelling, Monitoring and Traceability, Wageningen Academic Publishers, Wageningen, The Netherlands, 2003, p. 211

[8]   J.R. Mathiassen, S. Jansson, E. Veliyulin, T. Njaa, M. Lønseth, M. Bondø, Proc. Nor-Fishing Technol. Conf. (NFTC), 2006, p. 101.