



# A Review: Robotic Four Finger ARM Controlling using Image Processing

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## Abstract:

The paper presents a smart approach for a real time inspection and selection of objects in continuous flow. Image processing in today's world grabs massive attentions as it leads to possibilities of broaden application in many fields of high technology. The real challenge is how to improve existing sorting system in the modular processing system which consists of four integrated stations of identification, processing, selection and sorting with a new image processing feature. Existing sorting method uses a set of inductive, capacitive and optical sensors do differentiate object color. This paper presents a mechatronics color sorting system solution with the application of image processing. Image processing procedure senses the human hand in an image captured in real-time by a webcam and then identifies color and information out of it. The main aim behind this approach to program a robotic arm, so that it should be controlled by human hand and will reach the locations where human will not be able to reach and do the given task by direct interfacing with human hand. In this we can see the real time movement of robotic arm.

**Keywords:** Robotic Hand, Camera, Arduino, Image processing software, MATLAB

## 1. INTRODUCTION

Robotic arms are used in lifting heavy objects and carrying out tasks that require extreme concentration and expert accuracy. This study mainly focuses on the accuracy in control mechanism of the arm while gripping and placing of objects. The system facilitates autonomous object detection within its limitations. A user interface is incorporated with the system for human input feed on the desired destination within the working frontiers. The targeted destination is specified in terms of height, radius and angle. In addition the orientation of the object can be provisioned along with the destination. Determining real time and highly accurate characteristics of small objects in a fast flowing stream would open new directions for industrial sorting processes. The present paper relates to an apparatus and method for classify in and sorting small-sized objects, using electronic systems and advanced sensors operating on the basis of a physical and geometric characterization of each element. Recent advances in electronics and printed circuit board technology open new perspectives for industrial application in this field.[1][4].



Figure.1. Robotic Four Finger Han

## 2. LITERATURE SURVEY:

**1."Fingers' Angle Calculation using Level-Set Method" A. Chaudhary, J.L. Raheja, K. Das, S. Raheja, Published in Computer Vision and Image Processing in Intelligent Systems and Multimedia Technologies, IGI USA, 2014, pp.191-202.2014 [4]**

Angle calculation has been done before with sensor based gloves/devices. This study has been conducted in the context of natural computing for calculating angles without using any wired equipment, colors, marker or any device. The pre-processing and segmentation of the region of interest is performed in a HSV color space and a binary format respectively. Fingertips are detected using level-set method and angles were calculated using geometrical analysis.

**2."Image Processing Based Customized Image Editor and Gesture Controlled Embedded Robot Coupled with Voice Control Features(2015)" Somnath Kar1, Ankit Jana2, Debarshi Chatterjee3, Dipayan Mitra4, Soumit Banerjee5, Debasish Kundu6,Sudipta Ghosh7, Sauvik Das Gupta8 World Academy of Science, Engineering and Technology International Journal of Mechanical, Aerospace, Industrial, Mechatronic and Manufacturing Engineering Vol:1, No:2, 2007[13]**

A Graphical User Interface (GUI) consisting of various MATLAB functions related to image processing and using the same to create a basic image processing editor having different features like, viewing the red, green and blue components of a color image separately, color detection and various other features like noise addition and removal, edge detection, cropping, resizing, rotation, histogram adjust, brightness control that is used in a basic image editor along with object detection and tracking. Additionally, Voice control technique has been

employed to navigate the robot in various directions in the Cartesian plane employing normal Speech recognition techniques available in Microsoft Visual Basic.

**3. “Multi-LeapMotion sensor based demonstration for robotic refine tabletop object manipulation task” Haiyang Jin , Qing Chen , Zhixian Chen, Ying Hu, Jianwei Zhang CAAI Transactions on Intelligence Technology 1 (2016) 104e113 [10]**

We use a new optical hand tracking sensor, Leap Motion, to perform a non-contact demonstration for robotic systems. A Multi-Leap Motion hand tracking system is developed. The setup of the two sensors is analyzed to gain a optimal way for efficiently use the information’s from the two sensors. Meanwhile, the coordinate systems of the Multi-Leap Motion hand tracking device and the robotic demonstration system are developed. With the recognition to the element actions and the delay calibration, the fusion principles are developed to get the improved and corrected gesture recognition. The gesture recognition and scenario experiments are carried out, and indicate the improvement of the proposed Multi-Leap Motion hand tracking system in tabletop object manipulation task for robotic demonstration.

**4. “Object Sorting by Robotic Arm Using Image Processing” Taniksha Singh1, Dnyanesh Dhayadak2, Pradnya Kadam3, R.J. Sapkal4 International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 03 Issue: 04 | Apr-2016 www.irjet.net p-ISSN: 2395-0072[11]**

This paper broaches one of the applications to sort objects using robotic arm. This method of sorting is quick and doesn’t require continuous surveillance, thereby increasing the growth of the industry. Hence it leads to better production and income.

**3. PROBLEM STATEMENT:**

In present scenario of technology, there are many industries where human hand is a must to complete the required task, but it may harm human skin or bones. So instead of using actual human hand, we can replace it by wireless robotic hand. So this robotic hand can be used to complete the same task so that the risk will be avoided and required task can be achieved. The objectives of the project are to ensure that the research will fulfill the solution of the problem research. All the objectives are shown below:

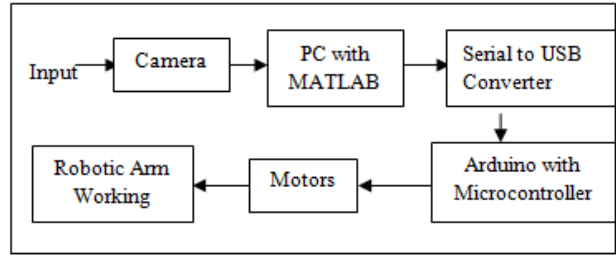
- a) To design and develop an Animatronics hand using wireless module (XBEE-S2)
- b) To design and develop the prototype of the human hand which can be a part of human robot and can be used in many applications.

“Hand Gesture Recognition Using Camera” is based on concept of Image processing. In recent year there is lot of research on gesture recognition using kinect sensor on using HD camera but camera and kinect sensors are more costly. This paper is focus on reduce cost and improve robustness of the proposed system using simple web camera.[3].

**4. PROPOSED APPROACH**

The Proposed system is a smart approach for a real time inspection and selection of objects in continuous flow. Image processing in today’s world grabs massive attentions as it leads

to possibilities of broaden application in many fields of high technology. The real challenge is how to improve existing sorting system in the modular processing system which consists of four integrated stations of identification, processing, selection and sorting with a new image processing feature.



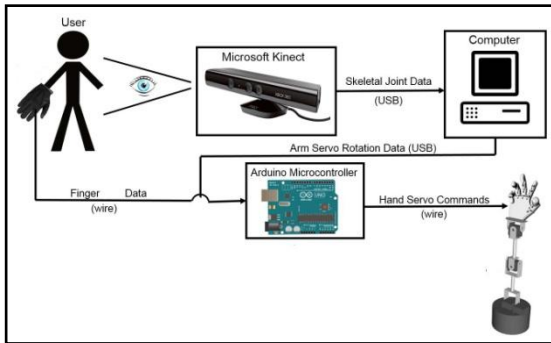
**Figure.2. Block Diagram**

This paper presents a mechatronics color sorting system solution with the application of image processing. Image processing procedure senses the objects in an image captured in real-time by a webcam and then identifies color and information out of it. This information is processed by image processing for pick-and-place mechanism. The Project deals with an automated material handling system. It aims in classifying the colored objects by color, size, which are coming on the conveyor by picking and placing the objects in its respective pre-programmed place. Thereby eliminating the monotonous work done by human, achieving accuracy and speed in the work. The basic theme of this project is object flowing on conveyor are sensed, selected and sorted depending on their color and size. For this, camera is used as input sensor, camera is overhead camera which will be mounted on PC, and will be connected to PC by USB. The camera will take a snap and it will feed to PC for color processing. In PC MATLAB is used for processing on color, depending on this signal will be given to microcontroller Atmega 328. These servomotors will control the movement of robotic arm, by controlling their angular movement. Thus the robotic arm will be fully controlled by servomotors. The gripper of robotic arm will pick the object place it depending on its size [4]. This is fully automatic process no manual support is needed. The microcontroller used here is with the support of Arduino kit. The Arduino is good platform for robotics application. It is the software and hardware also; using both the above system is developed. Thus the real time, continuous object sorting can be done.[8][9]

**5. METHODOLOGY:**

In this, process is about interfacing of human hand using robot arm. With this method the robotic hand can be controlled using human hand. Demonstration is done by using image processing technique to detect different human hand gestures. Technique is very useful since it takes real time video of hand and tracks it to get interface with robotic arm. The image of hand is captured by webcam which is interfaced with MATLAB software. In MATLAB were performing image processing. The captured image of hand is processed and gesture is obtained. For each gestures of d image obtained from that image is transmitted as serial data through USB of laptop to the USB module attached with ARDUNIO NANO. Were the USB interfaced with ARDUNIO board will control the action of the robot arm. The

data's transmitted from USB be serial format and receiving will be also in serial format.



**Figure.3. processes diagram**

## 6. TOOLS FOR DEVELOPMENT:

### 1. HARDWARE SPECIFICATION:

- a. Arduino
- b. Web Camera
- c. Robotic Arm
- d. Servo Motors
- e. Accelerometers (Sensor)

### 2. SOFTWARE SPECIFICATION:

- a. Matlab Software
- b. Image Processing Software

## 7. EXPECTED OUTPUT

**The following results were observed in our project:**

1. The objective is met by sorting the objects based on the color feature from a group of objects. A GUI in MATLAB was successfully created in order to display the video of the incoming object and displaying the color of the object to the user. The user has to select the COM Port. After the Connection is made the camera detects the RED, GREEN and BLUE object and using serial communication the robotic arm picks the object and places in the desired location
2. System able to detect the object and place it in the desired location.
3. By image processing, we can detect all colors of objects for sorting.
4. This system reduces the human efforts and risk in sorting fields.

## 8. REFERENCES

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