

Automatic Garbage Collection using Firebird-5 Robot

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Abstract—The world today faces major Garbage crises like the product of Rapid economic growth, Overcrowding, Poor urban planning etc. The present trade & tested method of garbage collection has so far been proven ineffective, and the world today is looking at smarter ways of overcoming the garbage collection problems to reduce human work. In this project, we are focusing on designing a robot which is capable of collecting the waste products from various places like footpaths, parks, schools & colleges etc. The robot is capable of detecting the objects in random movement. After detecting the objects, the robot senses by webcam & followed by Image processing, after segmentation process the object gets collected. To do this we are using a robot called Firebird-5 robot, which provides an excellent wireless control using Zigbee technology, by designing this controller it is capable of reaching nearer to the waste product & collecting them. By image processing technique, modifications in the robotic arm, navigation, image, & interfacing modules that encountered various problems in garbage collection.

Keywords— Automatic, Garbage, Image Processing, Collection, Micro-Controller, Firebird-5.

I. INTRODUCTION (Heading 1)

Waste gathering is one of the significant issue in urban areas as well as in rustic regions of India, it is real wellspring of contamination. Indian urban areas alone create in excess of 100 million tons of strong waste in a year. It is right to state that India is on skirt of refuse emergency despite the fact that 9000 crore rupees assigned for SWATCH BHARATH ABHYAN. In this task we are concentrating on gathering garbage from specific places and after that arrange it at a solitary place from where the waste will at that point be taken for transfer or procedure of reusing. As there are expanding a wide range of waste transfers numerous advancements are utilized for squander accumulation. Today the refuse gathering is manual which takes parcel of endeavors and tedious, to lessen human work and time we are making a robot which is equipped for gathering waste item from the encompassing with the goal that the human work will get diminished for certain moment. Here we are utilizing a image

processing procedure to recognize the waste items, as there are n number of waste items are accessible in nature we are thinking about a round and square as two waste items in this venture and gathering them from the encompassing with the assistance of this robot. There are diverse kinds of microcontrollers that can be utilized as a stage. In this venture we are utilizing FIRE BIRD-5 Robot which gives a magnificent remote control utilizing zigbee innovation.

II. EXISTING SYSTEM

The old innovation utilized has the equipped for gathering the waste inside the predefined line by the Arduino controller as smaller scale controller and the robot utilized can ready to gather the waste in that predefined line and after the accumulation of certain amount of refuse it will look for the container to transfer of the garbage

III. PROPOSED SYSTEM

The proposed approach is that the firebird-5 robot recognizes the object by the utilization of sharp IR sensor and it can gather the object automatically by detecting that object utilizing web camera mounted on robot by the image processing strategy utilizing mat lab as stage after this, the firebird-5 robot has the ability to identify the object into round or not round. Embedded c programming dialect is utilized for the arm and holding activity of the robot development by the ATMEGA2560 controller and the division of garbage is finished by the image processing procedure of shape, color.

IV. REQUIREMENT SYSTEM ANALYSIS

The programmed refuse accumulation utilizing Firebird-5 robot requires the accompanying necessities to serve to finish the undertaking. The necessity is acquired are given beneath.

- Firebird-5 robot is modified with embedded C programming dialect with ATMEGA2560 microcontroller.
- The robot development is done by two outfitted engines of 120 gms weight and one castor wheel at 12

v and which is worked at DC engine gearbox of 125 gm 5-6v of voltage.

- Arm utilized are comprise of servo engine control and servo engine control 3 (S3) for picking activity and servo engine control 2 (S2) is for here and there activity.
- The gripper is settled at the edge end of the arm which is mounted on robot.
- The control supply circuit is available to give supply control as indicated by input limit control

V. DESIGNING HARDWARE AND SOFTWARE

The ATMEGA2560 Micro-controller is utilized as a part of that ATMEGA2560 fills in as a master control and ATMEGA8 functions as slave control.

- The robot along with the gripper movement is controlled using embedded C programming language.
- Processing of the recognized picture is finished by Mat-lab picture preparing as appeared in Figure 1.

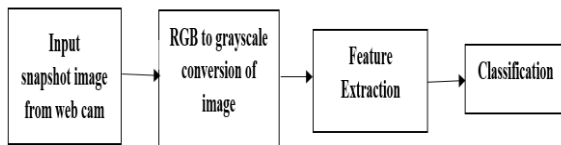


Fig. 1. MATLAB image processing

VI. FEATURE EXTRACTION

A. Color Feature Extraction

In color image feature in R, G, B color feature projection values are extracted and stored in database using specified programming methods.

- **Step 1:** - Several images are taken in working directory of matlab.
- **Step2:** -By using MATLAB program all the captured image feature in R, G, B color projection values are extracted and that is stored in database of specified programming methods of matlab.
- **Step 3:** -Threshold values are taken into consideration for categorizing the detected images as different object if the image into inverse grayscale image

B. Shape Feature Extraction

Shape highlight extraction is utilized to identified the specific state of the recognized object utilizing matlab. By considering the object as round, discover the edge of the circle utilizing the predetermined recipe. Set some inexact limit border an incentive to recognize the identified object as round or not round. The stream chart of shape highlight extraction is conveyed by portrayed by Figure 2.

C. Hardware Working Flow

Once the MATLAB handling is done it will give the charge to Firebird-5 robot through Zigbee remote innovation module. It has the correspondence speed up to 250kbps. Also its equipment structure contains 6- 10-bit ADC input pins and advanced IO pins.

Working stream of robot to do additionally process is delineated in beneath stream graph.

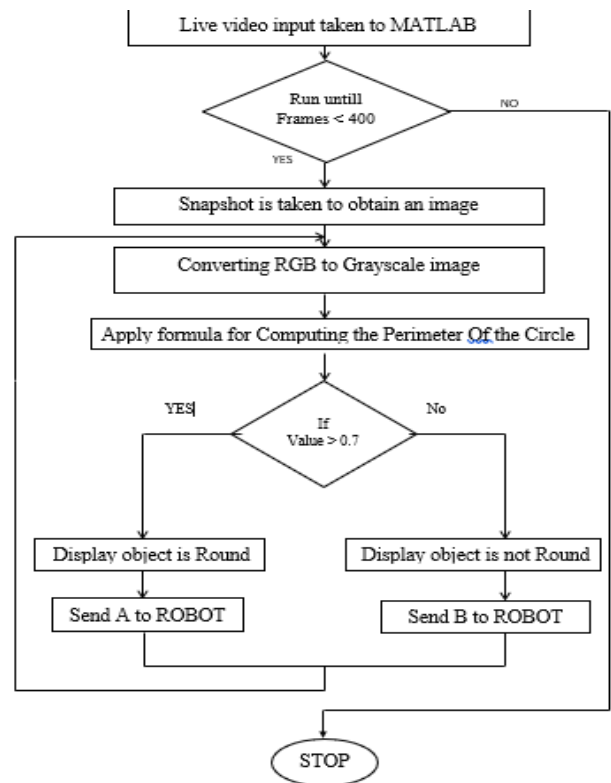


Fig. 2. Software flow diagram in matlab.

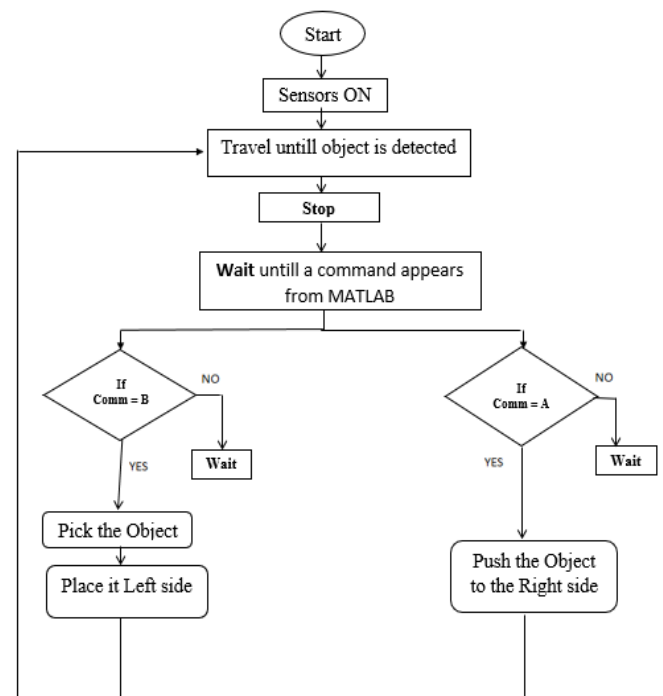


Fig. 3. Hardware flow

D. Working Principle

The firebird-5 robot works under the rando movement and if any object is detected by the sharp IR sensor, the robot stops and the object is sensed by web camera by the image

processing technique using matlab of color and shape feature extraction. After the processing of image the robot can able to detect the object is whether round or not, which is done by programming in the matlab and then it is picked by means of gripper and place it in a predefined place in way as garbage or not a garbage.

VII. EXPERIMENTAL RESULTS

The test comes about after the handling of matlab apparatus gives the object recognizable proof outcomes

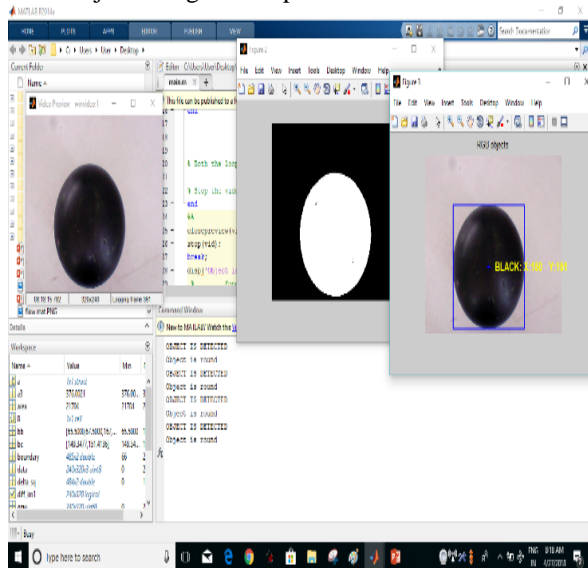


Fig. 4. Object detection of circle as round.

Once the preview taken from the live video, it will send the database to Matlab process the picture by changing over it into reverse grayscale picture from RGB picture utilizing perimeter of the hover as real parameter to identify the question as round.

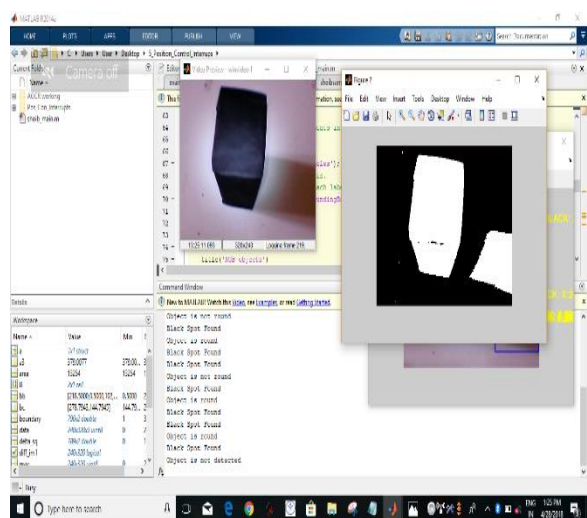


Fig. 5. Object detected as not round.

The second picture demonstrates the consequence of matlab which is handled and gives the yield as not round.

VIII. CONCLUSION

Although the completion of Automatic Garbage Collection Robot was a relative success, the team has exposure to do a work for future improvement in terms of research and theory, implementation, and program management. In addition, more time should have been spent researching mechanical design of the robotic arm, whose problems led to a limited functionality of the robot. And also providing bin for the collection of the object into garbage or not a garbage. Improved code for movement of the robot in a well-defined path will be provided.



Fig. 6. Automatic Garbage Collection using FIREBIRD-5 ROBOT

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