

GARBAGE COLLECTION ROBOT USING IMAGE PROCESSING

Bhagyashree P Hegde^{*1}, Chaitrashree HG^{*2}, KS Shilpa^{*3},

Madhu PM^{*4}, Yojana Yadav^{*5}

^{*1,2,3,4,5}Department Of Electronics And Communication Engineering, PES Institute Of
Technology And Management, Shivamogga, Karnataka, India.

ABSTRACT

This paper proposes a robotic bot to collect the litter thrown and segregate a garbage so as to reduce human effort and keep the environment clean. The proposed robotic bot autonomously identifies garbage and classifies it into biodegradable and non-biodegradable. The final collected garbage is, in a way, segregated automatically. The robot moves towards the garbage just like a rag picker does. This autonomous bot is capable of collecting, segregating the garbage.

Keywords: Robot, Garbage, Segmentation, Processing, Automatic, Webcam, Dc Motor, Raspberry Pi.

I. INTRODUCTION

Reducing rubbish discharged in landfills can be accomplished by waste sorting and recycling. People have neglected to dispose of their waste properly, ignoring warning labels, and recyclables that can still be used are thrown away. Many are uninformed of or deciding to disregard the need of waste segregation and recycling can lower expenses and impact on our using fewer resources will reduce waste production. Typical 5.8% of the waste individuals discard contains metals. 12.9% papers, 8.1% textiles, 1.6% plastic, 3.5% glass having a bio degradable content of 53.7%, only the remaining. Actually, our landfills should receive 20.7% of the waste. Recycling facilities in our nation carry out a manual procedure of sorting trash puts you at a high risk of getting sick. In order to reduce human intervention in the waste collection and segregation process, this project attempts to automate waste segregation and develop a garbage delivery system. Wastes like biodegradable and non-biodegradable garbage must be separated for this project.

II. METHODOLOGY

The robotic base is the main frame of the robot, equipped with all sensors, controller, manipulator and garbage field. The robotic base has two driving wheels and passive wheel, and is driven differentially to show direction. The controller of the robotic is just like the human brain, such as CPU (Central Processing Unit) , GPU (Graphics Processing Unit) and motor driving force. All the algorithms which include locating, obstacle averting, picture free processing, and course planning, and so on are completed at the CPU. The garbage popularity and segmentation set of rules are accomplished on the GPU. The GPU has the parallel shape that makes it greater efficient than the overall CPU for image processing and deep mastering computations. The rotation, forward or returned translation of there robot is controlled with the aid of the motor driving force. A manipulator is used to select up the garbage, and positioned it lower back to the garbage field. It includes four joints with five ranges of freedom. A garbage field is used to accumulate the garbage that is fixed on the robotic base with the aid of a clamping slot type to assemble and dismantle very easily.

With the increase of deep learning, the CNN improves the image comprehension by learning more discriminative and richer features. The proposed robot should be capable of recognizing the garbage and other obstacles (namely, determine the passable area) in the image. Through the pixel wise semantic labels produced from segment, the ground can be distinguished from the other areas or objects. However, the thing on the ground can't be recognized exactly because the scene was just coarsely segmented. Then, the segmented image can be acquired.

The segmented image can provide the area of ground and the object on the ground. If there's an object on the ground the object tracker will control the robot to approach the object besides multiple objects may be exist within the ground contour in this case the closest one will be selected to track.

Then, the close range image are often acquired and used for visual perception. If the object is recognized as garbage, the manipulator will pick it up; otherwise, the robot will take it as an obstacle and planned to avoid it. During the movement of the robot, if any scrap is detected by the ultrasonic sensor the robot stops and the

object is sensed using the camera. Waste moves further for detection with CNN to detect either it is biodegradable or non-biodegradable. The bin is provided to put the waste. The bin is divided into two compartments using a wall in the middle such that one side is for bio degradable waste and the other side is for non-biodegradable waste. A flap type construction is made in the middle such that one side is hidden and inclination is provided when the garbage is being dropped in the other compartment. When the category of garbage is detected, it is thrown in the respective compartment. That is, if the garbage is biodegradable, the motor changes the direction of the flap such that the non-biodegradable side is covered and the garbage drops due to inclination in the compartment for biodegradable waste compulsorily. The same process is followed for non-biodegradable waste. The motion of the flap is supported by a servo motor which is situated in the middle portion which gives it a turn based on the detected category of the garbage.

III. MODELING AND ANALYSIS

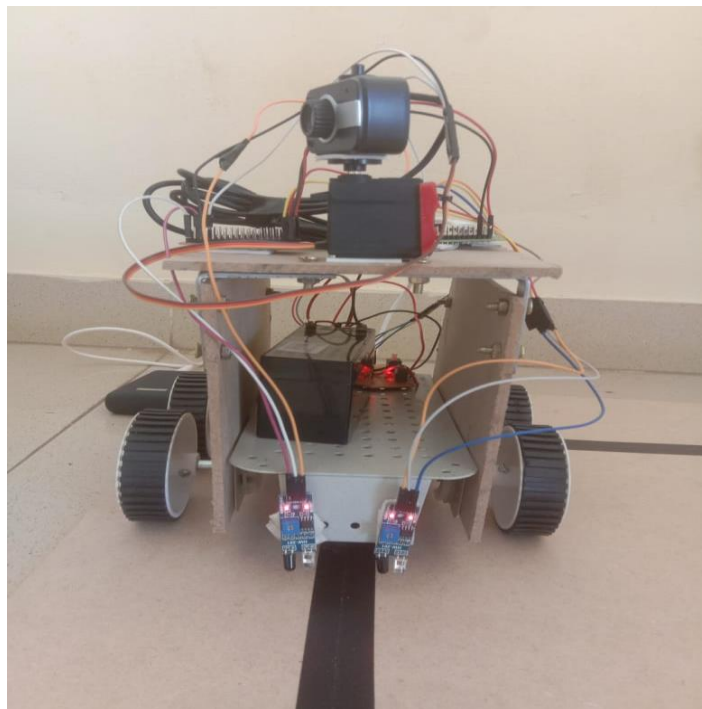


Figure 1: Garbage collection robot model.

IV. RESULTS AND DISCUSSION

The smart garbage separator robot was able to sort out the two types of waste, degradable and non-degradable. When the obstacle sensor is triggered the camera is actuated and through CNN, OpenCV, Tensor flow the waste is detected, and according to this robot is instructed to dump the waste in respective bin.

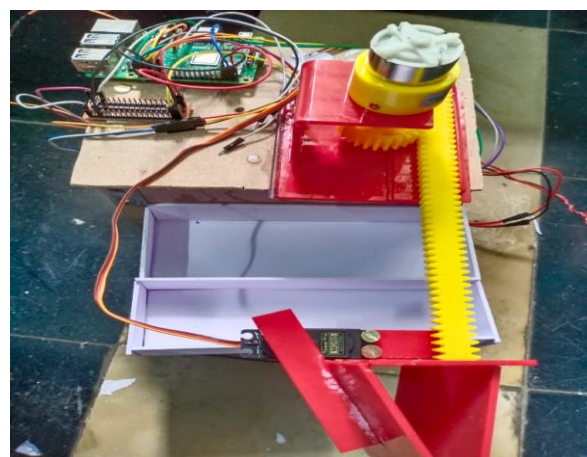
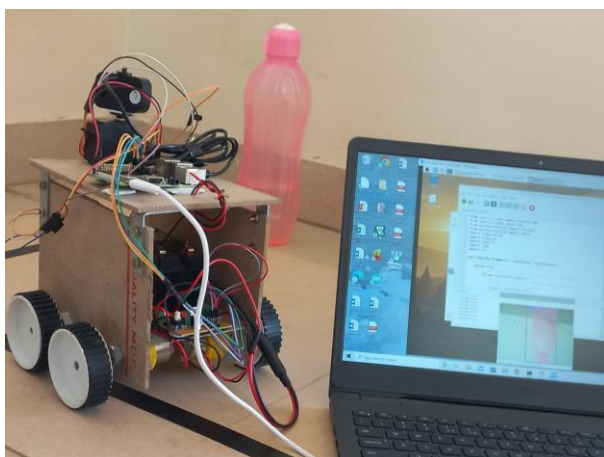


Figure 2 & 3: Output Pictures

V. CONCLUSION

The designed automatic garbage collector robot which can do multiple functions. The basic reason of completion of this task is to implement a well-organized way of garbage collection and segregation. Intelligently handling garbage waste can help for clean environment and to reduce the environment pollution.

VI. REFERENCES

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