

ANALYSIS OF SEMI-AUTONOMOUS WASTE SEGREGATION SYSTEM

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Abstract - The main aim of this project is providing effective, sustainable waste management for local and national government. Technology is used for making our process simple and quickly thus we have include robotics and automation for providing accruable result. The essential target of this project is implementing simple method for the segregation of degradable and non degradable wastes and to create awareness among the public about waste management system to maintain safe and green environment in our country. Most of the wastes are dumped or burned today this create pollution the best solution for this is segregation of waste. In this paper we provided solution using embedded system technology with the help of MATLAB. Here, we use robot (recycle bot), ultrasonic sensor, image processing, zigbee, human machine interface. The Robot segregate the waste as degradable and non-degradable waste then ultrasonic sensor is to detect the presence of object. The most important equipment is image processing, obtained by camera which capture the image entering and then the image processing will compare it with the predetermined pictures. Thus directing the wastes to their respective bins

Key Words: Recyclebot, image processing, ultrasonic sensor, zigbee, human machine interface, MATLAB

1. INTRODUCTION

INDIA is one of the country which is generating large amount of wastes day by day. World bank, has published an report as INDIA is generating approximately 1.3 billion tones of wastes every year and this is calculated as it will reach 2.2 billion tones of municipal wastes every year by the end of 2025. The generation of wastes per day in our country is calculated as 0.1 million tons out of this only 5% of waste are recyclable waste. The mixing of waste produced by people contains 5.8% of metals, 3.5% of glass, 1.6% of plastics, 12.9% of paper, 53.7% of biodegradable wastes. People are unaware about the waste utilization and their effects. Thus, the segregation of waste becomes more important. Currently, the segregation of waste has been takes place majorly with the help of humans. Thus the intervention of human may not be perfect at some times. It will take more time and there are various methodologies proposed now like pick and place the wastes using magnets, optical separation, eddy current, IR analog sensor these all system have certain drawbacks while segregating the wastes. In order to overcome this drawback we are using image processing techniques which will

compare it with the prestored images and segregation it as degradable and non degradable wastes easily.

2. LITERATURE SURVEY

The recyclebot use camera which will separate the waste as recyclable and non-recyclable waste. The picture is captured by using the camera and the captured images is analysed against it's database but in this communication is not feasible [1]. In the garbage collector robot four geared motor of 30rpm each, motor drivers and three ultrasonic sensor are used. ARDUINO receives the input from ultrasonic sensor and the output is send to the motor through the driver for the movement which are controlled by microcontroller. The main aim is collect the waste like paper & plastic items automatically. So, it reduces the manpower to clearances the plastic waste [2]. RF transmitter is used to transmit the message of filled bin to authorized persons. Two types of sensors are load sensor and IR proximity sensor one placed in the top and other one is placed in the middle of the bin. Load sensor is used to sense the load of the waste and IR proximity sensor is used to detect the level of the waste [3]. This is useful to detect and segregate the usable and non-usable object the microcontroller will detected the waste from the source location and placed it in the desired location. The detection of waste will be performed by infrared sensor using transmitter and receiver path. After getting the messages microcontroller will operate the robotic arm to collect the waste and segregate it into different trash bin [4]. The system consists of setting up smart waste bins per society, which will be IOT enables. The smart bin will transmit information it provided efficient and optimized route to collected maximum waste with less cost and fuel [5]. Three wheel drive autonomous robot to interact with the environment this robot can be able to distinguish multiple object and color with surrounding environment the software used here kinect gripper are also attached here. To segregation object on the colour and shape the three vehicle autonomous robot to determine the colour [6].

3. BLOCK DIAGRAM

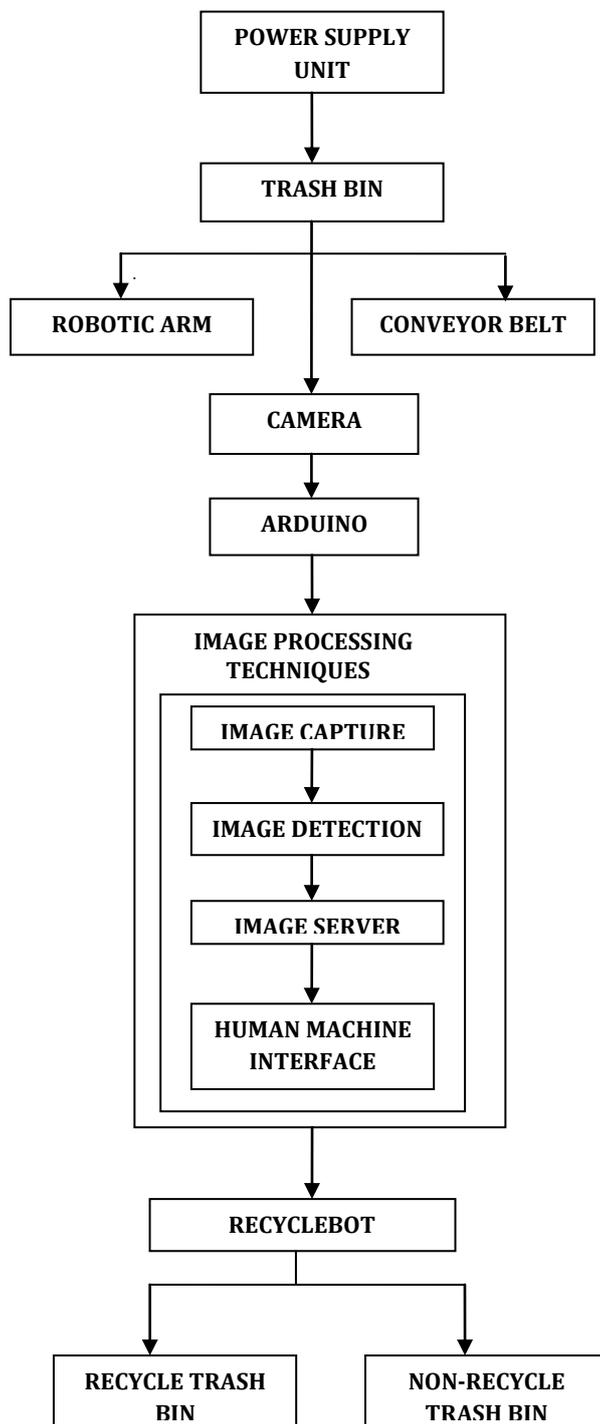


Fig-1.1 Block diagram of semi-autonomous waste segregation system

3.1 Power supply unit

Power supply which we received during our process is alternate current of 230v and then it is converted as 12v AC

supply using step down transformer. There are two types of AC supply linear and switch mode.

A linear power supply uses transformer to reduce the voltages the ratio of primary windings. The primary are connected to the mains the number of secondary winding are connected to the output where that the voltage of the ratio is reduced in 20% which reduce to 240 volts AC inputs into 12 volts AC on secondary winding. A switch mode supply work by turning that very quickly reduces the voltages in this voltages and time they depends on the ratio on and off time. The process takes place very fast quicker.

3.2 Robotic arm

Robotic arm is one kind of mechanical arm which is programmable, the action of which is similar to that of human hand that contains muscles. Here the robotic arm will pick the object which is placed in the trash bin and the robotic arm is very much helpful for making the object to pass to the camera. The link or joints of the robotic arm contains rotational motion (or) translational displacement. It is fixed after the collection of garbage bin. The arm will collect the waste one by one from the trash bin which makes them to moves towards the camera with the help of conveyor belt. The servomotor is connected at the joints of the robotic arm for making rotational movement. The arm, will perform different task based on the application. Action controlled by the robotic arm here is front, back, up and down in addition to this the gripping movement and placement movements too. There are variety of robotic arm which is being available, here we are using SCARA robot. The action must be similar to that of pick and place work which handle the waste to the desired position.

3.3 Conveyor belt

The conveyor belts are basically wide belts attached to the loop turning two (or) more rotor are driven by motor. The loop is actually provided with two (or) more layers of rubber. These conveyors loops are generally attached to the two wheels are called as rotors. The belt of the conveyor has the enough friction between the rotor and that rotor stricks to this motor.

The movement of conveyor belt is controlled by rotor that induces friction between the rotor wheel and conveyor belt to move in one direction. The direction may be either in clockwise or in anticlockwise direction but never in the opposite direction at a time. The major operation of conveyor belt is to transmit or receive a material. The conveyor belt is mostly used in industry to carry the raw material from one place to another. Here, we are using conveyor belt to transmit the wastes collected from the trash bin to camera for segregation purpose.

3.4 Camera

Camera plays a vital role in the separation of waste as degradable and non-degradable waste. The camera contains many subunits, Image detection, Image server and Image classification.

3.5 Arduino

Arduino is a open source hardware and software it is a single board microcontroller, intended to make the application of interactive objects or environment more accessible under which the programming language will be more simple. This contains onboard power supply, USB port to communicate with PC. It will perform multiple function by providing multiple input and output. Here, Arduino is used to gather the image captured by the camera and analyse it within it with the help of image processing techniques. Arduino plays an vital role thus the operation of image processing techniques are controlled here. It is more preferable compared to microcontroller because microcontroller will give only one output at a time but arduino will perform multiple tasks.

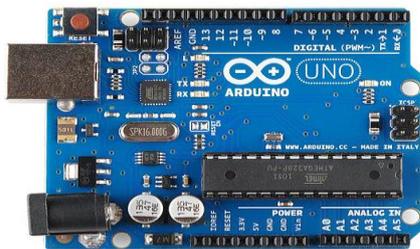


Fig 1.2 Arduino

3.6 Image processing techniques

Image processing is a technology in which the detection, comparison and classification takes place the techniques which included in this are image detection, image server, image classifier thus each techniques has been discussed in detail below

3.6.1 Image detection

In image detection the image which has been captured by the camera is entered into it with the help of ultrasonic sensor that will detect the waste which is present above it and the image will be passed through the image server.

3.6.2 Image server

In image server we already store the image of waste as recycle and non-recycle separately. We have stored the images based on Sizes, Shapes and Colour of the waste separately as recycle and non-recycle wastes. Thus the image

entered after the detection of it will compare the images with it then the result of waste in which type has been identified and pass the messages to image classifier.

3.6.3 Image classifier

The image classifier will classify the waste image as whether it is recycle and non-recycle waste and pass the result to the human machine interface.

3.6.4 Human machine interface

The human machine interface is the intermediate between the image processing system and recycle bot. The result which is passed from the image processing system is conveyed to the recyclebot the recyclebot will work based on the message received from the human machine interface by placing the waste either to recycle or non-recycle waste.

3.7 Recycle trash bin

Recycle waste are Wood, Paper, Glass, Bottles are the recycle trash bin will store the recycle waste as a result of it.

3.8 Non-recycle trash bin

Non-recycle waste like plastic and non-recycle trash bin will store the waste of non-recycle which is entering. Thus the two wastes are separated and stored successfully.

4. WORKING PRINCIPLE

When the object has been get entered into the trashbin with the help of robotic arm the waste is being collected one by one then the waste is placed in the conveyor belt one by one it is made to pass through the camera. The camera will capture the image of the waste and pass it to the image server before passing it to the image server the waste has been detected the image server store the images of recycle and non-recycle wastes separately when the image has been entered it will analysis it compare the Sizes, Shapes, Colour of the entered images with already stored images then they pass the ,messages to human machine interface which is the communication between the camera and recyclebot thus the waste is then recycle and pass through the recycle and non-recycle trash bin separately.

5. CONCLUSION

The waste which is dumped in landfill or collected by manual process is sort down by our project. They segregates the waste automatically and easily with low cost. The waste is segregated as recycle and non-recycle with the help of Image processing technique it is most accurate technology compared to other segregation system which is used in

future we can also implement Bluetooth or any other wireless technologies for passing information to the municipal office. Thus by implementing it in our society will reduce the spreading of disease and pollutions too. Here, we have segregated recycle and non-recycle you can also introduce a system in addition to this like the separation of wet, dry waste and e-waste too.

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