

Solid Non-Biodegradable Waste Segregation Using Matlab and Robotic ARM

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ABSTRACT

The continuous consumption of resources tends to produce more wastes as different countries face a common environmental problem. Nowadays growth in quantity of waste materials is enormous. The need for segregation and recycling has increased today. Usually manual sorting is preferred in industries. To avoid the disadvantages such as time consumption, slow and non-consistent of manual sorting, robot is used for segregating the dry and wet wastes. In this paper waste management tool is used which would reduce the human effort. The pattern of the waste particles image is taken as a variable that decide the dry and wet waste segregation, robot acts for handling the waste from the scrap.

KEY WORDS: Dry waste, Wet waste, Robot, Waste segregation.

1. INTRODUCTION

Waste normally divided into two- Dry and Wet waste. Wet waste includes fit for human consumption and lightly cooked food, waste from fruits. Dry waste includes plastic, rubber, metals, glass and thing etc. Wet waste is organic and Dry waste is inorganic. Waste management is a frequently growing problem at international and local levels. Solid wastes normally arise from humans and animal actions that are normally discarded as ineffectual or unwanted. In other words, solid wastes might be defined as the organic and inorganic waste materials created by various actions of the culture and which have lost their value to the first user. The domestic waste products are collected all the way through waste bin at a common place at a particular spot for an area or street. A main complicated duty is that inspection process of waste bins for the collection of wastes.

The common technique by which, a person has to walk through the different spots and make sure the places for waste collection. This is fairly difficult and moment consuming process. The present day waste management system is not as capable as it should have been taking into deliberation the advancements in the technologies that arose in the modern years. There is no security about the management or clearance of wastes at all the places. To overcome this problem a new approach, Waste management tool is proposed here.

In general embedded system is nothing but the Circuits have been embedded into application; a microprocessor is the single chip CPU Very Large Scale Integration (VLSI) state the acronym is the name technology has permitted us to set a complete CPU on a single chip. The primary microprocessor be the Intel 4004, was designed for embedded application namely a calculator.

Integrated circuit design was an expensive and time consuming method, the ability to reuse the hardware design by changing the software was the key brake through. Nowadays microprocessor is used in automobiles to control the engine, determining when spark plugs free, controlling the fuel, air mixture and so on.

Microcontroller devices used to integrate the number of components of microprocessor system onto a single microchip. Its use is widespread that it is almost impossible to work in electronics without coming across it. So, microcontroller combines onto the identical microchip that is CPU core, Memory and some parallel digital I/O.

Existing System: Normally in India the waste are disposed by the people who works a labour. Waste separation is not a easy job to performed by labour it is highly unsafe for them to handle. Labour who is hired for this cleaning purpose is not even given with any protective covering. It will cause major damage and infections to those who do it with bare hands.

As compared to other country India is lacking behind in waste management because India government is not considering any method for developing the system for waste segregation. In foreign there government are given extra care for the development in waste segregation. The methods that are processed in foreign is that they are given special vehicles that would collect the waste that is set aside outside of the house in each street and the vehicle is returned to garbage area where they are disposed. There the wastes are separated into renewable and non-renewable waste. After the separation the non-renewable waste are destroyed completed by burning where the renewable waste are recycled and keep their environment safe. Table.1, shows the waste generated in the various countries.

Table.1. Waste Generation

Countries	Amount /year	Countries	Amount /year
Japan	395 M tonnes/year	Romania	607 M tonnes/year
Germany	104 M tonnes/year	Bahrain	92,000 tonnes/year
Netherlands	6.1 M tonnes/year	China	6 B tonnes/year
Hungary	102 M tonnes/year	Philippines	1.3 M tonnes/year
Poland	130 M tonnes/year		

2. PROPOSED SYSTEM

In our project, an image processing approach is applied for image acquisition to classify and grade solid waste bin level. In this method, quarter video graphic array (QVGA) RGB camera is designed for processing and analyzing the graphical picture of the waste bin condition. The picture data is then collected by the server parses since GPRS and GIS network. Waste images were studied widely, and a waste classifier is specially developed to categorize images of the waste bin level. In quality extraction and categorization, the Hough Transform is used to identify the line recognition based on image's gradient field. The method has been successfully selected with the motivation of waste bin monitoring system, to increase the results that can applied to large variety of local municipal authorities method.

The storage space of high-level radioactive waste in federal interim storage facilities (CIS) creates an exceptional and tough environment for developing and deploying innovative robotic technology. Restricted convenience and resources as well as difficulties in predicting the performance of some facility components call for enhanced collaboration between humans and robots and enhanced capacity for robotic instruction in nearly linguistic conditions. Hardware's used in the proposed systems are ARM Microcontroller, Robotic ARM and Personal computer.

Microcontroller devices used to integrate the number of components of microprocessor system onto a single microchip. Its use is widespread that it is approximately impossible to work in electronics without coming across it. So, microcontroller combines onto the identical microchip that is CPU core, Memory and some parallel digital I/O. **ARM Microcontroller:** ARM Corporation developed the ARM processor which is having RISC processor 32 bit. Two types of core available in ARM license, one is soft cores and another one is hard cores. A hard core is optimized for a specific manufacturing process, whereas a soft core can be used in any process but is less optimized. ARM processors possess an exclusive combination of features that makes ARM is one of the popular embedded architecture. ARM cores are very simple compared to other processors, Because ARM cores are manufactured using a comparatively small number of transistors, and chips space is large because leaving lot of space on the chip for the application-specific cells. LPC2129 ARM processor is used here. ARM processor picture shows in Figure.1.

Reduced instruction set computer (RISC) is used here. We can't able to overwrite the source code. Read only possible. 32 bit and 64 bit Processor available but here we used only 32 bit processor. Each port having 8 pin totally 4 ports so 32 pins but we are using only 16 pins in this processor.

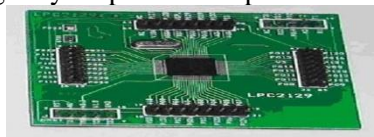


Figure.1. ARM processor

MAX232 IC is used to convert the hexadecimal code into TTL (Transistor Logic). TTL code only given as the input of peripherals.

Robotic ARM: Type of mechanical ARM is known as Robotic ARM, normally programmable with same function as well as human ARM. Robotic arm might be the sum of total mechanism otherwise might be the part of most complex robot.

Every home will have the Robotic ARM in future, Robot used to wash the dishes plate and walk the dog for us too. But we don't have time for waiting for the future. It takes too long, that's why Robotic ARM kit is recommended now, and you just pick up the fine edge Robotic ARM kit now. It has five axes movements are at your command with the remote. Gripper command is used to open and close, 120 degree of wrist motion and 300 degrees of extensive elbow range, 270 degrees of base rotation, 180 degrees of base motion, 15 inches of vertical reach, 12.6 inches of horizontal reach, and 100g of lifting capacity. An LED spotlight on the gripper illuminates your work. Robotic ARM picture shows in Figure.



Figure.2. Robotic ARM

RS-232 Connectors: RS-232 has been replaced in personal computers instead of USB for communications. RS-232 has most advantages compared with USB. RS-232 is faster than the USB, It consumes less voltage and connectors are simpler to connect as well as use. RS-232 cable length is large and long compared to USB. USB include a procedure for passing information to devices for the reason that is very complex to use. This need more software to support the protocol used but functions of the physical interface pins voltage signals are standardizes in RS-232 only. Pin diagram of RS-232 shows in Figure.3.

Serial ports of personal computer are also sometimes used to directly control various hardware devices, like relays and lamps, because the control lines of the interface can be easily manipulate by software. This is not possible with USB, which require some form of receiver to decode the serial data.

RS-232 connectors are mainly used for interfacing purpose. Interface the personal computer and ARM processor kit.



Figure.3. RS-232 connectors

Function: Normally two types of wastes are available. One is Wet waste and another one is Dry waste. We have to segregate the dry and wet waste by using the robot. Here MATLAB software is used as well as KEIL C compiler is used. Picture taken by the camera it may be wet waste or dry waste. Then the image program written based on the wet and dry waste. This program already installed in MATLAB.

Databases are already stored in MATLAB pattern recognition. By using camera picture was taken and given to the MATLAB based pattern recognition. Already images are stored in database then we have to compare the manually captured image and database image .There are two types of databases available for wet and dry. If the manual captured image is matched with the database image then only the robot will be act. Then the result is given to the serial port communication. Serial port output is given to the ARM Microcontroller. ARM microcontroller send the hexadecimal code to RS232 connectors then the output of the RS232 connected to the robotic ARM. Finally Microcontroller output is given to the robotic arm which is used to segregate the dry and wet waste. Finally dry and wet waste identified and segregated with use of Robotic ARM. Dry wastes are stored in dry waste container and wet wastes are stored in wet waste container.

This method is mainly implemented to anyone organization particularly in departmental store we are using for segregating wet and dry waste. Dry waste container stores only dry waste as well as wet waste container stores only wet waste. This segregation is done by using the Robotic arm with servomotor. Major purpose of this paper is to create a way to make a waste management tool which would reduce human effort. This would become an initiation for many more research that would come in the way of automating waste management. The pattern of the waste particles image is taken as a variable that decide the dry waste segregation possible in our work. A pick and place robot acts for handling of the waste from the scrap.

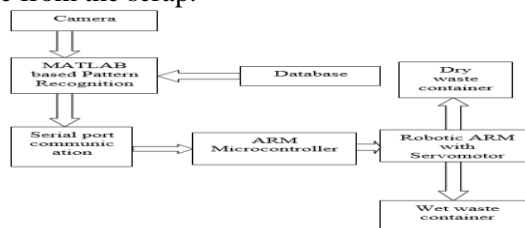


Figure.4. Block diagram of proposed system

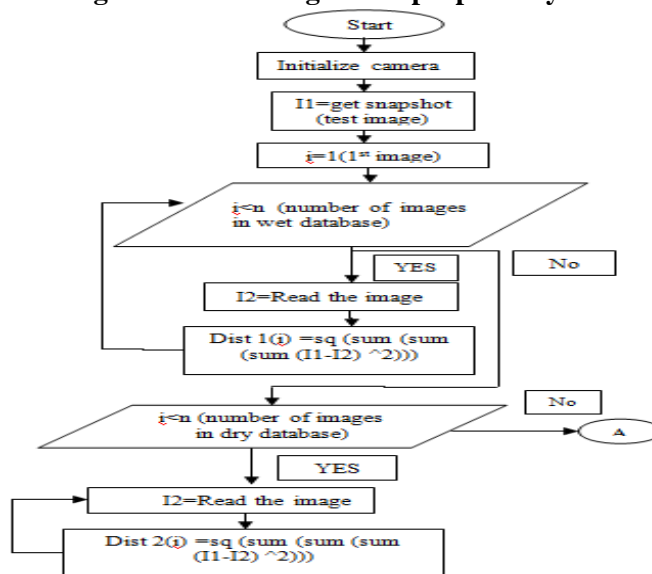


Figure.5. Flow chart for dry and wet

First initialize camera, Picture taken from the camera, this picture is known as test image. Test image is

denoted as i previously wet and dry images stored in database for analyzing wet and dry image. Now the test image is compared to the database images. If the first condition is yes then the image is read then segregates to the wet container. If the condition is no then the image is consider as dry and the image is read then segregate to the dry container. The above process we are using the condition if lesser than n and the formula used to segregate the wet and dry waste container is

$$\text{Dist}(i) = \text{sq}(\text{sum}(\text{sum}(\text{sum}((I1-I2)^2)))$$

Flow chart shown in the Figure.5. We can easily understand the process by using this flow chart.

Software Description: MATLAB software is used here. High performance language for technical computing is MATLAB. It integrates calculation, hallucination, and program in a user-friendly environment anywhere problems and solutions are expressed in familiar mathematical notation.

Embedded C language is used here. It is easier and time consuming is very less to write in C than Assembly. C is easier to change and modernize. You can use available in-function libraries. C code is portable to other microcontrollers with small or no modification. For compilation keil software is used here. Three main tools are used in keil 8051 tool; Assembler, Compiler, Linker.

To assemble the assembly program only assembler used. Compile the c source code into the object file only compiler used. Absolute object module is created by using linker. Some steps are given below for developing 8051 project using keil software.

Source files are created in c otherwise assembly

Assemble source files or else compiler

Errors corrected in source files

Link object files from the compiler and also assembler

Last step is test linked applications

These are the steps used in keil software for dumping the code in ARM microcontroller

- First step of the keil is Open the KeilµVision2
- Next step is Go to Project then Open Project.
- Go to Project then Select Device for Target that target is Target1
- Select 8052(all variants) and click OK
- Go to project then Options for Target in that 'Target1'
- Check the oscillator frequency is 12MHz
- Build the target then debug the session

3. RESULTS AND DISCUSSION

Embedded C is used for writing the source code. Keil software is used for dumping the code in ARM Microcontroller. Start a debug session.

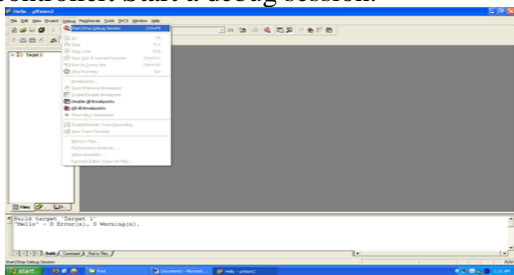


Figure.6. Port assigning

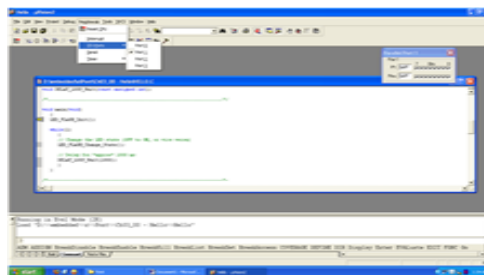


Figure.7. Assigning individual port

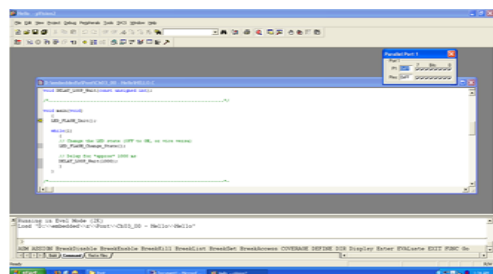


Figure.8. Selecting source code

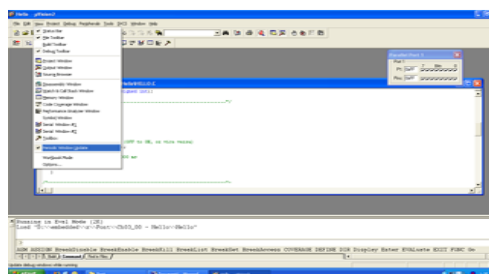


Figure.9. Periodic window update

3. CONCLUSION

Waste Segregation is the method of separating the Degradable and non-Degradable waste with easy and safe method. In our project we have generated the way to construct a waste management tool which would reduce human effort. This would become a initiation for many more research that would come in the way of automating waste

management. The pattern of the waste particles image is taken as a variable that decide the dry waste segregation possible in our work. A pick and place robot acts for handling of the waste from the scrap.

In our waste management we had implement a method of separating waste into dry and wet. The wastes are separated into those categories by capturing the waste image this waste image is analyzed by the image processing and the corresponding signal is given to the controller for picking it. The human beings need not get in direct contact on the scrap meaning health maintained. Trolley would be used to fill the scrap.

In future we can improve our project by implementing a moisture sensor to check the accurate moisture of the waste and it would be easy for us to separate them without the help of user and also making it into mobility make our job much more easier by the help of GPS and GSM.

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