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Automated Waste Segregator and Visualization for Separation of Wastes using Neural Networks

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Abstract - *The rapid growth in the population has also led to the surge in the volume of waste being generated on a daily basis. It is also posing a serious problem for the local authorities to manage the wastes being dumped everywhere as landfill. To ensure the minimal risk to the environment and human health, it is necessary to take meticulous measures when segregating and transporting waste. Segregation of waste in a proper manner brings to the limelight actual economic value of the waste. The aim is automate waste sorting by applying learning techniques to recognize the type of waste from their images. Deep learning with Back Propagation algorithm is used here. It separates waste into 3 main categories: Plastic, Paper and Metal using image of the waste and implement it on a open cv. The microcontrols a mechanical system that guides the waste from its initial position into the corresponding container.*

Key Words: Waste segregator, Python, Neural networks, Image processing.

1. INTRODUCTION

In developing countries, waste sorting is becoming particularly important at all levels. If these wastes are not disposed properly, then they can have a many affect on the environment. This sorting of waste should be done as early as possible, so it reduce contamination possibility by other elements. Making the trash bin smarter helps in this matter by automatically sorting waste on both home and large scales. The current trend is to efficiently separate the waste in order to appropriately deal with it. Separating the different elements found in waste streams enables the recovery of useful materials hence, minimizes the large quantity of material sent to landfill and allows recyclable materials to reach its destination. The whole purpose of assigning machines to do a man's work is to reduce our work load and most importantly. The concurrent effects of a fast national growth rate, of a large and dense residential area and a pressing demand for urban environmental protection create a challenging framework for waste management. It is necessary to design and develop an automatic garbage classification system. This paper presents a new method which obtains waste images from the refuse conveyor belt by high-speed camera system, extracts the texture features and separates the waste automatically. This paper proposes an automated waste classification system using Convolution Neural Network algorithm, a Deep Learning based image classification model used to classify objects into bio and non-biodegradable, based on the object recognition accuracy in real-time. This algorithm is suitable for a large amount of waste segregation process. Python index package is used to identify and classify the waste material in real-time through webcam.

2. EXISTING WORK

"Automatic Waste Sorting using Shortwave Infrared Hyperspectral Imaging System"[2013]

HIS provide significant information about the chemical constituents of materials and increased classification and recognition capability. Different waste materials are scanned by the SWIR hyperspectral imaging system and automatically sorted using the proposed steps. Further increased using post-processing. The application is the most comprehensive in terms of waste types in hyperspectral imaging literature for recycling.

"Automated waste segregator"[2014]

It is designed to sort the refuse into metallic waste, wet waste and dry waste. Eddy current based separators used to diffentiate the plastics, and various sensors are used to detect the metallic, wet and dry wastes. The experiment has been conducted for large volume of dry waste objects. It can segregate only one type of waste at a time.

"Remote Monitoring and Sorting System for Waste Material Management Using RFID"[2014]

CRT have lead and cadmium which are highly toxic in nature and should be identified and separated. RFID reader for collecting the information from all RFID tags. An embedded system to collect digital data from the arduino board and perform necessary mathematical computations to identify nature of polymer. An affordable and efficient method that can sort different categories of plastics and e-waste quickly and accurately.

"Capsule Neural Networks and Visualization for Segregation of Plastic and Non-Plastic Wastes"[2019]

In order to bring down the disadvantages and for improving the performance, we use capsule net instead of CNN. In the setup is mounted with webcam which captures the images

and send to capsule net for classification. The output is given as the probability value, there by classifying the waste material. In spite of that it is found that capsule-Net is capable of giving better accuracies even for small datasets, add up more images in the dataset.

3. PROPOSED SYSTEM

This paper presents a new method which obtains waste images from the refuse conveyor belt by high-speed camera system, extracts the texture features and separates the waste automatically. We proposed waste sorting scheme based on Image processing. The aim is automate waste sorting by applying learning techniques to recognize the type of waste from their images. It separates waste into 3 main categories: Plastic, Paper and Metal using image of the waste and implement it on a open cv. When the object is dropped on the moving conveyor blet, object sensor is placed on the some distance to detect the object on the blet, the sensor detected then the moving of the blet will be stop, the image is capture and process with the data sets for what type of waste or object, will segregate the depending on the data sets, the laptop sends the data to microcontroller, start the kit starts the with help of L293D driver for DC Motor to rotatae, and we have three segsration depending on that the waste will be placed in the respective dustbins like state, right and left placed dustbins.

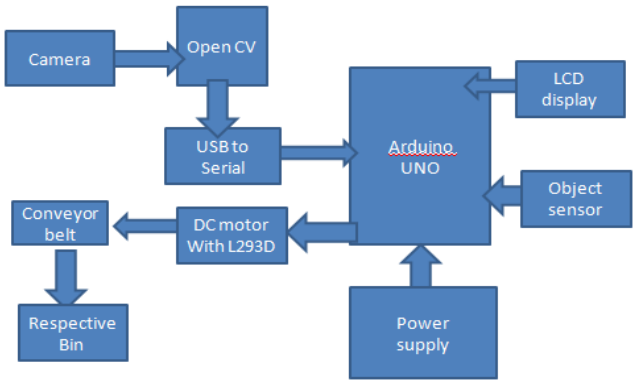

Fig.1. Block diagram of Proposed System

4. HARDWARES

4.1. Arduino IDE

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer.

4.2. Conveyor Belt Rotating System

For the rotating system of the conveyor belt, DC motor was used. For the control of the speed of the motor a control circuit was used as the rotating speed of conveyor belt directly depends on the speed of the motor. A potentiometer in that control circuit controls the voltage in motor and by this way it controls both motor and conveyor belt rotating speed.

4.3. L293D Motor Driver

The L293D is a popular motor driver IC that is usable from 6 to12V, at up to 1A total output current. By itself, the IC is some what difficult to wire and use, but the Compact L293D Motor Driver makes it much more convenient to use.

4.4. DC motor

Many applications call for a high start-up torque. The D.C. motor, by its very nature, has a high torque vs. falling speed characteristic and this enables it to deal with high starting torques and to absorb sudden rises in load easily. The speed of the motor adjusts to the load. Furthermore, the D.C. motor is an ideal way of achieving the miniaturisation designers are constantly seeking because the efficiency it gives is high compared with other designs.

4.5. IR sensor

Ranging sensors include sensors that require no physical contact with the object being detected. They allow a robot to see an obstacle without actually having to come into contact with it. This can prevent possible entanglement, allow for better obstacle avoidance (over touch-feedback methods), and possibly allow software to distinguish between obstacles of different shapes and sizes.

4.6. WebCam

The term "webcam" (a clipped compound) may also be used in its original sense of a video camera connected to the Web continuously for an indefinite time, rather than for a particular session, generally supplying a view for anyone who visits its web page over the Internet. Some of them, for example, those used as online traffic cameras, are expensive, rugged professional video cameras.

5. SOFTWARES

5.1 OpenCV-Python

Python is a general purpose programming language started by **Guido van Rossum**, which became very popular in short time mainly because of its simplicity and code readability. It enables the programmer to express his ideas in fewer lines of code without reducing any readability. Compared to other languages like C/C++, Python is slower. But another important feature of Python is that it can be easily extended

with C/C++. This feature helps us to write computationally intensive codes in C/C++ and create a Python wrapper for it so that we can use these wrappers as Python modules. This gives us two advantages: first, our code is as fast as original C/C++ code (since it is the actual C++ code working in background) and second, it is very easy to code in Python. This is how OpenCV-Python works, it is a Python wrapper around original C++ implementation.

5.2Arduino IDE

Arduino is an open-source project, enabling hobbyists to easily take advantage of the powerful Atmega chips. The Arduino IDE is the software where you can write code and upload it to the Atmega chip. The code is then executed on the chip. Most 3D-printer electronics are Arduino-compatible; they use the Atmega chip and enable the user to upload their code using Arduino. This includes Megatronics, Minitronics and RAMPS.

Before you can start using the electronics you need software 'firmware', that translates machine instructions (gcode) into actual movements. There are a few options here, including Marlin and Sprinter and Repetier. The actual firmware is not discussed in this document. You can use Arduino to upload this firmware onto your electronics. This document will guide you in the steps you need to take.

To upload a firmware, you must first open the files using File → Open. Select the. ino file from the directory containing the firmware. Arduino will open several tabs with files.

6. RESULTS

The given object is checked successfully based on colour and edge detection using the RNN algorithm and the result is the given object is plastic, then python software send the serial output to Arduino, then Arduino guide the respective dc motor to rotate right side, then the object put through bin1.

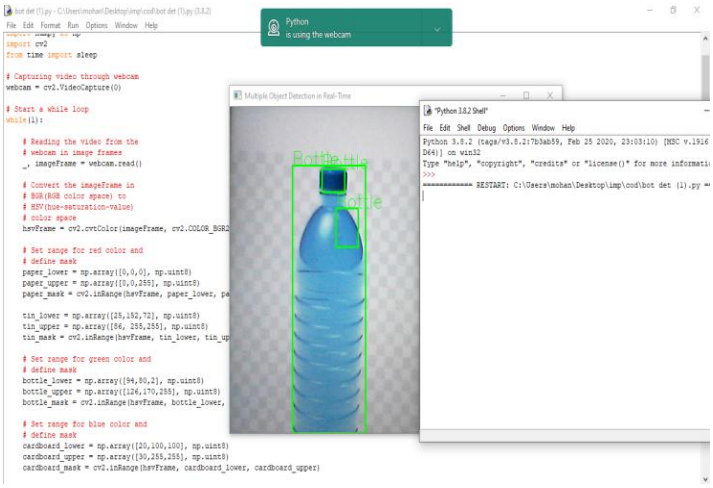

Fig.2. Results of Object detection

7. CONCLUSION

In this paper, we propose a new solution to enhance waste collection efficiency using the image processing. Fully relying on digital information attached to waste items, this approach sensor, nor external system support, enabling high scalability and availability. The presented system helps the user in correctly sorting and disposing wastes.

Implementation of this system at a local level like societies, educational institutes, etc. can reduce the burden on the local authorities. The automatic waste segregator is one small step towards building an efficient and economic waste collection system with a minimum amount of human intervention and also no hazard to human life. Using a conveyor belt makes the system far more accurate, cost-effective and also easier to install and use at a domestic level. Segregating all these wastes at a domestic level will also be time-saving.

8. REFERENCES

[1] Islam, M. S., Hannan, M. A., Basri, H., Hussain, A., & Arebey, M. Solid waste bin detection and classification using Dynamic Time Warping and MLP classifier.[2014]

[2] Kannan, S. G., Kumar, S. S., Ragavan, R., & Balakrishnan, M. Automatic Garbage Separation Robot Using Image Processing Technique[2016].

[3] Aleena V.J.*, Kavya Balakrishnan, Rosmi T.B., Swathy Krishna K.J., Sreejith S, T.D. Subha, Automatic Waste Segregator and Monitoring System[2017].

[4] Kittali, R. M., & Sutagundar, A.Automation of Waste Segregation System using PLC[2016].

[5] Sreelakshmi K,comAkarsh S,Vinayakumar R,Soman K.P, Capsule Neural Networks and Visualization for Segregation of Plastic and Non-Plastic Wastes[2019].IEEE

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