IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 9, Issue 7, July 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.542

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 7, July 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0907176 |

Image Processing Based Smart Garbage Separation System Using Arduino

V.Sanjana, P.T. Padmavathi, P. Rajalakshmi, R. Ranjanadevi, D.Nithya

Department of ECE, Panimalar Engineering College, Chennai, Tamil Nadu, India

ABSTRACT: Rising garbage of the world poses serious threats to human being because the amount of waste gets escalated per each minute by an individual. India alone produces approximate 0.2 million tones of garbage per day. Maximum garbage cannot be fixed to proper solution because separation mechanism is not present widely in India. Only rage picker does separation of garbage in some cities but it cannot complete the whole separation. As per the data only 30-40% garbage is separated daily. Some garbage cannot be separated by hand as they are hazardous like chemical waste, medical waste, floating waste etc. so the separation of the garbage is needed which is safe, lenient and automatic. This paper proposes a machine learning based image processing system for the detection of type of garbage waste like plastic or bio-degradable. An Arduino micro controller is used to drive the motor system for the separation of wastages.

KEYWORDS: Arduino, Motor, Robotics, Smart Dustbin, Waste management,.

I. INTRODUCTION

Waste segregation and recycling are effective ways of reducing dumped trash. People have been negligent when it comes to proper waste disposal, ignoring labels and throwing recyclables that can still be reused. Most are unaware or choose to ignore the fact that the waste segregation and recycling can reduce cost, reduce drain in our resources, and lessen the waste being produced. Typical composition of garbage people throws in are 5.8% metals, 3.5% glass, 1.6% plastic, 12.9% papers, 1.8% textiles and 53.7% biodegradables which means only the remaining 20.7% of the wastes should really be going to our landfills. In our country, recycling centers do manual process of sorting wastes leading to a high risk of acquiring sickness. This study aims to automate waste segregation and implement a waste delivery system that would minimize human interference in the waste collecting and segregation process. Garbage such degradable and non-degradable are the wastes that need to be segregated in this project.

The main objective of this project is to find and separates the garbage waste for the smart garbage waste management system. The idea of "Smart waste management system", mainly concentrates on Monitoring the waste management, providing a smart technology for waste system, avoiding human intervention, reducing human time and effort and which results in healthy and waste ridden environment.

II. LITERATURE SURVEY

An improvement of the original SIFT algorithm providing more reliable feature matching for the purpose of object recognition is proposed in [1]. The main idea is to divide the features extracted from both the test and the model object image into several sub-collections before they are matched. The features are divided into several sub-collections considering the features arising from different octaves, that is from different frequency domains.

In [2], a mixed discrete- continuous conditional random field (CRF) that explicitly models both types of constraints: Exclusion between conflicting observations with super modular pairwise terms, and exclusion between trajectories by generalizing global label costs to suppress the co-occurrence of incompatible labels (trajectories) are used. An expansion move-based MAP estimation scheme that handles both non-submodular constraints and pairwise global label costs was developed. Furthermore, a statistical analysis of ground-truth trajectories to derive appropriate CRF potentials for modeling data fidelity, target dynamics, and inter-target occlusion was proposed.

In [3] object perception is applied to mobile robotics. Being able to perceive semantically meaningful objects in unstructured environments is a key capability in order to make robots suitable to perform high-level tasks in home environments. However, finding a solution for this task is daunting: it requires the ability to handle the variability in

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 7, July 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0907176 |

image formation in a moving camera with tight time constraints. The well-known SIFT object recognition method was evaluated in a very challenging dataset of 30 objects captured while navigating with a mobile robot in a typical indoor setting. The obtained results were compared with those obtained in the same dataset by two other popular state of the art object recognition methods.

In [4], a new approach for matching images observed in different camera views with complex cross-view transforms is proposed and applied it to person identification. It jointly partitions the image spaces of two camera views into different configurations according to the similarity of cross- view transforms. The visual features of an image pair from different views are first locally aligned by being projected to a common feature space and then matched with softly assigned metrics which are locally optimized. The features optimal for recognizing identities are different from those for clustering cross-view transforms. They are jointly learned by utilizing sparsity inducing norm and information theoretical regularization. This approach can be generalized to the settings where test images are from new camera views, not the same as those in the training set.

In [5], Arduino is used as brain of smart garbage bin filling status and other user-friendly interactions like digital display, buzzer and GSM module are used for enabling mobile alerts in the model. As an initial condition, the garbage bin shows a status of 'EMPTY'. This status can be accessed by the user through the mobile message and also in the web portal using the registered login details. As the garbage bin is made available at the accessible sites, the garbage filling starts, based on the level of filling the status is updated. The disadvantage is that the model accommodated only for 4 levels namely empty, medium, nearly full, full and threshold crossed.

In [6] an alternative approach for speeding-up classifier evaluation which overcomes important limitations is highlighted. It involves maintaining a probability estimate of the class label at each intermediary response and stopping when the corresponding uncertainty becomes small enough. As a result, the evaluation terminates early based on the sequence of responses observed. Furthermore, it does so independently of the type of ensemble classifier used or the way it was trained.
In [7], an integrated system Wi-Fi modem, IoT, GSM, Ultrasonic Sensor is introduced for efficient and economic garbage collection. The solutions currently available for the implementation of IoT are analyzed. By proper implementation of this project, overflowing of the garbage from the container in a residential area can be avoided which is previously either loaded manually or with the help of loaders in traditional trucks. It can automatically monitor the garbage level & send the information to collection truck.

In [8], an introduction to the esp8266 Wi-Fi module. They label this module as 'low cost, high performance' chip. The aim of this module is to provide IOT designers to enhance their systems with Wi-Fi capabilities at an economical yet high performance level. The module has various models of the esp8266-xx family with each variant being an upgrade on another. It requires a dc input of 3.3V/250mA.

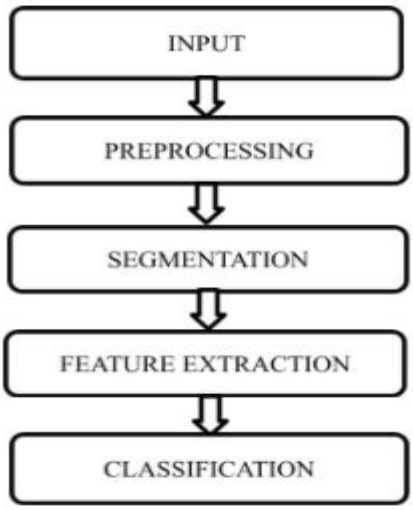

Fig.1 Block diagram of the proposed design methodology.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 7, July 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0907176 |

III. METHODOLOGY

The design methodology of the proposed system is described in the block diagram as shown in Figure 1. The steps involved in the proposed methodology are as follows;

1. INPUT IMAGE
2. PREPROCESSING
3. SEGMENTATION
4. FEATURE EXTRACTION
5. CLASSIFICATION

INPUT:

Read and Display an input Image. Read an image into the workspace, using the (im_read) command. In image processing, it is defined as the action of retrieving an image from some source, usually a hardware-based source for processing. It is the first step in the workflow sequence because, without an image, the processing is impossible. The image that is acquired is completely unprocessed.

IMAGE PREPROCESSING:

Pre-processing is a common name for operations with images at the lowest level of abstraction in which both input and output are intensity images. The aim of pre-processing is to improve the image data that suppresses unwanted distortions or enhances some image features important for further processing. Image pre-processing methods use the considerable redundancy in images.

RESIZING THE INPUT IMAGE:

All the input images are resized into same dimensions. If the specified size does not produce the same aspect ratio as the input image, the output image will be distorted.

CONVERTING COLOUR FORMAT:

For many applications of image processing, color information doesn't help us. If you get into the business of attempting to distinguish colors from one another, then one reason for converting RGB image to GRAYSCALE formats in image.

SEGMENTATION:

Image segmentation is nothing but a technique in which the digital images are processed and analyzed to partition an image into multiple parts or regions, often based on the characteristics of the pixels in the image. In computer vision, Image Segmentation is the process of subdividing a digital image into multiple segments (sets of pixels, also known as super pixels. Segmentation is a process of grouping together pixels that have similar attributes. Homogeneity criteria such as color, intensity or texture are used to locate and identify objects and boundaries (lines & curves) in an image. Segmentation accuracy determines the eventual success or failure of computerized analysis procedure.

FEATURE EXTRACTION

In machine learning, pattern recognition and in image processing, feature extraction starts from an initial set of measured data and builds derived values (features) intended to be informative and non-redundant, facilitating the subsequent learning and generalization steps, and in some cases leading to better human interpretations. Feature extraction is related to dimensionality reduction. When the input data to an algorithm is too large to be processed and it is suspected to be redundant (e.g. the same measurement in both feet and meters, or the repetitiveness of images presented as pixels), then it can be transformed into a reduced set of features (also named a feature vector). Determining a subset of the initial features is called feature selection.

The selected features are expected to contain the relevant information from the input data, so that the desired task can be performed by using this reduced representation instead of the complete initial data.

- Shape features
- Color features
- Texture features

A. SHAPE FEATURES:

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 7, July 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0907176 |

Visual features of objects are called the shape characteristics or visual features. For example, circular object or triangular objects or other shapes, perimeter boundary of the object, the diameter of the border and so on. The visual features showed intuitively are all belongs to shape features.

B. COLOR FEATURES:

Global features include color and the texture into non-intersecting regions such that each region is homogeneous and the union of no two adjacent regions is homogeneous Pixels in a region a re histograms and color layout of the whole image. Local features include color, texture, and shape features for sub images, segmented regions, and interest points. These features extracted from images are then used for image matching and retrieving.In this work SURF (Speeded-Up Robust Features) is used for taking important features of traffic sign images.

C) TEXTURE FEATURES:

An image texture is a set of metrics calculated in image processing designed to quantify the perceived texture of an image. Image Texture gives us information about the spatial arrangement of color or intensities in an image or selected region of an image.

CLASSIFICATION:

Image classification refers to the task of extracting information classes from a multiband raster image. The resulting raster from image classification can be used to create thematic maps. There are many classification algorithms are available and one such classification algorithm that we use is given below, KNN (K-NEAREST NEIGHBOUR MACHINE CLASSIFICATION) Which is not only for shape extraction but also for color and feature extraction.

IV.SIMULATED RESULT

The proposed system has been simulated using MATLAB software and the image processed smart garbage separation has been obtained using this software.

DECOMPOSIBLE WASTE:

This Fig.3 shows the final separated output image after SURF feature processing for a degradable waste.

Fig.3 Simulated output for decomposable waste

NON-DEGRADABLE WASTE:

This Fig.4 shows the final separated output image after SURF feature processing for a plastic waste.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 7, July 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0907176 |

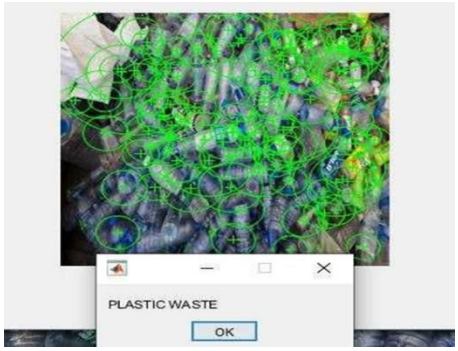

Fig.4 Simulated output for plastic waste

V. HARDWARE DESCRIPTION

The components and functionality of the proposed system is described in this section.

1. ARDUINO:

In Fig.5, Arduino uno board depicted consists of,

- 5 Processor: Pentium Dual Core 2.00GHZ
- Hard Disk: 500 GB
- RAM:4GB(minimum)

Fig.5 Arduino uno Board

2. SERVO MOTOR.:

Servo motor which allows precise angular movement of the automatic lid incorporated in SDN is shown in Fig.6. Servo used is SG 90 model with operating voltage of 4.8V and stall torque of 1.8 kgf.cm. If the motor rotates in the clockwise direction ,then it is a Bio-Degradable waste. If the motor rotates in the anti-clockwise direction ,then it is a non-biodegradable waste.

Fig.6 Image of Servo motor

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 7, July 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0907176 |

3. POWER SUPPY CABLE:

Fig.7 shows a power supply cable which supplies power to the Arduino to make it work.

Fig.7 Power Supply Cable

3. CH340 CABLE:

Fig.8 shows CH340 Cable which is a cable that connects Arduino with Servo motor.

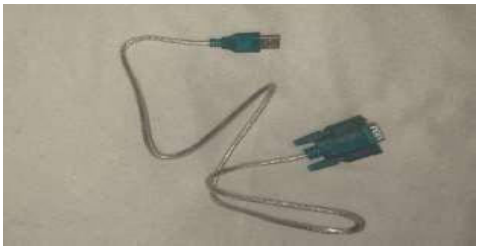

Fig.8 CH340 Cable

5.HARDWARE SETUP:

Fig.9 shows the hardware connection setup used for obtaining the image processed smart garbage separation system.

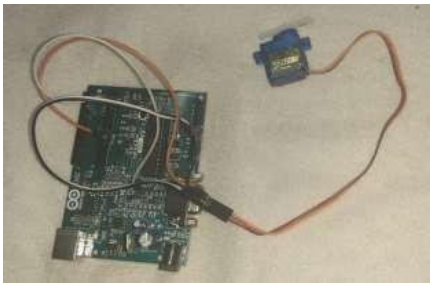

Fig.9 Hardware Connection Setup

VI. CONCLUSION

This paper presents the implementation of the smart garbage detection that helps the waste management system. In this system some feature extraction algorithms are developed to extract the important features of the waste object. After feature extraction the extracted values are trained and classified by the KNN classifier algorithm. The output is then used to drive the motor controller in order to split the waste as either decomposable or plastic using Arduino microcontroller.The Smart Dustbin will in turn improve the garbage collection systems implemented across the country.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.542

|| Volume 9, Issue 7, July 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0907176 |

REFERENCES:

1. H. R. Choi, S. W. Lee, K. M. Jung, J. C. Koo, S.I. Lee, H. G. Choi, J.W. Jeon, & Indonesia Customer Satisfaction Index Study Nam. 2004, "Tactile Display As A Braille Display For The Visually Disabled", International Conference on Intelligent Robots And Systems, Vol.2.
2. Manohar, P., & Parthasarathy, A., 2009., "An Innovative Braille System Keyboard For The Visually Impaired", 11th International Conference on Computer modeling and simulations Uksim 2009, pp. 25- 27.
3. Bojan, T.M., Kumar, U.M., & Bojan, V.M., 2014., "Meet the Vehicle Tracking System An Open Source Approach", International Conference on Vehicular Electronics And Safety (ICVES).
4. Tian, Z.J., & Zhang, J., 2009., "Location-Based Services Applied To An Electric Wheelchair Based On The GPS And GSM Networks", International Workshop on Intelligent Systems And Applications.
5. Rasyidah, A.N., 2015., "self-confidence on the blind people (User Case Studies the science of Vibrations Perguruan pencak silat organize an empty handed Dove White)", Islamic Religion and Psychology faculty of the University of Mohammadiyah Surakarta, Vol.13, No.1
6. Rahma, R.N., 2015., "Psychological Welfare backer of the blind people", a study on the blind people Students Education Science Faculty of the University of Yogyakarta, 7 Edition
7. Fitriyah, C., Rahayu, S.A., 2013., "Concept of self in teenage blind people in Blind people Children
8. Education Foundation (Ypab) Surabaya", Research Journal Psychology, Vol. 04, No. 01, pp.46-60
9. Radhika, R., Pie ,P.G., Rakshitha, S., Srinath, R., 2016., "Implementation of Smart Stick for Obstacle Detection and Navigation", International Journal of Latest research in Engineering and Technology (IJLRET), Volume 02, pp. 45-50
10. Nugroho, H.E., 2010, "Letter Recognition Braille System development based interactive Mobile The SLBN A Citeureup", Informatics Engineering -Computer University of Indonesia
11. Wardani, I.K., Herani, I., Rahajeng, U.W., 2019., "Self-Presentation Strategies" Students the blind people", Study Program Psychology faculty of Social Sciences and Political Science University of Brawijaya Malang.

INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 7.542

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details