

Determining the Components of Waste Assisted with Analysis of Methods for Reuse and Recycling

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Abstract - - *Data mining can be termed as the process of exploring data, searching consistent patterns and relationships between variables. The ultimate aim of data mining is prediction. Data mining can be used to study different patterns in a set of images using a huge database of the same. Through this project, the need for waste analysis through manual inspection can be eliminated, as images generated can be analyzed to segregate various components of waste. Also, recycling techniques would be suggested to the user based on the components identified from the images.*

Key Words: *web crawling, automatic segregation, CBIR, biodegradable and non-biodegradable*

1. INTRODUCTION

Due to ever increasing population, various issues have been raised. One such issue that has had serious and irreversible effects is the waste generated by us. Waste management is extremely important so as to maintain the balance of the ecosystem. Poor management or turning blind-eye to such problem shall pose a serious hazard in the near future. There is a need for accurate and timely information so that suitable steps can be taken to mitigate it. The objective of this project is to enlighten the users about various substances found in day-to-day garbage so that they be aware of them and reduce the generation of the same.

Through this project, the need for waste analysis through manual inspection can be eliminated as images that are uploaded can be analyzed using CBIR (Content Based Image Retrieval) to segregate various substances. The authority with the responsibility of managing the waste can effectively manage the waste by monitoring them without personal investigation on field. The substances thus listed out, would be termed as biodegradable or non-biodegradable according to their properties. Also, recycling techniques would be suggested to the user if the substance is biodegradable. A web crawler is a program which browses the World Wide Web in an automated and methodological manner. Consequently, on clicking a biodegradable substance, the crawler searches the World Wide Web for its recycling techniques and displays them on the screen. Hence, along with all the waste substances, the user can also get the knowledge of recycling them for a better waste management. The identification and crawling can be done using the softwares Eclipse Luna, Navicat and Apache Tomcat.

2. LITERATURE REVIEW

A lot of places like universities, downtowns, subways, and malls have different containers for specific kinds of waste. Unfortunately, due to dearth in the citizens' awareness towards placing waste in the correct containers, it becomes difficult to recycle waste which has to go through a separation process that is generally results in a high economic cost. Hence, our project looks forward to reduce the task of separation manually. There were methods proposed by people for achieving the goal of waste segregation, some of which are mentioned here:

2.1 Automatic waste segregation using Image Processing and Machine Learning:

The waste segregation is carried out largely with the help of manual workers. The efficiency of manual segregation is low. The chances of incorrect classification of any waste matter is high because of human error. Along with that, the workers are subjected to the risk of infection and diseases which are very common in such working conditions. Waste segregation using exploitation of deep learning is planned for quicker and cleaner operating. It involves pictures taken from camera with detection, object recognition, prediction and classification into categories as biodegradable and non-biodegradable. The waste segregation using sensors has been proposed in and the bin is fitted with metal sensor and an IR (infrared) sensor to determine the type of waste. The response from the metal detector indicates non-biodegradable waste and therefore the response from IR detector indicates recyclable waste. The lid tilts consequently and drops the waste item into either compartment. The waste is further processed by electrical phenomenon sensing module that distinguishes between wet and dry waste. The waste is then subjected to LDR (Light Dependent Resistor) + LASER to determine plastic components. The waste is identified with the help of the above sensors and then segregated by pushing them into separate containers belonging to each category (International Journal for Research in Applied Science & Engineering Technology (IJRASET) 2018).

2.2 Automatic waste segregator and monitoring using ultrasonic sensors:

The design of Automatic waste segregator aims at sorting the waste into three main categories namely; metallic, organic and plastic, thereby making the waste management more effective. Ultrasonic sensors are used for watching waste segregation process. The sensors would be placed in all the bins.

When the rubbish reaches the amount of the detector, then the indication will be given to a microcontroller.

The microcontroller will give indication to the driver of garbage collection truck by sending SMS using GSM technology (Journal of Microcontroller Engineering and Applications 2016).

Taking a glance into the history of separate waste assortment and exercise, one will notice that, in time, many solutions were used, however only an absence of resources appeared did the government and local authorities take action in order to establish rules for separate waste collection. As we can see the usage of hardware concepts is quite expensive for separating waste at a small scale. Hence, we have come up with a software solution, making a web-based application wherein the application itself will identify the components without any sensor or human assistance, thus reducing cost and time.

3. DESCRIPTION OF COMPONENTS

3.1 ECLIPSE LUNA

Eclipse Luna supports Java 8 officially, that includes implicit support for Java development tools, Plug-in Development Tools, Object Teams, Eclipse Communication Framework, Maven integration, Xtext, Xtend, Web Tools Platform and Memory Analyzer. It is an essential tool for any Java developer, which includes a Java IDE (Integrated Development Environment), XML (eXtensible Markup Language) editor and WindowBuilder. Eclipse is an integrated development environment (IDE) for programming in Java in the field of computer programming and is the most widely used Java IDE throughout the Industry. The environment can be customized not only by using the base workspace, but also by an extensible plug-in system. Java is used to design the front end of our application.

3.2 MYSQL

A widely used, user friendly, open source Relational database Management system (RDBMS) that uses Structured Query Language (SQL) for accessing and managing content in a database. It allows multiple users to create and manage multiple databases in a time-shared manner. Also, the software is available for free. Hence, for our project, MYSQL

is used for creating a database of substances which are biodegradable and non-biodegradable separately.

3.3 NAVICAT

Navicat for MySQL is the ideal solution for MySQL administration and development of databases. It provides an intuitive and powerful graphical user interface for database management, development and maintenance. It connects to multiple databases on a single GUI. It helps us create, edit and run SQL statements/queries without having to worry about syntax and proper usage of commands.

3.4 CBIR

Content Based Image Recognition (CBIR) is the process using which, one can search images which are similar to the content of the query image based on color, texture, shape etc. It uses color percentages, color layout, texture, shape, location, and keywords for this purpose. First the images are segmented on color plus texture, then user selects a region of the query image and after that the system returns images with similar regions. This method is also known as query by image content (QBIC). 'Content Based' is the term used when the search analyzes the content of the image rather than the metadata i.e. keyword tags or descriptors associated with the image.

3.5 Web Crawling

A crawler is a program designed to visit numerous Web sites and read their pages and other information in order to create entries for a search engine index. All major search engines on the Web have such a program, which is also known as a "spider" or a "bot." It browses the World Wide Web in an automated manner. A search engine employs special software robots, called spiders, to find information on the hundreds of millions of web pages that exist, by building lists of the words found on web sites. Web Crawling is the process that includes the results compiled using the list provided by these spiders.

3.6 APACHE TOMCAT

Basically, after writing the java code, we need to deploy the Java servlets and JSPs (Java Server Pages). Hence, Apache is an HTTP (hypertext transfer protocol) Server and Tomcat is a web server (which can handle HTTP requests/responses) and web container in one. To store, process and deliver web pages to clients, a web server is employed. HTTP handles the communication between the client and the server.

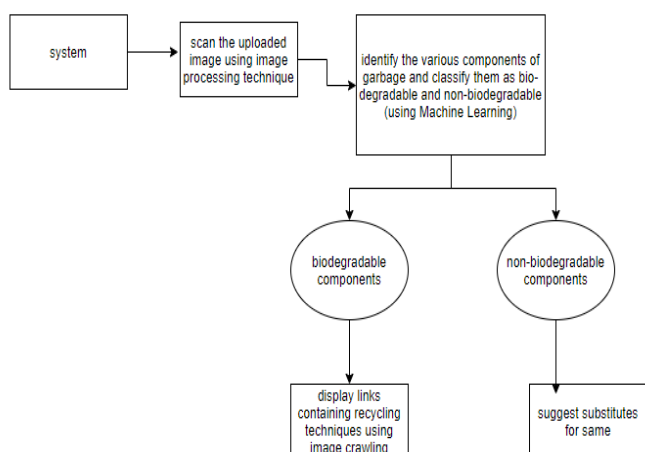
4. REQUIREMENT ANALYSIS

- Apache Tomcat Server
- MySQL 5.1

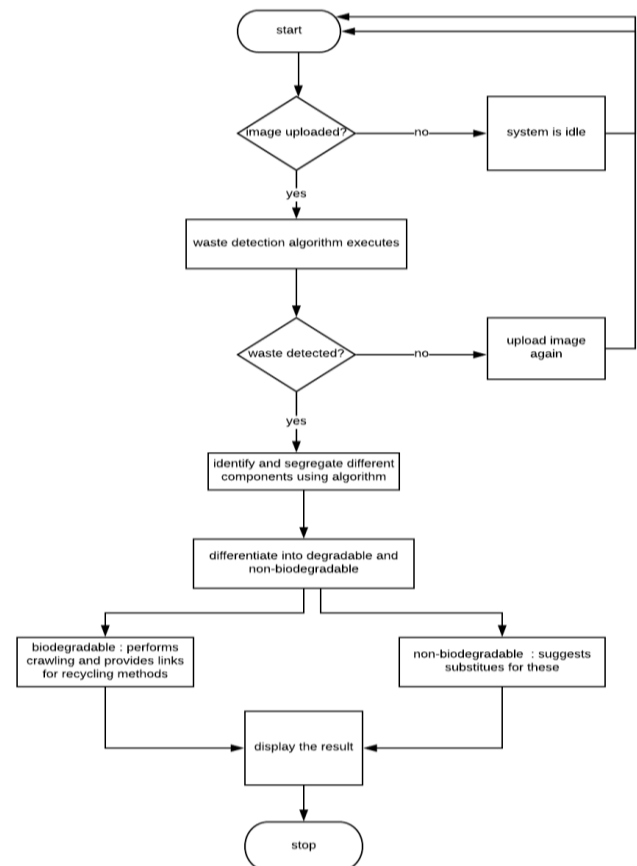
- Navicat
- Java jdk 1.6 or above
- Computer
 - Basic Computer with computational capabilities.
 - Min Req:
 - Pentium Processor or above
 - 2GB RAM
 - 80GB Hard Disk
- Front end design using following languages: JSP, Servlet, HTML5, CSS, JQUERY, AJAX, Bootstrap

5. PROCEDURE

The process of segregation begins by first uploading the image for which the segregation is to be done. The application then checks this image with the dataset of images already present in the database. The similar substances are matched with and listed out accordingly. If there are any new substances that are not present in the database, the system displays checks for the shape, size and color of the substance. As it is evident that there are a few shortcomings in our system, but it can effectively work for low scale garbage production such as the waste collected from our homes or small offices on a day to day basis. There is a lot of future scope for our system, which can be further modified and deployed for segregation of large waste collected in huge institutions and garbage dump areas.



6. PROPOSED METHODOLOGY



Our proposed system is designed in a way, wherein the user has to first upload the image from his/her system (that is a desktop, laptop, or a mobile phone). Now the system begins the process of segregating the different components present in that image and lists them out. Then they are classified into their respective categories. These categories can be broadly classified into 'Recyclable' and 'Non-Recyclable'. Under Recyclable waste, it describes the type of the material, viz: Paper, Metal, etc. and under non-recyclable, there are materials like plastic, nylon, etc. Once the system completes the task of analyzing the image, it not only gives the classification of the materials into their respective categories, but also gives crawled results from the internet for enlightening the user with the knowledge of how to recycle the recyclable materials successfully. This is done by hyperlinking the name of the category to which the material belongs to. Hence, this way it becomes easier for the user to get details about the type of materials accumulated in the waste. Since this is a primitive version of the system, there are various shortcomings in the overall system. As image classification is a wide domain, all functionalities of the system cannot be in this version. The future scope of this project includes recognition of a wide range of materials and classifying them successfully into its respective class.

7. RESULT

In this work, we successfully develop a system that can help in an automated waste segregation system by analyzing the various substances from an uploaded image.

- First, display the various components in the image
- Second, segregate them as degradable and non-degradable and display them separately
- Display the links for biodegradable substances using crawling concept
- Enable the user to segregate the waste without human assistance
- Give knowledge to the user about various recycling techniques for the waste generated

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