iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VIII **Month of publication:** August 2021

DOI: https://doi.org/10.22214/ijraset.2021.37600

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VIII Aug 2021- Available at www.ijraset.com

Geo Tracking of Waste

Sahil Pulikal[1], Haresh Lad[2], Sahil Mirashi[3], Manjusha Shelke[4]
[1, 2, 3]*Student,* [4]*Assistant Professor, Information Technology Department, K C College of Engineering & Management Studies & Research, Thane (East), Maharashtra, India - 400603*

Abstract: ***Littering of waste causes a lot of negative impact on the environment as well as it affects the economy of the nation. Because of unavailability of a proper waste tracking and detection system, littered waste remains uncleaned. The traditional way of waste management includes regular waste collected by the groups assigned such as municipal corporation trucks. To overcome this problem, we develop a system where the admin can capture images using a mobile camera and using artificial intelligence, it processes those images and identifies the type of waste present in the image. It also maps the waste locations along with its images on a map. At the end, the admin notifies the nearest garbage collector to clean the waste. The system uses the concepts of image processing, deep learning and object detection.***
Keywords: Object Detection, Image Processing, Coordinates, Deep Learning, Mapping

I. INTRODUCTION

In India nearly 70 million of waste is generated every year and nearly about 20 million of waste is produced in urban areas. Due to this reason landfills in most of those cities are overflowing with no space for garbage waste due to which this waste is being thrown into streets, rivers, lakes which leads to an increase in serious health issues to the public. To overcome these problems, we developed a system which uses mobile cameras to capture images and using artificial intelligence, it is possible to obtain information about the contents of waste present on the roadside and send notification accordingly. Using the above system, it offers a good solution to this problem and also saves the environment from pollution and various diseases such as cancer, etc.

II. THE PLANNING PROCESS

A. Problem Statement

The littered waste lies in cities which makes it difficult for the cleaning staff to know which area requires more attention. This leads to pollution in areas and diseases such as Parasitic Infections, Lung Infections, Skin Infections, etc. The traditional system in which the garbage collectors pick the waste from a specific location only, leaves many places containing littered waste uncleaned. So, to solve this problem we have created a system in which continuous tracking and monitoring of waste takes place by using mapping and object detection technologies.

B. Feasibility Study

Our main motto is to minimize the piles of waste lying in areas by providing an efficient mapping and detection system for solid waste which helps waste administrators administration to keep continuous track of waste and using mapping technology, it helps take actions based on the wastage level in those areas. Also, it helps the cleaning staff of the waste management team to know exactly which area requires attention and urgent waste pickup and can quickly take actions based on the wastage level in those areas.

C. System Requirements

1) Hardware Requirements

- Mobile Camera

2) Software Requirements

- TensorFlow 2.0
- YOLO (You Only Look Once) v3
- Angular
- PHP
- OpenCV – Python

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D. Scope

The purpose of this project is to develop a system which takes real images containing littered waste from mobile cameras and detects the type of waste in it. The system is proposed to work in small areas such as colleges, housing societies, etc. and sends images to the computer for performing the further processing. With the help of image processing techniques & object detection, the contents of the images are extracted and sent to the database. At the end notification will be sent by the admin to the respective person in charge via inbuilt chat application system and the waste collector sees the map which contains the location where waste is present and takes further the necessary action.

E. Project Design

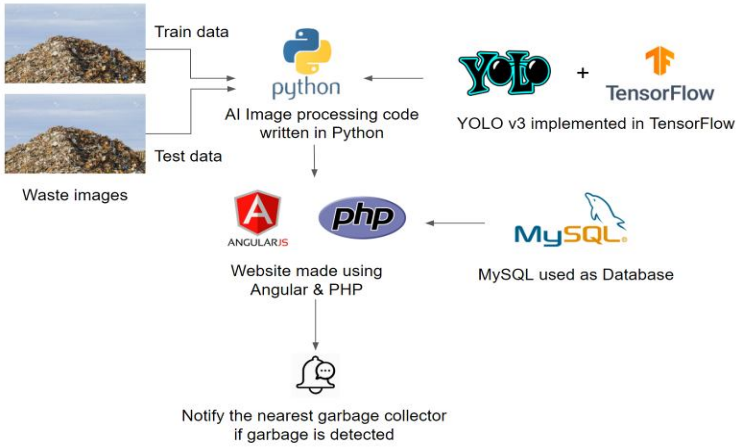


Fig 1. Schema of project

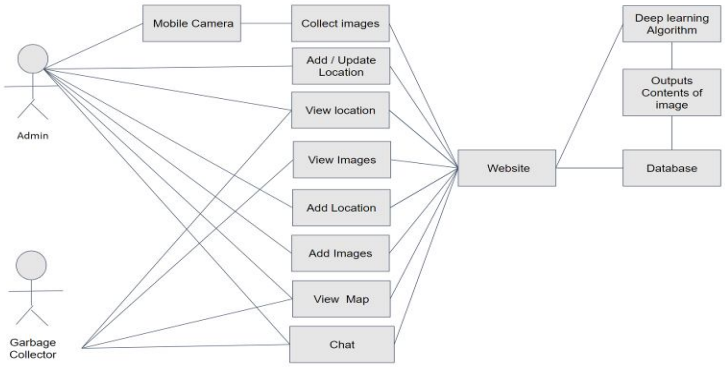


Fig 2. Use Case Diagram

III. PROPOSED SYSTEM

At first, images containing waste are collected for training the machine learning model using TensorFlow and YOLOv3. This custom model is trained using 2000 images with around 100000 steps and Mean Average Precision (mAP) of this object detection model is 75%. Once the model is trained, we deploy the ML model to a website which will help us to do object detection on the images captured by camera. All of the processing will be done on the website's server to provide a quick and accurate response. The website also allows the admin to add images and location of waste lying in a locality and the same gets updated on the map and allows the garbage collector to see the garbage lying in an area on a map. He/She will also be able to view the location of the garbage on the map. An integrated Chat Application helps to notify the garbage collector about the waste present in an area to be cleaned up by the admin. Also, we have integrated an attendance system for easy management and tracking of attendance of garbage collectors for a complete waste management solution. All the operations performed by admin and garbage collector are saved in the database.

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A. Screenshots

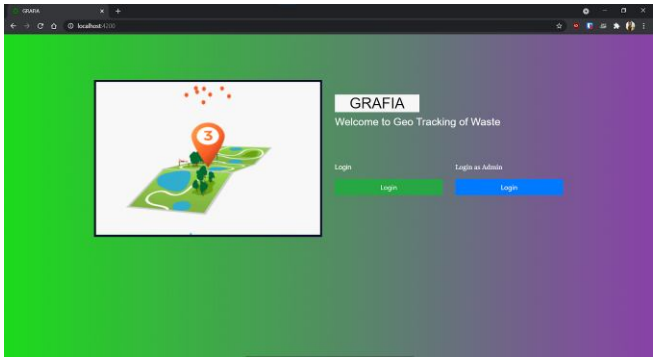


Fig. 3. Homepage of Geo Tracking of Waste

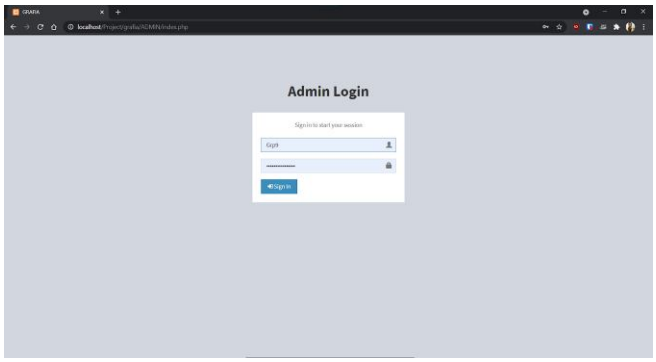


Fig. 4. Admin Login Page

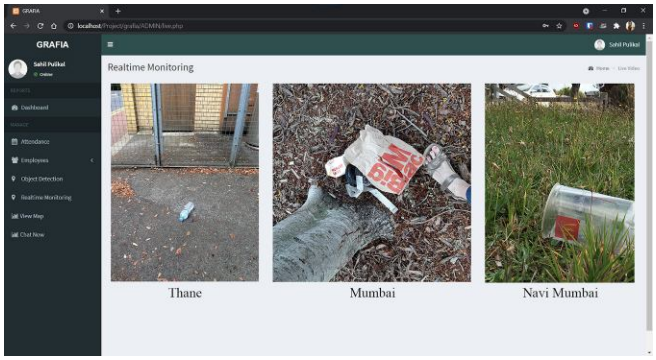


Fig. 5. Monitoring of waste

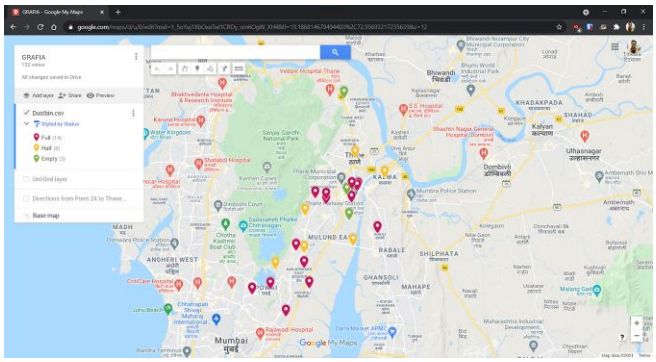


Fig. 6. Map shows the location of areas containing waste

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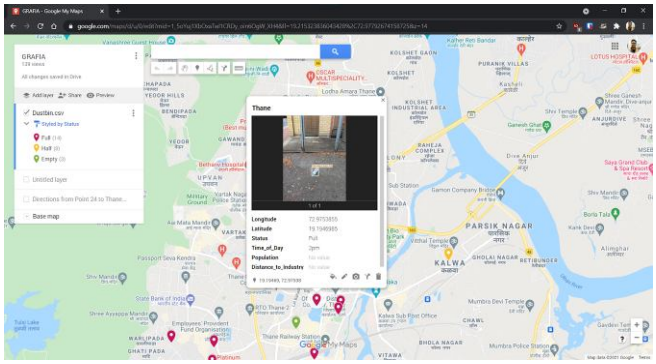


Fig. 7. Map shows object detected image of waste

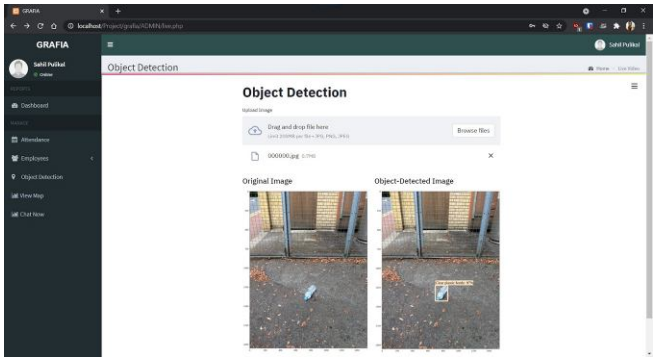


Fig. 8. Detection of waste

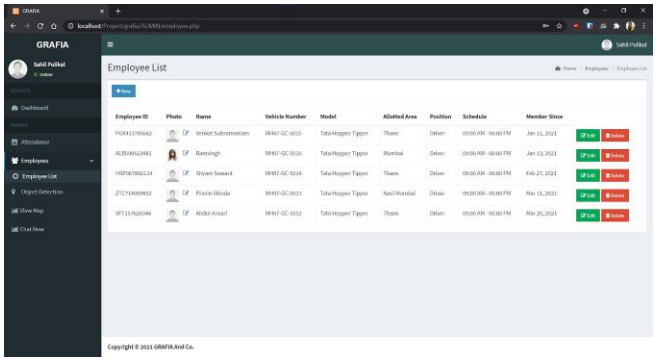


Fig. 9. Garbage Collectors' Attendance Management System

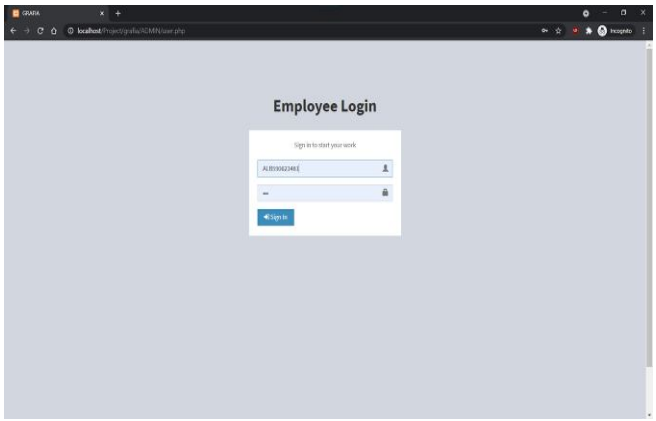


Fig. 10. Employee login page for Garbage collectors

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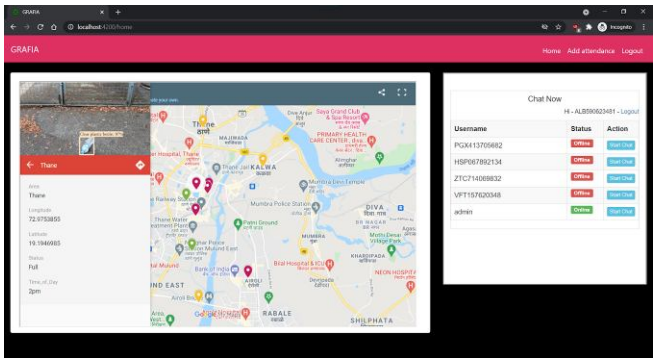


Fig. 11. Homepage for Garbage Collectors displaying a map along with integrated chat application.

IV. CONCLUSION

By using Geo Tracking of Waste project, we believe that a lot of littered waste can be easily detected and tracked thereby helping garbage collectors to know where littered waste is present in an area all at one place on a map and take required actions on it, thereby saving time and eliminating confusions caused such as which area to be cleaned first. Also, by providing an integrated chat system, the garbage collectors can easily communicate with their administrators thereby reducing friction and chaos caused by communicating through various methods. We are glad that our system will be useful for all small waste cleaning organizations and NGOs for cleaning waste efficiently and thereby contributing to a cleaner, greener and litter free environment.

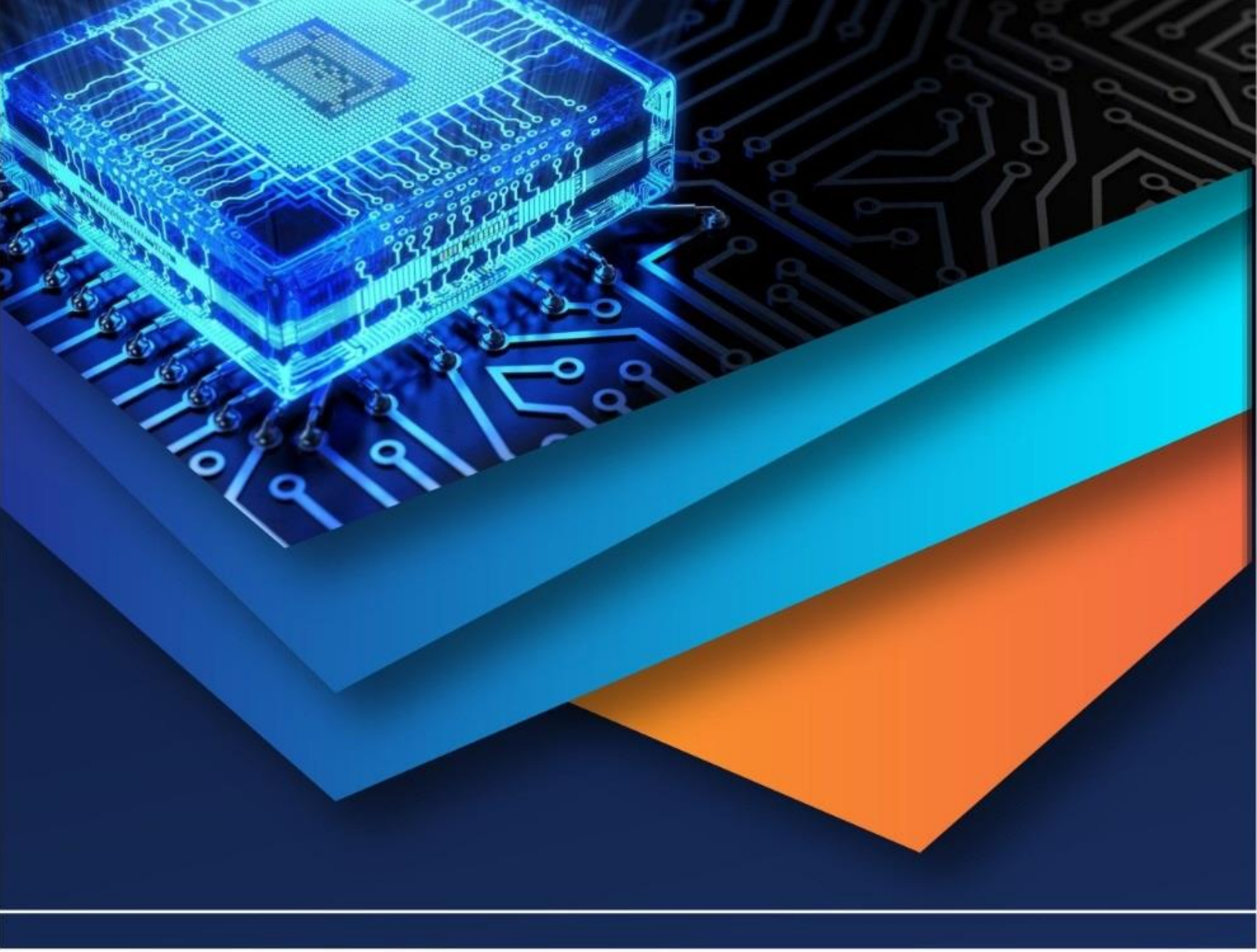
V. ACKNOWLEDGMENT

We would like to give a special thanks of gratitude to our project guide Prof. Manjusha Shelke as well as our Project Coordinator Prof. Amuthavalli Yadav who gave us the golden opportunity to work with this wonderful project topic Geo Tracking of Waste, who also helped us in doing a lot of research work and we came to know about so many new things. We are also very grateful to our Head of Department Prof. Amarja Adgaonkar for extending her help directly and indirectly through various channels in our project work. We would like to thank our Principal Dr. Vilas Nitnaware for providing us the opportunity to implement our project. We are really thankful to them. Finally, we are grateful to our parents and friends who helped us a lot in finalizing this project and helping us with unique ideas for our project.

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