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This is to certify that ___ABHISHEK MISHRA___ has secured Third Place in Hackathon *"Recursion 3.0"* held on **21 – 22, April 2022** at **MCT Rajiv Gandhi Institute of Technology, Mumbai.**

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HOD-Computer Department

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IIC President

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HOD-Computer Department

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St. Francis Institute of Technology
PRAKALP 2022 - 4th - Inter College BE Project Competition
Title of the Project : Smart Waste Management System

Registration no:E14R563

Abstract

Overflowing dustbins and garbage spilled out of them are a common sight nowadays. Such unhygienic sites pose threat to nearby areas as they tend to serve as breeding zones for disease spreading organisms like mosquitoes, flies, stray animals, microorganisms, etc. Moreover, they waste spilled out may also cause choking in the animals that come in search of food near them. The densely populated areas need to take additional care because extremely high amount of waste is generated and dumped in the bins. Hence, the garbage should be collected from the bins on regular interval of time, where the vehicle should take minimum possible route to reach to that node(dustbin) which will eventually save time and fuel. The proposed system consists of admin and driver end where the data of dustbin is fed statically. The admin can manage over all activity from adding removing driver to tracking the activity of each driver. In Driver end, the driver is allocated bins on regular basis and on embedded map and the optimized route will be displayed. The proposed algorithm utilizes A* algorithm in the origin. Algorithm has been optimized in a way that it includes some additional factors such as size of the bins and size of the vehicle, road quality, distance, and overflow time of dustbin.

Problem Statement

Optimizing routes for garbage collection with system management (Real time tracking)

Figure 1: Workflow of the proposed system

Algorithms used and Experimental setup

Additional parameters have been added to the A* algorithm and done the necessary improvement to get the desired output according to the need. Additional parameters include traffic, road quality, size of bin, size of vehicle and overflow time of dustbin. These changes in the algorithm helps to provide more optimized path to collect garbage from dustbins. This optimized path is generated according to the provided dustbins' location which are the assigned dustbins to the driver. The driver can have the shortest route to collect garbage efficiently from all assigned dustbins and save time & fuel. To overcome from existing challenges, a smart system is proposed that will help the municipal personnel with digital approach.

The proposed system is using factors based on which, algorithm will take required inputs and provide efficient and optimized solution to solve all the existing challenges. The proposed algorithm is based on the A* algorithm with concerned parameters to get the desired output. Web applications have been created one for admin side and another for driver side. Admin app is having create, update & delete access for vehicle, dustbin and users. Admin can also assign vehicles and bins to users and track all data in real time. Driver app have all dustbins data which are assigned to that particular driver. It helps driver to provide most optimized route and navigate through all dustbins to collect garbage . Driver can also see real time status of assigned bins and do the needful . MERN Stack is used for development of entire application .

Results
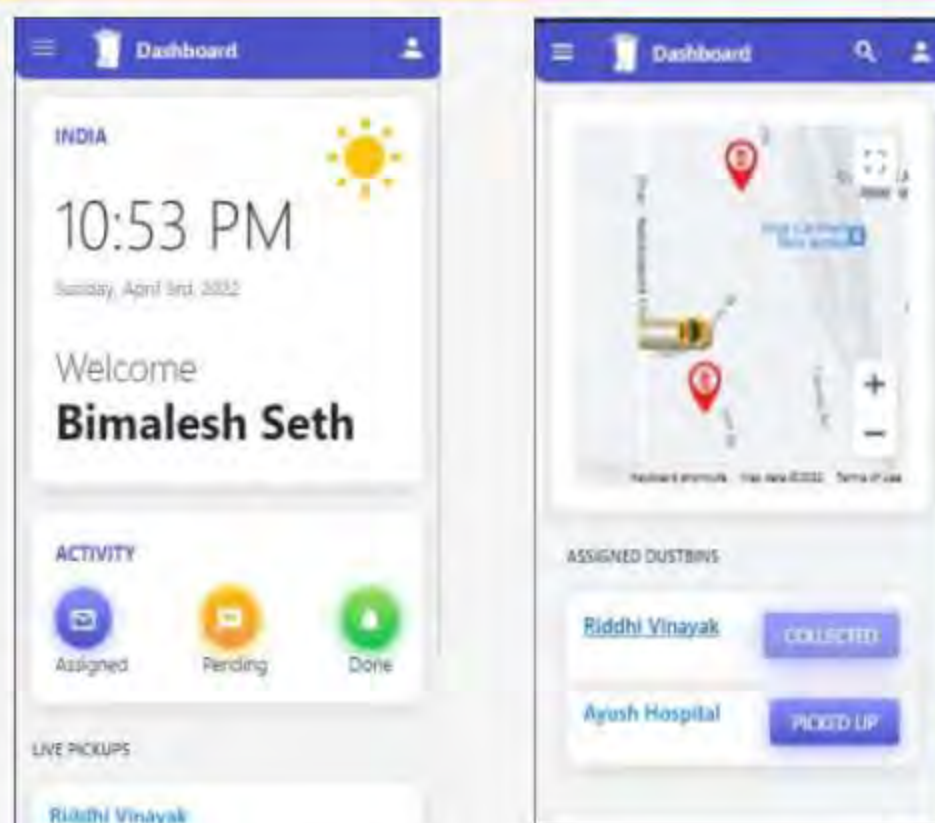
Analysis

1. Genetic Algorithm: It has very high time complexity and increases with parameter.
2. Ant Colony Algorithm: It also behaves in similar manner like Genetic Algorithm, also it considers random path.
3. A* Algorithm: It is highly efficient algorithm which consider best path with hindrances.

Conclusion and future directions

The Factors that are utilized to improve the efficiency of proposed algorithm will directly affect fuel and time. Where the driver will take less time to travel from source to destination which will eventually lead to less fuel consumption. It will lead to clean environment where over flow of dustbin and many problems due to that can be avoided in one go. With the help of system individual can track driver activities, assigned bins, and more from the admin portal which has user friendly UI and the portal can be accessed from web app.
The route to reach from particular source to destination is selected dynamically
in a way such that the route is optimized and the bins which need immediate attention for garbage collection is fulfilled.
Future Scope:
1. Predicting overflow of bins using AI/ML.
2. Turn by turn navigation can be added to help drivers.
3. IOT devices can be added to get real time data from bins

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Detail

Group Members:

1. Vikas Tiwari
2. Bimalesh Seth
3. Durgesh Tiwari

Project Guide: Mrs. Neha Kapadia