

Incentive Based Waste Management System

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(Received November 30, 2020)

Abstract: In present world, waste management is a challenging task for cities to make it as clean and smart city, especially creates a mess of problems due to increase in population and urbanization. Generally, people are demotivated and careless during segregation of waste and do not take necessary actions in managing it, which results to unhygienic condition for the family as well as the people around the city resulting people to fall ill due to various diseases.

To overcome the above problem, we propose an incentive based waste management system which learns from the waste segregated by people on day to day basis and based on the segregated waste, an incentive is fixed and recorded on to a public ledger which can be globally verified and rebated when needed by the people. The system needs to be transparent to people and to municipalities which can be achieved by defining a Blockchain based system, the records of each family residing in an area can be stored in blocks, identified uniquely by an ID which can be later used for various purposes.

Based on the data stored in blocks, concerned authorities can take appropriate actions from their place and have an information about the entire area monitored through some GUI or through the portal. With the help of the above system, we could easily manage and keep a record an amount of waste area wise as well as proper actions could be taken to reduce the amount of waste.

Keywords: Incentive, Waste Management, BlockChain

1. Introduction

In the present world, process of development we generate a lot of things which are actually of no much use and we discard it. So, the objects which are no longer of use are called waste. This waste can be as small as a used

pen or could be as big as a vehicle. Once these waste are been discarded it undergoes a series of processes such as collection, segregation, transportation, treatment and finally disposal. One such big hectic job is the collection of waste. It could be domestic waste, industrial waste, bio-medical waste, agricultural waste, animal waste, nuclear waste, mineral waste and many more. So here waste management is becoming a huge hectic for the local municipality/bodies to handle it.

Nowadays all the solutions provided to us are very primitive and there is very less creativity and novelty in the way of thinking. We have primitive regular collection, self-disposing or disorganized mixed collection systems which are not efficient at all. The limitation of segregation related issues and promptness is the main drawback in the present day garbage collection systems.

To overcome the above problems, here we are proposing incentive based waste management where based upon the waste segregated by the humans some incentive can be deposited. So that, an amount of work to be done by the local bodies may be reduced which will basically help the municipal bodies to have a clean and healthy environment. The application which we are proposing provides access only to the registered users and gives chance to monitor the status and track the amount of waste segregated and given to the garbage collection vehicle. The data will be stored in the database.

2. Background Study

Though it might not seem that fancy automated garbage collection has been some-thing which was in the minds of most of the fiction writers. Thankfully the generation in which we live today has a sufficient amount of easy to access resources which have made it possible for us to bring our project to its culmination. Even in the past ten years there have been big hints in the direction of automated technologies which have finally led to the existence of concepts of smartphones and tablets. All this indicates that the time is right to make the sophisticated automated garbage collection a reality. Leading worldwide companies, such as Amazon and Google, are spending a lot of money to give this type of disruptive work the encouragement that it requires to transform it from just ideas to reality. Currently, approaches to deal with garbage management are emerging from two extreme schools of thought. One focuses on a single task, such as garbage segregation (informative applications), and another aims to

integrate functionalities like calendar marking with pre-set notifications. Such type of concentrated one dimensional task solutions can over specialised functionality for end users. However, these are ultimately limited in their generic nature and cannot be used for finding real-time one stop solutions. Calendared notification systems, while quite useful do not provide the whole spectrum of features that a user might require. There exists a strong necessity for such systems to provide a one stop solution. Despite this desperate need, existing solutions available do not accommodate this. Such systems typically require trained mavens to install, service and personalize the system which is both inconvenient and costly and works only for basic settings.

Rapid growing population in our country has created many serious problems. One of them is the menace created by bad waste management. Tons of waste will be produced in urban areas and it needs to be managed correctly. With the on-going Swachh Bharath Abhiyan being carried out by the government of India motivated to contribute to the society by using the technology. The motivation is to facilitate the users to give some incentives based upon the amount of waste segregated and given to the local bodies. The incentive based management system can be developed with an affordable cost and was thought to be built which would aim at mobile providing remote access to the status and tracking of the amount of waste collected area wise and the type of waste.

3. System Architecture

The system mainly contains two modules: One for the user and other for the admin. The admin application consists of following modules

- (a) Analysis module
- (b) Leader-board module
- (a) Update status module
- (b) View complaints module
- (c) Complaint module

Architecture for admin application is shown in figure

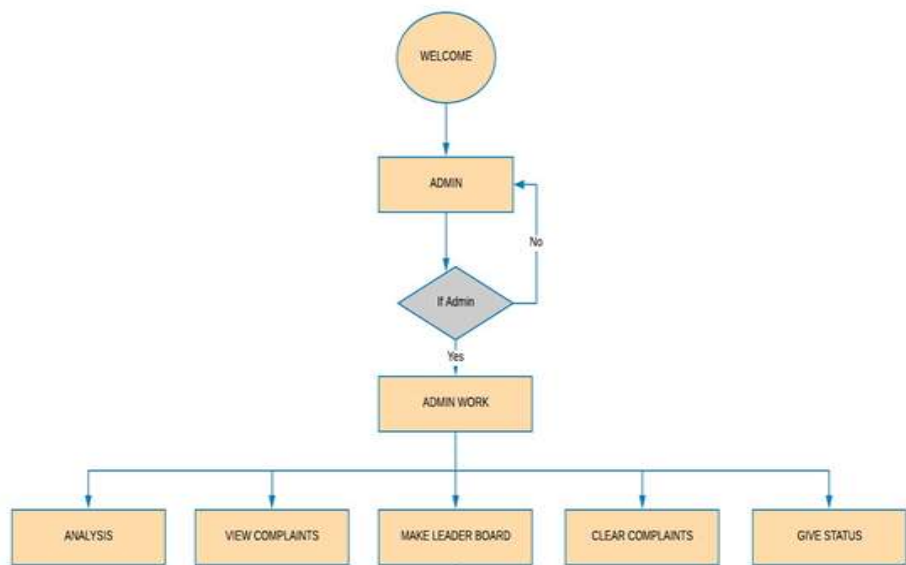


Figure 1. Admin module

The user application consists of following modules

- (a) Authentication module
- (b) Complaint module
- (c) View Leader Board
- (d) Check status module

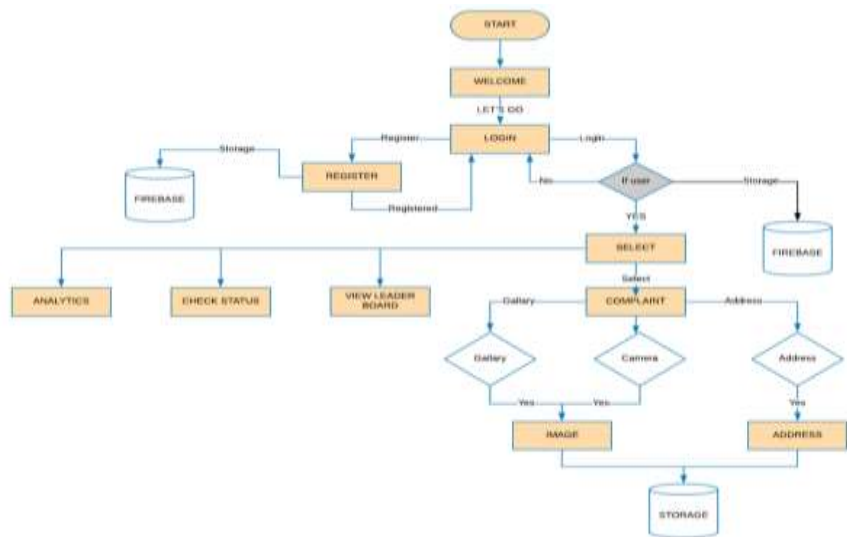


Figure 2. User Module

4. Methodology/System Design

Important steps in the design of the application and their working details are given below:

User:

- (a) Immediately after the launch of the application, welcome screen will be displayed and a start button will take us inside the application.
- (b) Next step is to login to the application. For this user enters the username and the password. Upon successful authentication next page will be displayed, else number of choices remaining will be decremented by one and after five tries the login button freezes. In the same screen the registration link is given to the user who enters the application for the first time.
- (c) Registration: Here user will be asked to create his user id and a good password. Along with this the name of the user is also taken. After successful registration, a success toast is displayed and user is directed to the login screen. Otherwise failure message will be displayed.
- (d) Using the app by user: After successful log in, a page with four options will be displayed. They are: “Complaint”, “Analytics”, “Check status” and “View leader-board”.
- (e) In complaint module user enters the current address and selects the submit button and the address is loaded into the database along with showing a message.
- (f) Analytics option will shed light on the various trends involving garbage management.
- (g) By choosing “check status”, user can know the status of the complaints.
- (h) View leader-board option shows the leader-board of users and agents.

Admin:

- (a) Admin need to authorize himself/herself by providing valid credentials. Here also proper messages are displayed about the status of the tasks.
- (b) After login, admin is provided with five choices: “view complaints” and “Clear complaints”, “Make leader-board”, “Analysis” and “Give status”. View complaints will display a list of all locations sent by all the users and admin by seeing these locations can take appropriate measures for cleaning them. “Clear complaints” button can be selected after entering a valid user-id in the complaints list and this will delete the entries in the list sent by the selected user of the application. Then he can confirm it by selecting view complaints option again. These are few important design points considered for the admin application.

5. Conclusion and Future Scope

The application will have a great social relevance to the society as the incentive programs will generally aim the users to segregate the waste properly and it will definitely help to reduce the amount of expenditure spent by the local municipal bodies just to collect the waste and segregate it, which generally involves lots of labour work. Here, since the Block Chain technology is used which is basically providing decentralization, benefit the users to access from any geographic location. Also, based on the analytics, it will inspire the local municipalities to take corrective actions in order to make garbage management more organised and will also give them specific pointers in terms of which areas need high attention, what type of waste is being generated.

References

1. B. Bilitewski, From Traditional to Modern Fee Systems, *Waste Management*, **28(12)** (2008), 2760-2766.
2. V. Elia, M. G. Gnoni and F. Tornese, Designing Pay-As-You-Throw Schemes in Municipal Waste Management Services: A Holistic Approach, *Waste Management*, **44** (2015), 188-195.
3. L. Dahlén and A. Lagerkvist, Pay As You Throw: Strengths and Weaknesses of Weight-Based Billing in Household Waste Collection Systems in Sweden, *Waste management*, **30(1)** (2010), 23-31.
4. E. Dijkgraaf and R. H. Gradus, Cost Savings in Unit-Based Pricing of Household Waste: The Case of The Netherlands, *Resource and Energy Economics*, **26(4)** (2004), 353-371.
5. R. Gradus, G. C. Homsy, L. Liao and M. E. Warner, Which US Municipalities Adopt Pay-As-You-Throw and Curbside Recycling?, *Resources, Conservation and Recycling*, **143** (2019), 178-183.
6. A. Le Bozec, The Implementation of PAYT System Under the Condition of Financial Balance in France, *Waste Management*, **28(12)** (2008), 2786-2792.
7. Bhanu G. Priya and R. Santhosh Kumar, Smart Garbage Collecting Bin for Municipal Solid Waste, *International Journal of Modern Trends in Engineering and Science*, (2016).
8. Norfadzlia Mohd Yusof, Mohd Faizal Zulkifli, Nur Mohd Yusof and Nur Azziana Afifie Binti Azman, Smart Waste Bin with Real-Time Monitoring System, *International Journal of Engineering Technology*, (2018).
9. Z. Zheng, S. Xie, H. N. Dai and H. Wang et al., Blockchain Challenges and Opportunities: A Survey, (2016).

10. Nagpal, Blockchain Platforms-A Brief Introduction, <https://medium.com/blockchain-blog/17-blockchain-platforms-a-brief-introduction-e07273185a0b>.
11. M. Vitso, B. Joar, G. Harkestad, S. Krogh and Aaboen, L et al., A Study on Blockchain Technology as a Resource for Competitive Advantage, (2017).