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Smart Waste Management Using IOT and Cloud

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ABSTRACT: In our management system we will design dustbin which will be automatically opened when person arrives to put the waste and keep track if it is full. This will be achieved using IoT project with sensors called ultrasonic sensors, Arduino and ESP-8266 together. The IoT will be connected to internet using public wi-fi which will send the dustbin details to cloud. We are using Google cloud platform (GCP) as our cloud provider which is reliable and secure in itself. Then our system will provide admin with desktop application which will fetch data from the cloud and see the status of a dustbin on his screen. To monitor a dustbin the admin will first assign code which be saved on cloud and embedded in the hardware of IoT device. To encourage people to use the smart dustbin we will be providing a mobile app. After registering himself a user will use the mobile app. The user will scan the QR code that will be attached to each smart dustbin and then put waste in it. After successful scan the user will be allocated with some points for each waste that he dumps which can be used to reduce his municipal bills.

KEYWORDS: Smart Waste Management, Smart Dustbin, Internet of Things (IoT), Google Cloud Platform, Mobile Computing, Cloud Computing, Real-time Monitoring System.

I. INTRODUCTION

Today India is developing rapidly with growth in all the sectors. With this growth there is also rapid increase of urbanization with many people migrating to cities and settling there. With the urbanization comes other problems for the government or other authorities like water management, waste management etc. the process to maintain the services takes a lot of man power which in turn costs a lot of money to the government. To build a beautiful and clean city waste management is important part of it without it is not possible. If the waste management is not done properly, it will give rise to unhygienic conditions which will increase diseases related to it. With the problem of waste management, the city or an area will not look good with filthy smell and unhygienic.

So, this nuisance of waste management should be handled properly by using traditional resources like large dustbins. But if these dustbins are manually handled then the authorities will need a lot of man power which will result in loss of money. So, this problem can be solved by using latest technologies such as IoT, desktop computing, mobile computing and cloud computing together to create a new and smart waste management system. With the use of technology, the waste management will need less man power and can be handled efficiently thus saving a lot of money and time to manage.

So, in our new management system we will design a dustbin which will be automatically opened when a person arrives to put the waste and keep track if it is full. This will be achieved using a IoT project with sensors such as ultrasonic sensors, Arduino and ESP-8266 together. The IoT will be connected to internet using public wi-fi which will send the dustbin details to cloud. We are using Google cloud platform (GCP) as our cloud provider which is reliable and secure in itself. Then our system will provide admin with a desktop application which will fetch the data from the cloud and see the status of a dustbin on his screen. To monitor a dustbin the admin will first assign a code which be saved on cloud and embedded in the hardware of the IoT device. To encourage people to use the smart dustbin we will be providing a mobile app which a user can install. After registering and authenticating himself a user will use the mobile app. The user will scan the QR code that will be attached to each smart dustbin and then put the waste in it. After the successful scan the user will be allocated with some points for each waste that he dumps which can be used to

reduce his municipal bills. Thus, by using our smart waste management system the authorities will be able to keep the area clean and will be a win situation for both the government and the citizen.

II. RELATED WORK

This section describes the fundamentals of various waste management techniques that can be used in designing a new more reliable and smart waste management system and help the authorities in keeping the area clean and hygienic. It helps in understanding various ideas put forward by various technical papers published by various authors and how they put forth a more accurate and concrete techniques. Some of the ideas with technique and drawbacks are mentioned below:

1. In 2020 Sharma et al. [1] presented the paper which mainly focuses on “Automatic waste segregation and sanitization” technique to manage waste. This technique is quite good and covers all the things needed for a successful waste management system but it lacks to explain how the system can be linked to a centralized waste management system remotely and how a user can be benefitted by using the waste management system.
2. In 2020 Badve et al. [2] presented the paper which mainly focuses on “Garbage collection system using IoT” technique to manage waste. This technique is quite good and covers all the things needed for a successful waste management system but it lacks to explain how the system can be linked to a centralized waste management system remotely and how a user can be benefitted by using the waste management system.
3. In 2020 Praveen et al. [3] presented the paper which mainly focuses on “Smart bin using IoT” technique to manage waste. This technique is quite good and covers all the things needed for a successful waste management system but it lacks to explain how the system can be linked to a centralized waste management system remotely and how a user can be benefitted by using the waste management system.
4. In 2020 Rao et al. [4] presented the paper which mainly focuses on “IoT based waste management system” technique to manage waste. This technique is quite good and covers all the things needed for a successful waste management system but it lacks to explain how the system can be linked to a centralized waste management system remotely and how a user can be benefitted by using the waste management system.
5. In 2020 Tripathi et al. [5] presented the paper which mainly focuses on “Smart bin using IoT” technique to manage waste. This technique is quite good and covers all the things needed for a successful waste management system but it lacks to explain how the system can be linked to a centralized waste management system remotely and how a user can be benefitted by using the waste management system.

III. SYSTEM ARCHITETURE

A. System Architecture Parts:

- Application medium: This block in system architecture shows how a IoT and desktop will communicate with each other.
- Get readings: This block in system architecture shows how the sensors will be connected to the IoT device and how it will take readings and send to cloud server for further operations.
- User: This block in system architecture shows how a user will register and authenticate his application using his mobile. The user will scan a QR code on the smart dustbin and send data to server and get points in return for billing.
- Admin: This block in system architecture shows how a admin will authenticate and then keep track of both smart dustbin and user using cloud and desktop application.
- Cloud: This block in system architecture shows how a real-time communication system is achieved between IoT, user mobile application and admin desktop application using Google cloud platform as cloud provider.

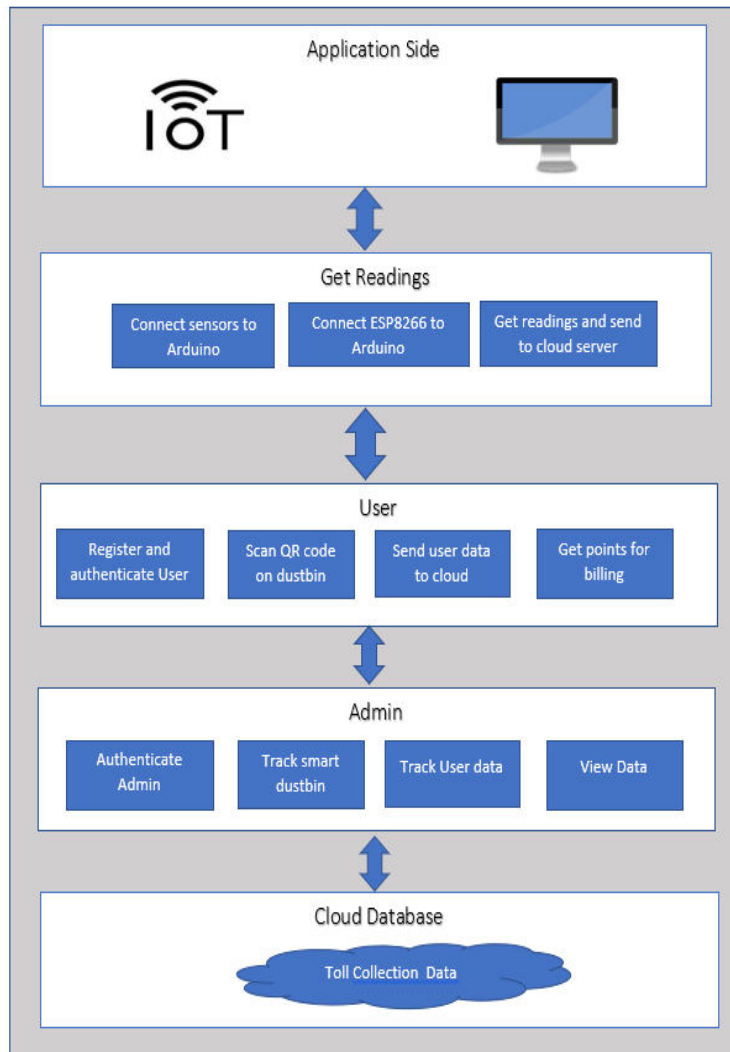


Fig. 2.1 System Architecture

B. System Flow
Data Flow Diagram:

- DFD Diagram Level-0:



Fig. 2.2 DFD Diagram Level-0

- DFD Diagram Level-1:

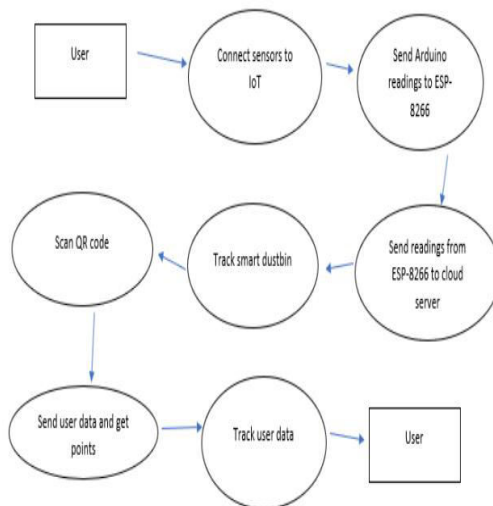


Fig. 2.3. DFD Diagram Level-1

IV. RESULTS

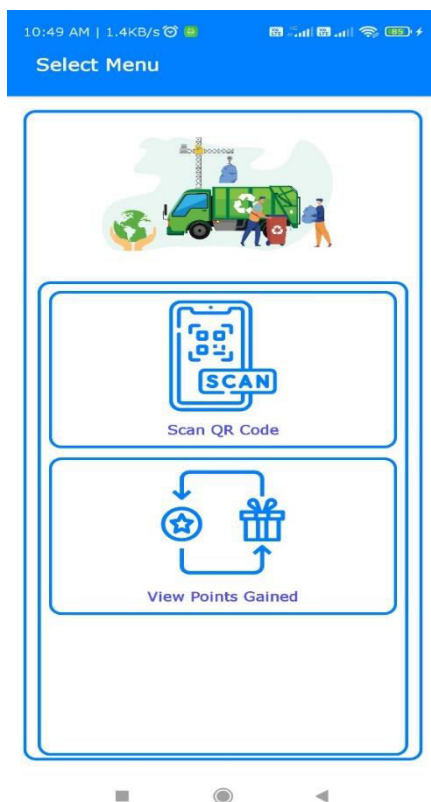


Fig.3.1. Android Result 1

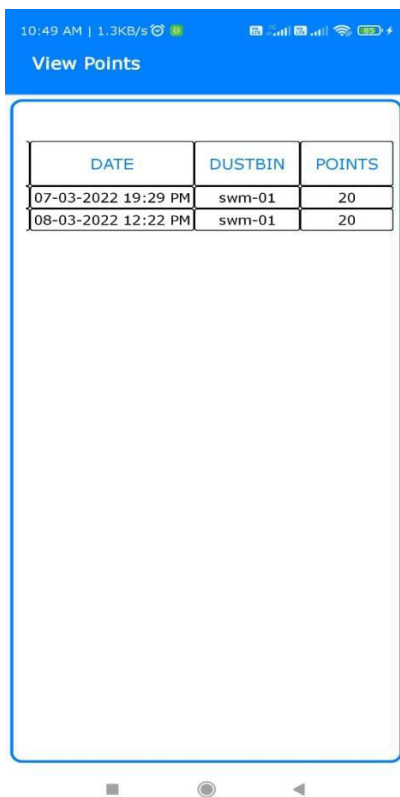


Fig.3.2. Android Result 2

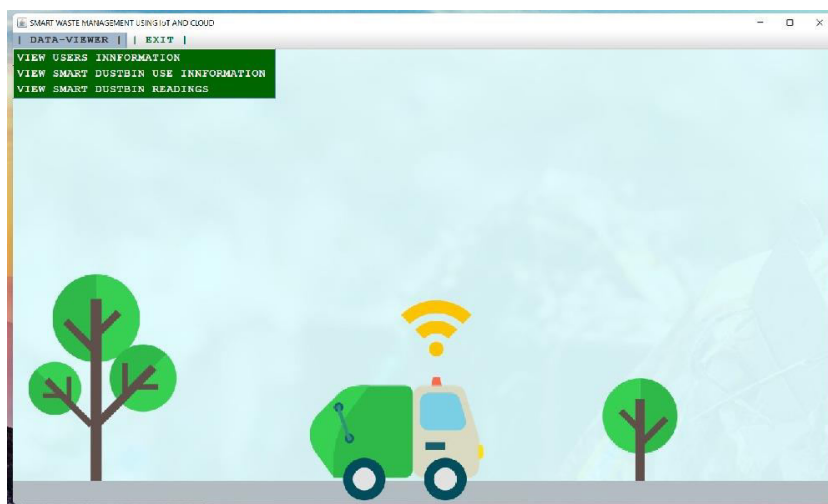
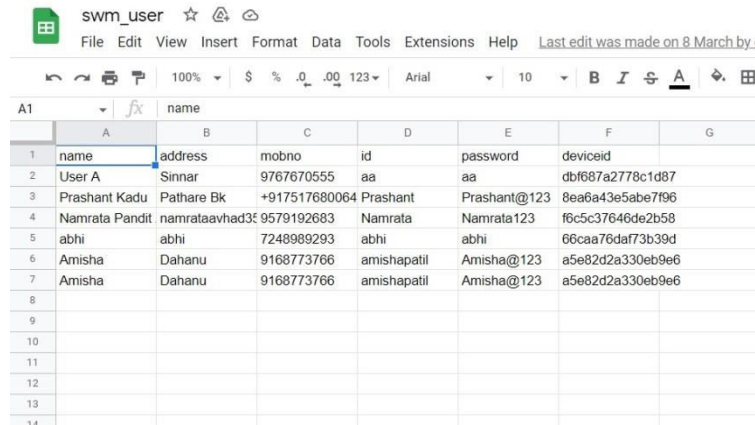
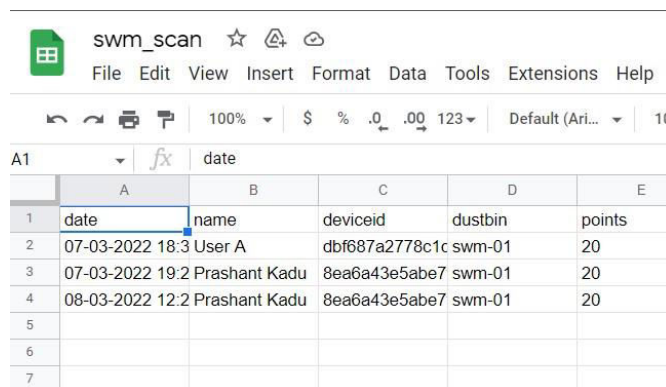


Fig.3.3. Desktop Result



| | A | B | C | D | E | F | G |
|---|----------------|---------------|---------------|-------------|--------------|------------------|---|
| 1 | name | address | mobno | id | password | deviceid | |
| 2 | User A | Sinnar | 9767670555 | aa | aa | dbf687a2778c1d87 | |
| 3 | Prashant Kadu | Pathare Bk | +917517680064 | Prashant | Prashant@123 | 8ea6a43e5abe7f96 | |
| 4 | Namrata Pandit | namrataavhad3 | 9579192683 | Namrata | Namrata123 | f6c5c37646de2b58 | |
| 5 | abhi | abhi | 7248989293 | abhi | abhi | 66caa76daf73b39d | |
| 6 | Amisha | Dahanu | 9168773766 | amishapatil | Amisha@123 | a5e82d2a330eb9e6 | |
| 7 | Amisha | Dahanu | 9168773766 | amishapatil | Amisha@123 | a5e82d2a330eb9e6 | |

Fig.3.4. Database Result 1



| | A | B | C | D | E |
|---|-----------------|---------------|----------------|---------|--------|
| 1 | date | name | deviceid | dustbin | points |
| 2 | 07-03-2022 18:3 | User A | dbf687a2778c1c | swm-01 | 20 |
| 3 | 07-03-2022 19:2 | Prashant Kadu | 8ea6a43e5abe7 | swm-01 | 20 |
| 4 | 08-03-2022 12:2 | Prashant Kadu | 8ea6a43e5abe7 | swm-01 | 20 |

Fig.3.5. Database Result 2



Fig.3.6. Smart Dustbin Result

V. CONCLUSION AND FUTURE WORK

In this paper we conclude a novel approach to provide smart waste management system using IoT, cloud computing, mobile computing and desktop computing technologies together with new framework called as smart waste management using IoT and cloud. In our paper we have studied papers [1][2][3][4][5], and took knowledge of how other authors have designed a smart dustbin and how it can be used in our system. We also studied their limitations and propose how to overcome them in our new smart waste management system. In our project we are implementing real-time tracking of smart dustbin and users who use them. We are providing a mobile app for user from where he can collect points which can be used in paying bills to encourage the use of the system. Thus, we conclude that our system will be helpful in saving a lot of money and man power needed to maintain a waste management system and achieve a smart city concept.

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