Smart Dustbin Using Internet of Things

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Abstract- *The continuous increase in the pollution, garbage management becomes most alarming concern of today's world mainly the developing countries with high population rate such as India. Excess garbage in disposal area of overflow of garbage in the dustbin may result into different harmful diseases for the neighboring people staying in that particular neighborhood. Hence the disposal, clearance and monitoring the garbage needs IoT bases smart dustbin. The main objective of smart dustbin project is to incorporate the smart dustbin which benefits even an individual by dumping the garbage into the dustbin and even the city is clean. This helps the proper usage of dustbins and helps in maintaining the city clean. The project consists of a camera, dustbin, a garbage weighing sensor, a LED to display the points and the weight of the garbage. The points will be generated according to the weight of the garbage.*

Keywords- weight detection, IoT, ratio of points according to the weight, QR code scanning, mail generated, electricity bill display

I. INTRODUCTION

Garbage is the major problem not only in urban region but also in rural areas of India. It is a major source of pollution. Indian urban region alone generate over more than 100 million tons of solid waste a year. In 2000, India's Supreme Court directed all Indian cities to implement a comprehensive waste management programmed that would include household collection of segregated waste, recycling and composting. No major city runs a comprehensive programmed enhanced by the government which is of the kind envisioned by the Supreme Court. Also, municipal solid waste workers (MSWW's) or refuse collectors, universally expose to many work related health hazards and safety risks, notably allergic and other diseases of the respiratory system. PMC's support is critical for the long term sustainability of the initiative. The Swacch model for door-to-door waste collection is a sustainable model designed to become financially self-sufficient within period of five to six years. With rising urbanization and change in the lifestyle and food habits, not only the amount of municipal solid waste has been increasing rapidly but its composition is also changing. These comprises of all toxic chemicals, radioactive materials, bio-medicals or infectious wastes. Over the last few decades, urban region has grown rapidly leading to the products being packed in cans, aluminum foils, plastics and other such non-biodegradable items that cause incalculable harm to the environment which may lead to the dreadful diseases. The implementation of a smart garbage management system can be done by using weight sensor, microcontroller and communication module. Web application will be handled by the admin, where admin can monitor the personal information of each individual who has registered.

II. LITERATURE SURVEY

In a country like India, access to sanitization facilities and safe drinking water is still prone to many impendent diseases. While India is progressing in other aspects, lack of sanitization and drinking water facilities have acted as impediments to the development process as there is decrease in the sanitization of the city. These basic rights are not only important to health and sustainability development, but also very essential for removal of poverty and overall growth of the country. According to latest estimates of UN, around 600 million people or 48% of the total population in India defecates, which is lot more than in any other country in the world. However, an interesting fact to note is that while there millions of people in the world, who defecate in the open, we have examples of many South Asian countries where people consider sanitization as dignity and cleanliness. A cleanliness drive, just before the launch of the Swacch Bharath Abhiyan, was carried out from September 25 till October 23 by all offices up to panchayath level. As a part of awareness campaign, the Delhi Government also covered more than seven to eight lakh ration card holders by sending SMS to their mobile numbers about the program. The main execution of the project is expected to cost over Rs. 2 crore funds sharing between Central and the State government and urban local bodies is allocated in the ratio of 75:25.according to government data, maximum funds were released to Uttar Pradesh with the amount of Rs 6592 crore and Bihar with the amount of Rs 2943 crore from 2018-2019 through SBM-Grahmin for building toilets under the dream project. Problems of urban waste management is notable not only because of large quantities involved, but also its spatial spread across thousands of cities and towns and enormity and variety

of problems involved in setting up the project and managing systems for collection, transportation and disposal of the waste.

III. EXISTING SYSTEM

In recent years, IoT gained well deserved attention in information technology(IT) as it seeks to create intelligent systems for social relevant applications to make lives more comfortable comfortable. The recent researches have shown that bin has been implemented successfully using the IoT technique where the bin will be equipped with the ultrasonic sensors which will sense when the bin will be filled completely. Then the authority maintaining the bin will be notified when the dustbin is completely filled. Then the garbage collectors will collect the garbage from the notified dustbin. By following this procedure there will be no need to collect the garbage door to door hence less fuel consumption. Due to lack of the waste disposal monitoring, people tend to throw the waste on empty land. This leads to air pollution and breeding sites for mosquitoes leading to the dreadful diseases.

IV. PROPOSED SYSTEM

The main objective of the proposed system is to keep the city clean by dumping the garbage in the designated area. The proposed system is modeled in such a way that it is both less cost and environment friendly. As well as it maintains the public health by keeping the environment neat and clean. The proposed system is built on the operating system as Raspberry pi. The weight sensors have to measures the garbage as and when is collected they keep getting extra additional points in their account. The points will get reflected on their electricity bill which means their bill can be reduced. The proposed system is divided into three modules based on the system requirement:

A. **Weight sensor:** a load cell is a sensor otherwise a transducer which converts a load or force or tension, the weight sensor depends on the conversion of a load or force into an electronic signal. The working principle of weight sensor offer resistive load cells and capacitance load cells. Resistive load cell is the cell that works on the principle of piezo-resistivity. When load or force is applied to the sensor, it changes its resistance. A load cell is a type of transducer, to be accurate it's a force transducer. The weight sensor is commonly used in weighing machine of goods or a human weighing machine. All the weighing machine which shows weight has a load cell as sensing element which detects the weight.

B. **Camera:** a device for recording visual images in the form of photographs, film, or video signals, which are stored in a physical medium. For example, in a digital system or a photographic film. A camera consists of a lens which focuses light from the scene and a camera body which captures the image capture mechanism. The still image camera is the main instrument in the art of photography and captured image maybe reproduced later as the process of photography, digital imaging and photographic printing. The fields in the moving image camera domain are such as film, video and cinematography. In the smart dustbin project, the camera is used to record the number of residents and to maintain the record of number of people disposing the garbage.

C. **Bar code:** a bar code is a machine-readable code in the form of numbers and a pattern of parallel lines of varying widths, printed on a commodity and that are used especially for stock control. The bar codes represented data by varying the widths and spacing of parallel lines. These bar codes, now commonly referred to as linear or one-dimensional can be scanned by special optical scanners called bar codes readers. Later, two dimensional variants were developed using rectangles, dots, hexagons and other geometric patterns that are called as matrix codes or 2D bar codes but mostly they do not use bars as such. 2D bar codes can be read or deconstructed using application software on mobile devices with inbuilt cameras such as smart phones. We are using bar code in the project so that we are registering the residents of that locality so next time when they come to discard the waste they need not register again as bar code exists.

V. ARCHITECTURE

The architecture of the proposed system is represented in the figure shown below. It consists of the Raspberry pi, camera, load cell, weight sensor and a button. The QR code sent to the individual will be scanned through the camera which is attached to the dustbin at the front. When the QR code is scanned, the lid of the dustbin will be opened automatically. As soon as the garbage is dumped into the dustbin, the weight will be calculated by the load cell. Then the data about the register user along with the weight and the points that needs to be credited to the cloud of the admin.

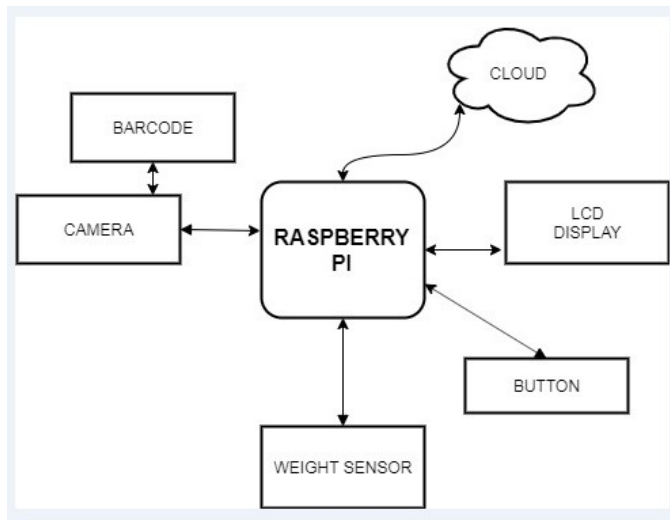**The architecture of the proposed system:**

Fig 1. Architecture

VI. IMPLEMENTATION

The Raspberry Pi hardware has evolved through several versions that feature variations in the type of the CPU, amount of networking support, peripheral-device support and memory capacity. Raspberry is a little capable microcontroller device that enables people of various age group to explore computing. It also promotes how to program in various languages which includes languages like Scratch and Python. An SD card a type of memory card typically used in digital cameras and other portable devices. The portable device which is supposed to be inserted into the slot of the board which acts as the hard drive for the Raspberry Pi. It is powered by USB and the video output can be hooked up to a traditional RCA TV set, a more modern PC, or even a LCD TV using the HDMI port. Raspbian comes preloaded with Python, the official or mostly used programming language of the Raspberry Pi, a Python Integrated Development Environment. The Raspberry Pi 3 has initially Bluetooth and Wi-Fi built in. QR codes can be read or deconstructed using application software on mobile devices with inbuilt cameras, such as Smart phones. We are using QR code in our project so that we are registering the residents of that locality so next time when they come to discard the waste they need not register again as QR code exists.

The camera's LED will switch on when the camera is ready to scan the QR code. A camera will be attached to the dustbin. When a person wants to dump the garbage, he/she has to scan the QR code that is generated through their respective mail ID while registering. We use raspberry pi and we use cloud database electricity bill is generated through it there is weight sensor that checks the weight of the waste material in order to check the weight so we have a limit of 2kgs which adds upon two points that is added to the electricity bill.

Fire base is a cloud web that provides a real-time database and storage. Fire base can also be used on back-end as a service which is used for storing the data. The service provides application developers an API that allows application data that is uploaded to be synchronized across clients and stored on Fire base's cloud. Fire base Hosting works out-of-the-box with Fire base services, including Cloud Functions, Real-time Database, Cloud Fire store, Authentication and Cloud Messaging. The data always appears as JSON files. It also allows real time changes to occur on the connected client side. When you build cross-platform apps using iOS, Android, JavaScript SDKs, your clients end up getting all the data that was updated which will be uploaded by the admin of the project.

The garbage needs to be dumped into the dustbin. Once the weight sensor senses the garbage that has been dumped the command prompt will be display the weight f the garbage. The same weight that will be displayed on command prompt should be stored in the database. The Fire base contains the personal details of each individual such as name, phone number, email, e-bill balance and points added to each user. For every user there will be a addition of the extra 1000 bonus points.

After the QR code scanning process, the dustbin will be opened automatically. Then the garbage needs to be dumped into the dustbin. The weight sensors will be installed inside the dustbin. The weight sensors will sense the garbage weight that has been dumped. The weight of the garbage will be calculated by the load cell. Once the weight sensors sense the weight of the garbage, the command prompt will display the weight that has been added to dustbin. The command prompt will also display the personal information such as name, mail ID, phone number and the electricity bill number.

The same weight that will be displayed in the command prompt should be displayed on the database. Extra 1000 points will be added to the database of each person during the registration process. The database will display all the details of each individual that will be provided while registration. The QR code will be scanned through a led display for withdrawing process. During this process the QR code will be scanned through monitor's camera. For the display of the electricity bill balance as well as the points that has been added to each user, the QR code will be scanned.

When the QR code is scanned through the monitor's camera, the electricity bill balance will be generated. After converting the points, the remaining bill amount will be displayed. Irrespective of the garbage dumped and the points added, the limit per day is 2000 points.

Table 1. Test conditions

Condition	True	Fake
If valid 10 digits electricity bill provided	Registration successful	Registration unsuccessful. Please provide valid electricity bill number
While scanning the QR code	Displays the data including the points and personal information	Please scan the QR code in front of the camera
If QR code is scanned successfully	displays the information according to the command prompt	Scan the QR code

Technical requirements:

Hardware components:

1. Raspberry pi board
2. Camera
3. Load cell
4. Weight sensor
5. Dustbin
6. Bread board
7. Motor

Software components:

1. Fire base cloud
2. Command prompt

VII. RESULTS
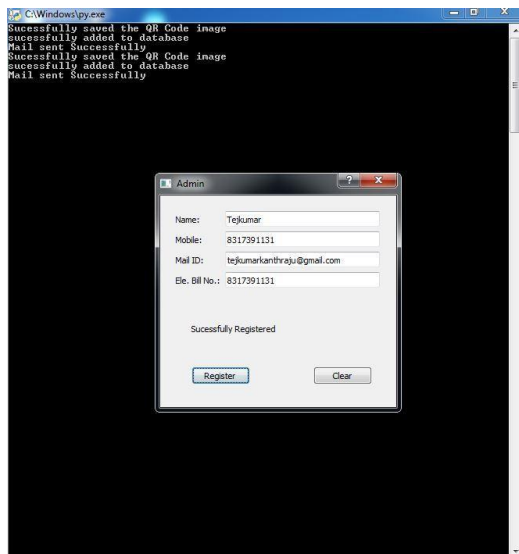
Fig 1. User registration
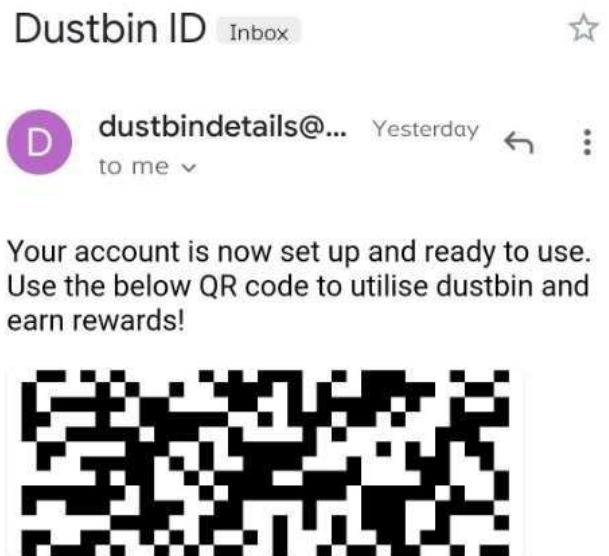
Fig 2. QR code sent to the user

Fig 3. Scanning QR code
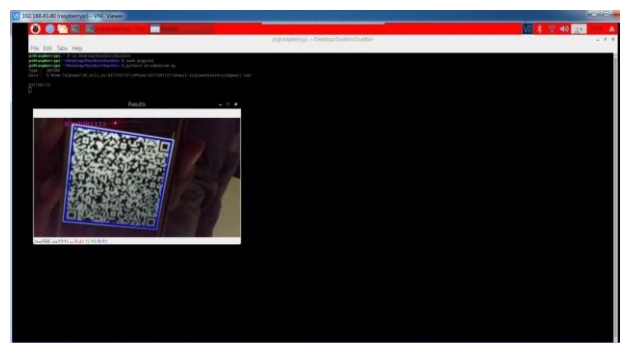
Fig 4. Display of the QR code
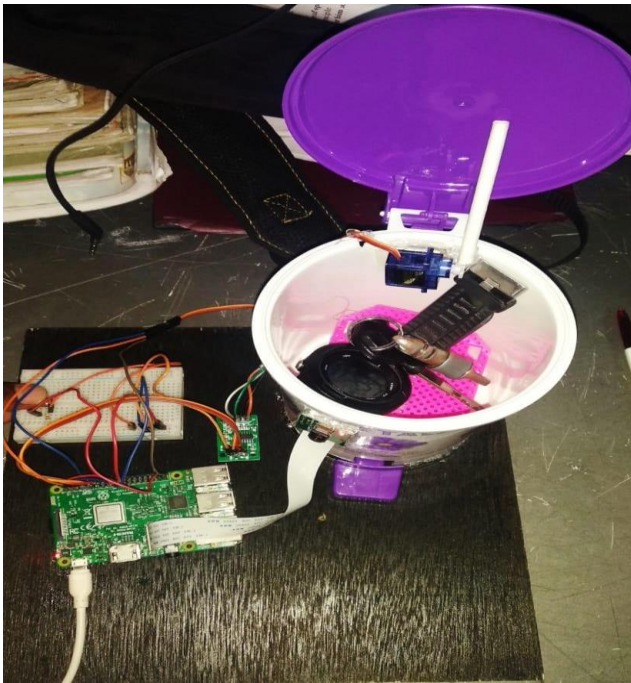
Fig 5. Adding garbage

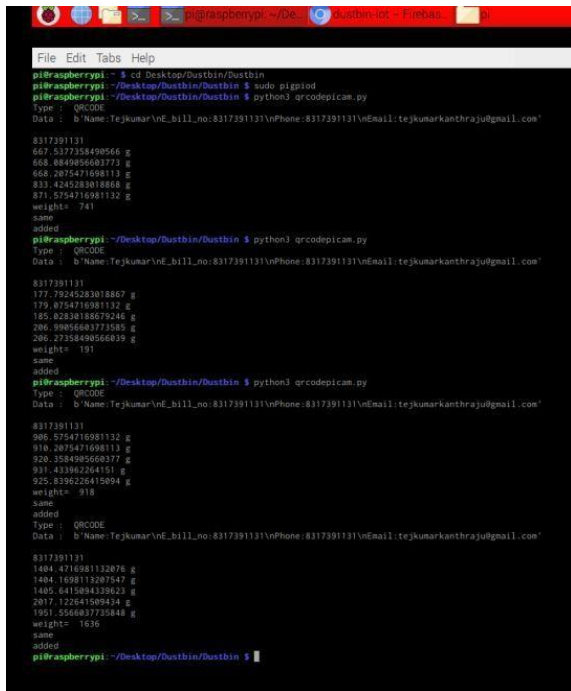**Fig 6.** Displaying on the command prompt
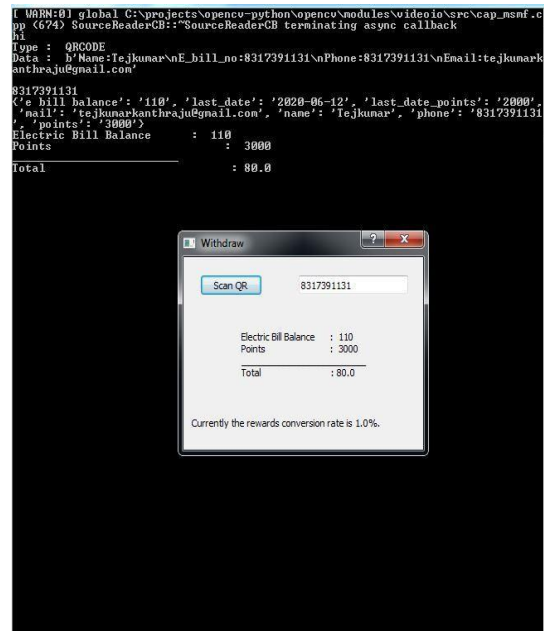

Fig 7. Scanning through the monitor

Fig 8. Displaying the electricity bill balance

VIII. CONCLUSION

The main objective of the smart dustbin project is to help the garbage collectors to make their work easier and efforts along with the enhancement of the smart city vision. We have often seen garbage spilling over from dustbins on to streets and this way an issue that required immediate attention. The proverb "cleanliness is next to god and clean city is next to heaven" inclined us to gestate the theme of smart dustbin project and implement the project. In our system, the smart dustbins are connected to the internet through Wi-Fi and the USB port will be connected to the power supply to get the real time information of the smart dustbins. In the past decade,

there is a rapid growth in population which leads to more waste disposal which won't be even segregated. So a proper waste management is necessary to avoid spreading some deadly diseases.

IX. ACKNOWLEDGEMENT

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