

Smart Waste Management System

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Abstract: Efficient waste disposal is a major issue in our country, which leads to serious health as well as environmental issues. In this paper, we present the Smart waste bin system that grants value added services according to the credit points got in turn for the waste dumped in the smart waste bin. The system is well suited for today's residential culture. The Smart Waste bin and a web application makes the Smart Waste Management System. The system ensures efficient waste disposal by providing needful attractive services (like biogas, *Wi-Fi*, etc...)

Keywords: Arduino Mega, web application, load cell, ultrasonic sensor, *Wi-Fi* module.

I. INTRODUCTION

Any eliminated or discarded material can be termed as waste. Waste management has been a major environmental issue everywhere since the industrial revolution. Waste is an unavoidable by product of day today activities in every sector. Biodegradable, non-biodegradable and recyclable are the main types of waste. Many initiatives taken in the issue of waste management have failed to find success. The main reason for this is the unawareness and the lack of interest of public, accompanied by lack of infrastructure. {Managing of wastes properly is an individual responsibility. Public awareness campaigns are necessary for environment protection. So there is a need to encourage the people to be part of this objective, protecting our environment through proper waste management.

Indian Prime Minister Mr. Narendra Modi announced Clean India Mission, a government programme that aimed to clean the streets, roads and infrastructures of India. Inspired by this mission, we propose a Smart Waste Bin system which provides value added services in exchange of a cleaner surroundings. The system requires a smart phones to allow the users to utilize and account the services that are provided by the Smart Waste Management System. The Smart Waste Bin system consists of a waste bin having three sections biodegradable, plastic and recyclable waste respectively. Each user in the association having an account may dispose wastes properly in respective bins to gain credit points. The credit points are assigned to their respective accounts based on the amount and type of waste disposed. This system promotes efficient and effective waste disposal leading to healthy and clean environment.

II. RELATED WORK

In this proposed system, free *Wi-Fi* is produced when somebody dumps trash into a dustbin. The Router provides *Wi-Fi* to user and the sensors check garbage fills in dustbin or not. The *Wi-Fi* module is the major component. This lead to smart city vision enhancement [1].

Smart system for management is to determine the garbage level in dustbin with sensors and notify the controlling authority through wireless communication module. Garbage level is supervised with GUI built in Android application. Location of garbage bin is traced with GPS system employed [8]. Sensor Based Smart Dustbin For Waste Segregation and Status Alert designed to sort the trash into metallic waste, wet waste and dry waste ready to be processed separately for the next process of operation for this .Using Embedded technology to continuous monitoring the dustbin in order to check whether dustbin is full or not. Wireless sensors sense the amount of the waste in the containers if it reached the maximum containers capacity, send instant message to the trash management department which deploy them to collect the garbage in no time [4].

Intelligent Waste Segregation and Monitoring System segregate the dry waste and wet waste at household level. The level of garbage collected in the container is monitored using ultraviolet sensors. This is monitored at control system office. Adding to it, a Zonal area around the roadside garbage is created using the load sensors concept, to monitor if garbage spills out of the container. Design and Implementation of Automatic Waste Management System [2].

Concept Design and Implementation of Automatic Waste Management System The system makes use of radio frequency (RF) tags and web support. It consists of four subsystems names Smart Trash System, Local Base Station, Smart Vehicle System and Smart Monitoring and Controlling Hut. This system would be able to automate the solid waste monitoring process and management of the overall collection process [10].

III. PROPOSED SYSTEM**A. System Overview**

The system mainly consists of a smart waste bin and a web application. Each family residing in an association will be a user of this system. Each user has to create an account through the application by providing required credentials, after which they will be provided with a unique id. Login to the account will be provided using the unique id and name provided. The account will be maintained by a person in the association who will have full privileges over it. For each amount of waste disposed by the users, particular points will be credited to their account which is assigned based on some predetermined calculations. Based on these points, users will be able to utilize services such as Wi-Fi and biogas. These services will be available as a package and when they opt any of these packages, then respective points will be debited from the total points.

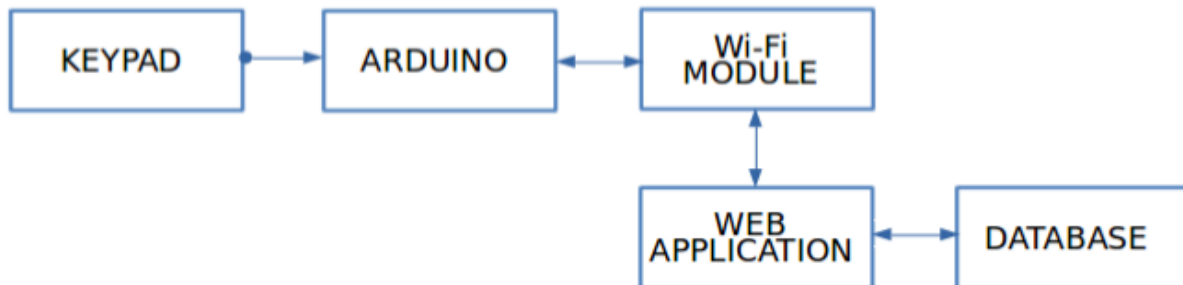


Figure 2: Architecture Diagram

B. Hardware

Main hardware components include:

- Three waste bins (Waste bins are attached together. One for collecting biodegradable waste, second for recyclable waste, third for electronic waste)
- ESP8266 WIFIMODULE (Provide communication between hardware and software parts)
- ARDUINO MEGA (Central part of hardware)
- HC 711 INSTRUMENTATION AMPLIFIER (The analog output from load cell is converted to accurate value)
- PZL 301C LOAD CELL (Sensor used to find the weight of waste dumped by the account holder)
- Ultra Sonic Sensors (To identify completely filled waste bin)
- Keypad (For entering the unique id)

The load cell calculates the amount based on the pre-programmed arduino and according to the type and quantity of waste dumped, certain points will be credited to their account.

C. Software

The software part consists of a web application named "CAPTIOSIS VASTUM", an Italian word for smart waste. This application has the account for each user. By using that account, the user can view his/her points and available incentive details. There is also a loan facility in the application for those who want to access the services but do not have enough points.

The web application includes the following modules:

1. Login Module: It includes options for opening an existing account using username and password. It also contains a 'Create Account' button to create a new account, it transfers control to Create Account Module. On clicking on 'Sign in' button, the User module opens.
2. Create Account Module: It includes options for creating a new account using personal details like First name, Last name, Username, Password, E-mail, Contact number and Address. It has two buttons 'Submit' and 'Back to Login'. When 'Submit' button is clicked, the details get submitted. On clicking 'Back to Login' button, the Login Module opens.
3. User Module: It includes user details along with auto-generated Consumer id and Total Points of the user. It includes 'Go to Store' option to go to the Home module. It also contains options for Edit Profile and Logout.
4. Home Module: It contains three packages, Gold, Silver and Diamond, with each having a pre-defined amount of Biogas and Wi-Fi. A Special package for taking a loan is also included. It has two buttons 'Back' and 'Logout'. On clicking 'Back' button, the User module opens. On clicking the 'Log out' button, control is transferred to Login Module.

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Figure 3: System Overview.

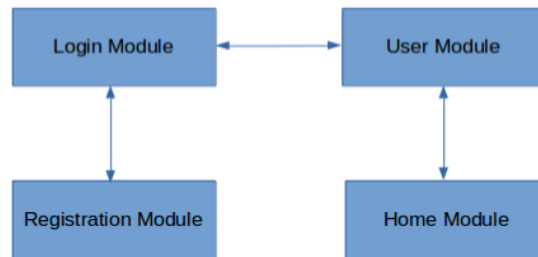


Fig.4: Flow chart Diagram

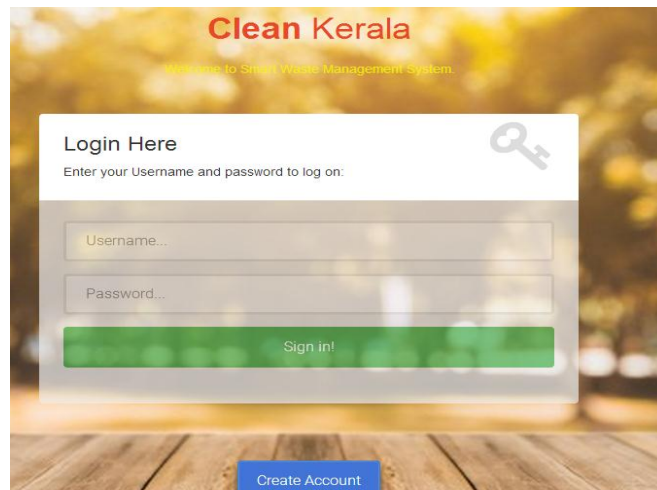


Fig 5: Login Module

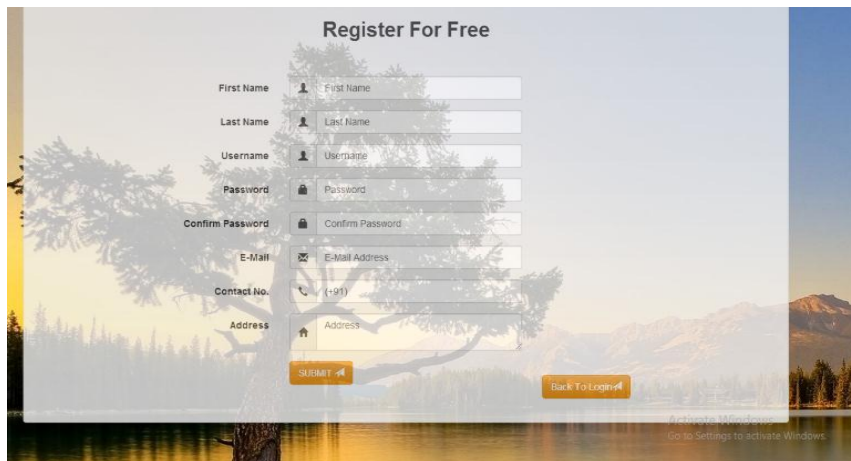


Fig 6: Registration Module

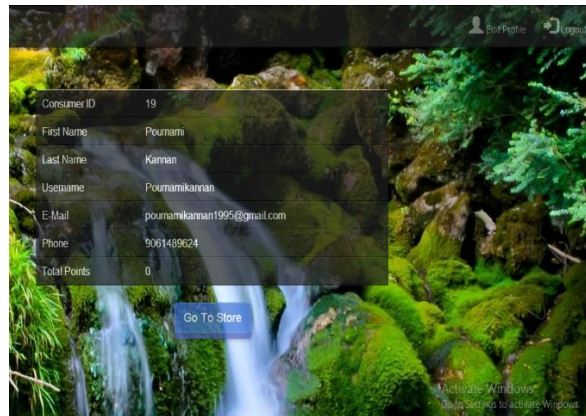


Fig 7: User Module



Fig 8: Home module

IV. CONCLUSION

The proposed system is an IoT based smart waste management system. A user dumps trash in to waste bin by entering a unique code. The points are credited to his/her account based on the amount of waste and the type of waste. According to the credited points users have a provision to access various services or packages given by the application. The various services includes Wi-Fi and biogas. Major part of our project depends upon the working of Wi-Fi module and the sensors. This prototype is a stepping stone towards the accomplishment of smart and clean city.

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