WASTE SEGREGATION USING RFID TECHNOLOGY

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Abstract: Internet of Things is a network which connects smart objects, which are embedded with electronics, software, sensors and enable exchange of data. One of the main technologies used is Radio-frequency identification (RFID), which is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. Our aim is to help the problem of proper waste disposal by segregating waste using RFID technology, at the site of waste generation. The proposed system implements smart dustbins equipped with sensors (RFID), and segregates waste into wet, plastic and non-plastic.

Keywords: Dry, Plastic, RFID, Waste Segregation, Wet.

I. INTRODUCTION

Bangalore's sobriquet 'Garden City' has nearly come to be replace with 'Garbage City' in the wake of villagers' refusal to allow garbage trucks to dump the city's refuse into nearby landfills. The city generates around 5,000 tons of garbage every day, out of which only 10% is segregated at source. We are working on an improved method of waste segregation, using RFID sensors, which will segregate all incoming waste into wet waste and dry waste, and further segregate dry waste into plastic waste and non-plastic waste. Internet of Things is an environment in which animals, human beings, and objects are provided with a unique identification and can transfer data, without human-to-human and human-to-computer interaction. Data can be gathered by attached sensors which is then sent to a device such as a smartphone or computer and accessed through an application. The data can then be analyzed, stored or it can trigger an action.

An RFID system has three parts: a scanning antenna, a transceiver with a decoder to interpret the data, and a transponder (tags) that has been programmed with information. The scanning antenna puts out radio frequency signals, which provides a means of communicating with the transponder and it provides the (passive) RDIF tag with energy to communicate. RFID tags can be classified by the radio frequency range they use to communicate: low, high, ultra-high frequency; and by the way the tag communicates with the reader: active or passive. The chip is capable of carrying 2000 bytes of data or less. It provides a unique identifier for a particular object. In recent times, its popularity has multiplied extensively. Common applications of RFID systems include library management, inventory tracking, RLTS (Real Time Location Systems), etc.

II. LITERATURE SURVEY

few challenges such as : privacy, security and costs from the end-user's view point and limited power supply to the tag from the engineering perspective which need to be addressed. To overcome these challenges, research in the

Many recently proposed RFID protocols faced security issues. To overcome this problem, this paper has adopted the authentication test method which is a new type of analysis and design method of security protocols based on Strand space model, and it can be used for most types of the security protocols. Hence this proposed protocol overcomes the security issues such as information confidentiality, data integrity and identity authentication. [1]Aside from a brief introduction to the principles of the technology, major current and envisaged fields of application, as well as advantages, and limitations of use, the current scenario of the use of the RFID technology is discussed.[2]This paper introduces the distinctive components of RFID technology and focuses on its core competencies such as scalability and security. It is then followed by a detailed synopsis of an investigation conducted to test the feasibility and practicality of RFID technology. [3]A recent study by Wal-Mart stated that the object detection probability has been as low as 66%. To overcome this, the use of multiple tags has been proposed. This strategy dramatically increases the efficiency of the RFID tags. Different types of multi-tags have been defined and their efficiency is examined. The economics of multi-tag RFID systems have been analyzed and it is concluded that the benefits of multi-tags will continue to increasingly outweigh their costs in many applications. [4]RFID has been available for more than fifty years and the prices have fallen down recently due to which these devices are being in many inventions. The objective of this paper is to present an introduction to RFID technology, its current and future applications, study various potential threats to security and privacy, and provide efficient protocols for security mechanisms. [5]RFID technology has been facin

fields of RFID privacy and security, antennas, polymer electronics-based RFID devices, power management circuits and techniques, and efficient RF spectrum utilization must be given importance. [6]
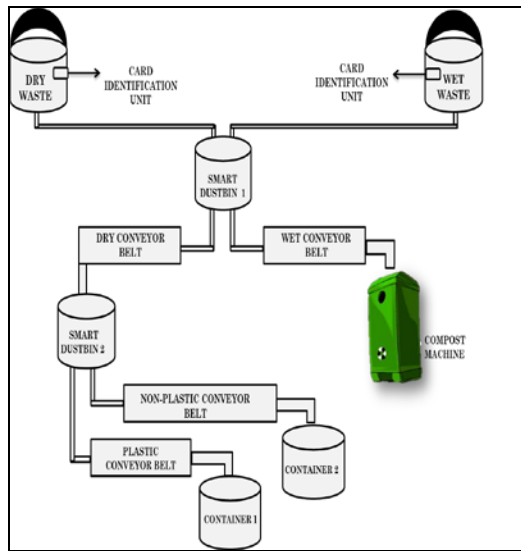
III. PROPOSED METHODOLOGY

Figure 1. Overview of waste segregation

In each locality, there will be 2 dustbins, one for dry and wet waste, which have NFC (Near Field Communication), embedded into them. NFC is a short-range high frequency wireless communication technology that enables the exchange of data between smartphones and other enabled devices over about 10 cm distance. It is an upgrade of the existing proximity card standard (RFID) that combines the interface of a smart card and a reader into a single device. On recognizing the NFC tag in the smartphone of the resident, the flap of the dustbin opens, and the resident empties the corresponding waste into the bin as shown in Fig (1.1).
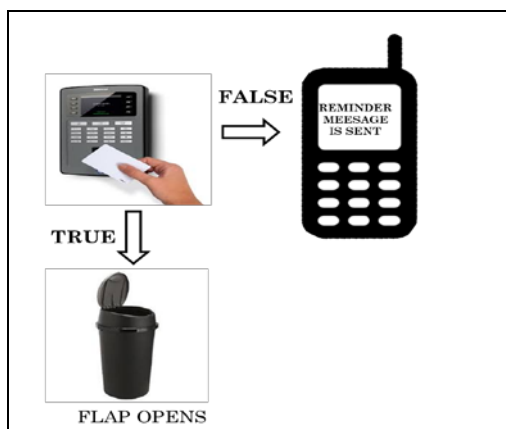

Figure (1.1)

One of the bins empties into the first **Smart Dustbin**, continuously for 3 hours, which is placed underground, where further segregation takes place. At the end of 3 hours, the other bin starts its emptying process.
The Smart Dustbin is equipped with 3 low frequency RFID sensors, for increased efficiency of the segregation. These sensors are used to detect liquid-content and are placed on glass panels inside the smart dustbins and are used to detect and ensure that the waste is segregated into dry and wet waste correctly as shown in Fig(1.2).
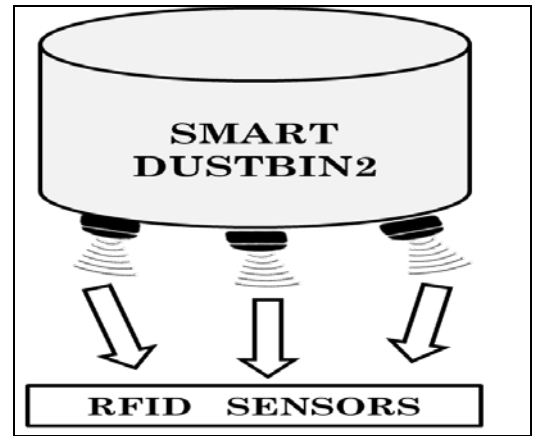

Figure (1.2)

Once the waste is correctly segregated, the wet waste, through a conveyor belt, enters into a composting machine, similar to the ones used in Aero India 2015. This machine is fully automatic and can convert wet waste from 300 houses/1200 people in around 24 hours. The compost can be collected and bagged and transported to farmers as shown in Fig (1.3
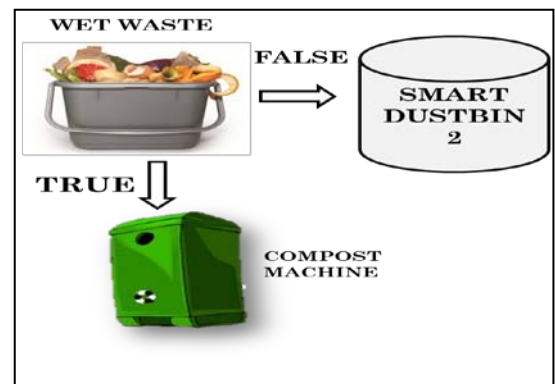

Figure (1.3)

Meanwhile, the dry waste enters into another smart dustbin which is equipped with ultra-high frequency RFID sensors as shown in Fig (1.2). Ultra-high frequency sensors are preferred to high frequency sensors because they are more cost-efficient and have higher range. Here the dry waste is segregated into plastic and non-plastic waste, which is sent to Container 1 and Container 2 respectively as shown in Fig (1.4).
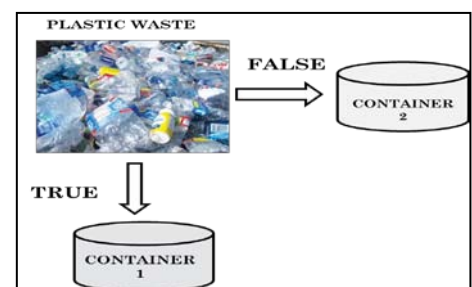

Figure (1.4)

The non-plastic waste from Container 2 is then collected and can be sent to recycling units, as is the norm now.

The biggest drawback of plastic is that it doesn't decompose. Prof.RajagopalanVasudevan, Professor of Chemistry at Thiagarajar College of Engineering, Madurai, the Plastic Man of India, came up with a technology to overcome this problem. This technology is simple as it requires the plastic, which is collected from Container 1, to be shredded and added to an aggregate mix which is heated at 165 degree Celsius. This mixture is then mixed with hot bitumen and is used for construction of roads, which are more cost-efficient, strong and durable to monsoons. Thus, this solves two problems at once.

IV. CONCLUSION

It is more than a decade since new laws were brought in with regard to collection of waste in Bangalore, and it is high time we looked at different methods of waste segregation and disposal, which will help curb this menace. Since the main problem is the unavailability of landfills, we have come up with this new method, which ensures recycling of majority of the waste that is generated on a day-to-day basis, thus cutting down the need for landfills to a very large extent. The end-products also include segregated plastic, which can be used for construction of roads, which are more durable, cost-

effective, and show greater resistance to damages caused by heavy rains.

Since almost the entire system, except the first two dustbins and the two containers, is underground, this method saves space, increasing its efficiency. The implementation of this system will begin in a few localities, and can be slowly expanded into the entire city, and eventually, the entire country.

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