A Review on Smart and Autonomous System for Waste Management

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***Abstract*— In the current scenario, waste management has become a significant problem due to study growth in the human population and increased human activities. Daily,a large quantity of garbage is being produced in most developed nations; depleted assortment and inefficient disposal of solid waste pose a risk to the environment and all living organisms. Solid waste has been efficiently managed and segregated through the use of numeroustechnologies. This article reflects a review of technologies for solid waste management. Thus, we would like to find an effective method to gather waste. An embedded IoT system can address this drawback by monitoring the quantity of the deposited waste, and by providing an idealplatform for the observation and segregation of waste. In the segregation half of the process, wastes will be separated into dry waste and wet waste, and in the observation half, the containers with dry and wet wastes are embedded with sensors, and also the level of the waste in the bin is transmitted through the Internet of Things. By using ultrasonic sensors, the proposed prototype will help city authorities to maintain a clean and tidy urban environment.**

Keywords*— *Avr processor, DC Motor, Wet Sensor Relays:5, IR sensor, Metal Sensor, Embedded C, Cross compiler, Avr Studio.

I. INTRODUCTION

I believe it is a good idea to dispose of waste in a bin. It is important to understand that this is not the end, but rather where the waste management process begins. The first step in the waste management process is to separate the degradable waste from the non-degradable waste and recycle it. It is suggested to have two separate trash cans in a home to prevent the mixing of dry waste and wet waste. As a result of improper segregation in landfills, toxic substances can leak into the ground and contaminate groundwater. When wastes are not separated correctly, they can be mixed up in landfill sites, causing toxic release into the soil and eventually polluting groundwater. There is a high probability that methane gas, one of the most dangerous greenhouse gases, will be released under those conditions. Proper separation leads to proper digestion of behavior. The production and management of hazardous waste are regulated by various laws, regulations, and other government actions. The literature research indicates that the basic method usually involves the weavers who recycle Garbage collection, discovery, segregation, and disposal throw away most of the solid waste. This paper suggests a new method that helps to keep developed countries clean and safe. All the garbage bins will be continuously monitored using the sensors which indicate to the users the amount of garbage that has been collected in the trash cans. Ultrasonic sensors are mounted on the top of every waste bin to estimate the amount of garbage and empty the container as soon as it becomes full. A web page displays the status information of every bin and reflects it to the users at the other end. The website provides an overview of garbage bins and highlights the amount of waste collected by color. In addition, the liquid crystal display (LCD) screen shows the level of waste. This new web-based method helps to maintain our environment clean and safe by providing authorities and every user with a clear picture of garbage bin levels by providing them with a clear picture of bins per page. Research like this is very important for anyone who dumps garbage cans, as well as those living in a community that embraces smart city guidelines to lead a more fulfilling life.

II. METHODOLOGY

A. Proposed Method

In this method, the work begins with the identification of the amount of garbage-filled inside the container using a Proximity sensor or IR sensor. Once the trash is identified in the waste container the slider gets activated and further pushes the trash onto the conveyor belt. The conveyor belt operates with the help of a 12V DC motor. As all the trash passes onto the conveyor belt the metal elements present in the waste get segregated by an electromagnet and will be passed onto a separate bin. The dry waste is separated by a blower and is collected by another bin. Now the left out waste is further passed onto the conveyor belt and now a separate bin collects all the ethanol-based garbage using which ethanol can be produced in further days. During this process, the LCD continuously displays messages about several varieties of wastes collected in several bins. The blower and electromagnet are under the control of the relay. Further, the circuit is provided with the

appropriate voltage supply that assists in the effective working of the microcontroller ATMEGA32 circuit along with the entire system. The motor of the conveyor belt is turned on when the waste enters and starts moving across. Now all the sensors and motors are turned ON, including the microcontroller. Inductive proximity sensors detect whether the waste is metal or not, and if it is metal, M2 is turned ON, M1 is turned OFF and the garbage is dumped into the trash can. Also, counter 1 gets incremented According to the amount of moisture content in the waste, M1 determines the type of waste whether it is wet waste or dry waste if it does not come into contact with a metallic waste. If it is dry waste, then M1 stays ON and the garbage is moved into the dry garbage container. In the end, wastes are deposited in their respective bins to conclude the segregation process.

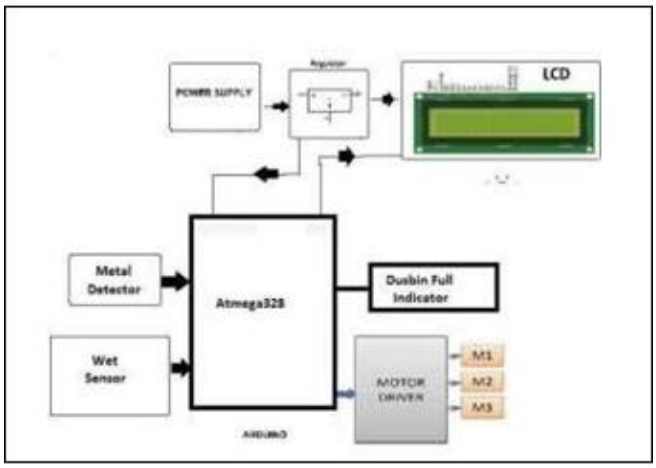

Fig 1. Block Diagram of ProposedMethodology

III. REVIEW OF LITERATURE

[1].The work presents an automatic waste segregator (AWS) that would be a low-cost and very effective method. It would also include a separation system for household waste that could be directly sent for further processing.

Waste is divided into metal waste, wet waste, and dry waste. The AWS uses parallel resonant electrical phenomenon sensors to distinguish metal objects from wet and dry waste. The output shows that the garbage disintegrated into the different categories mentioned above can be effectively separated using Automatic Waste Segregator. It is the conventional way of separating waste in our nation, that is done by rag pickers who require a lot of time and have major health implications when they are exposed to trash. The Automatic Waste Separator (WS) is an affordable, easy-to-use solution for waste separation that is affordable and also easy to use. Whenever the availability is provided for the separation of wet and dry waste into various bins, the paper proposes a novel technique involving the use of various sensors incorporated into the transporter on which the garbage is initially moving. Glass, paper, metals, and wet waste are separated. The wet waste can be used for plant growth and the dry waste such as paper, glass, and plastic can be recycled thereby increasing the value of waste. In this work, we propose an automated waste segregator (AWS) that is of low cost and simple to handle for the segregation of waste at household levels, so that the garbage can be directly sent for further processing. The garbage separator isolates the garbage into metal, organic, and plastic, resulting in more efficient waste management. The waste collection process is monitored by ultrasonic sensors. All dust bins would be equipped with sensors. The microcontroller will receive an indication when waste reaches the maximum level. GSM technology is used by the microcontroller to send messages to toss the garbage collection truck driver.

Modern society faces many pressing problems, including waste management. A waste's economic value is best determined once it's quarantined. It is inefficient, time-consuming, and expensive to manually segregate waste. Economic machine- driven waste segregationists (AWS) are proposed in this work as a low-cost and simple solution for household-level segregation systems so that the garbage can be directly sent to the processing plant. The system will sort out the refuse into wet, dry, and bimetal waste [1].

Garbage is most valuable when it is treated properly. This work helps us to develop an application for separating solid wastes into different types such as metal cans, glasses, and plastic using a programmable logic controller (PLC)S7-300. Other sensors such as proximity sensors and capacitive sensors are also used. Sensors are used to find the presence of waste objects and to direct them into separate bins[2]. As a result, there exists a scenario where proper waste disposal is not being performed, resulting in overflowing dustbins. To manage the waste effectively, it must be collected, separated, carried, and discarded minimizing risks to the public health and the environment. This method is a convenient and easy solution for segregating the garbage: dry, metallic, and wet. It segregates the garbage into metal, wet, and dry waste so that the garbage can be directly sent for further processing. With the help of embedded technology, the container is continuously monitored to determine if it is filled or not[3]. Uncontrolled waste dumping on the outskirts of cities and towns has resulted in overflowing landfills, which are not only impossible to reclaim due to haphazard handling, but also have serious environmental consequences, such as contributing to groundwater pollution and global warming. As a result, we proposed an automatic waste segregator aimed at segregating waste at the disposal level. To improve waste management efficiency, waste is classified into three major categories: metallic, wet, and dry. We proposed this project as a starting point for transforming our country into a Swachh Bharath, or clean nation[4]. Separation, handling, transportation, and disposal of waste need to be properly managed so that the environment is not at risk. Economic Waste has the greatest value after separation. The conventional method of manually sorting garbage necessitates more human labor, time, and money This paper introduces an economical automated garbage segregator, that is a low-cost and simple solution for a household waste separation facility. The machine will Sort the garbage into four piles: metallic waste, wet waste, dry waste, and plastic waste[5]. As Shyamala Mani and Satpal Singh argue in their paper, "Sustainable Municipal Solid Waste Management in India: A Policy Agenda, 9", a policy agenda for sustainable SWM needs to promote behavioral change amongst citizens, elected representatives, and decision-makers to minimize waste and maximize reuse and

recycling. They cite a general lack of awareness as the main reason for poor waste management in India. Comparing private waste management to ULBs, if the private sector offers higher standards or equivalent service at alower price, then PSPs will win[6]. This study on the management of solid waste in Aurangabad City in India has been presented. It was created to plan the distribution of trash cans in the locality through the use of remote sensing and GIS technologies. Several factors were taken into account when planning waste management and determining trash cans placements. To begin, we needed to map out all of the present garbage containers in the locality. It was critical during the planning process to ensure the users' convenience and inconvenience from the existing bin location[7]. A solid waste bin with an intelligent design was developed to ensure a waste management system that is both efficient and dynamic. Implementation and execution of an integrated sensing system along with an algorithm for a solid waste bin is done here to automate the solid waste management process. Many different sensing methods have been integrated and their verdicts have been combined to detect the bin condition along with measurement of its parameter. The integration of several detecting systems has been done utilizing a rule-based decision-making procedure which offers an intelligent, as well as an automatic bin status monitoring system along with the sensing systems, have made a proficient bin which is also automation of waste solid management efficient manner that optimizes routes of collection and improves effectively[8]. To dispose of waste, an effective system has been introduced using Wireless Sensor Networks (WSN) and VANETs. A multicast routing system has been suggested to be further implemented in Garbage Collecting Vehicles (GCV) and On-Board Units (OBU) to ensure proper communication and filling of multiple trash cans at the same time, as well as to effectively use reserve CVs[9]. Several mobile technologies have been discussed to be a further collection of a waste used process as a potential method of developing waste management technologies for a mobile device including Mobile Network Based GPS Tracking which predicts time and also helps in Route Designing, GPRS technology helps in Real-Time Data Transmission and Communication between vehicles, Bluetooth is used to monitor workers and Bluetooth is used to monitor workers and RFID helps in Bin Tracking & Weighing. Integration of GPS, GIS, GPRS, and RFID along with the camera technologies is used for bin and truck intelligent monitoring systems[10]. It is a solid waste bin monitoring technique prototype that works using a wireless sensor network. It responds immediately after the garbage is dumped into the container. The system is built with ZigBee and GSM/GPRS communication technologies, and several sensors are used to track the amount of garbage in the container in real-time, which is then fed into the management system[11]. Municipal Solid Waste (MSW) composting system has been introduced. Several strategies have been implemented here to separate the garbage they are, Eddy current separation, magnetic separation, air classification, and wet separation are just a few examples. These technologies are implemented to separate ferrous and nonferrous metals, as well as plastic, glass, and organic waste. To begin, garbage is segregated into various volumes by a screen and every proposition of garbage is processed separately. In a composting plant, size isolation will make the subsequent isolation procedure much easier. As a result, it is considerably easier for machines or people to further separate similar-sized materials because little objects are not buried beneath larger ones[12]. Separation of several types of plastics, an effective segregation method has been introduced. NIR spectroscopy and multivariate examination concepts are used, as well. Based on a Raspberry Pi system, it was designed and implemented Separate the plastic from the rest. Use the computational and GUI tools. Python was used to develop them. This technique helps to identify the difference between several varieties of plastics[13]. One of the most important methods used for the separation of FT-IR spectroscopy and Hyper Spectral Imaging can be utilized to study post-consumer polymers/plastics. A mixture of different varieties of postconsumer plastic is given as input to this system and it does the operation of separation of those several varieties of plastic components[14,15,16,17,18-23]. It has been proposed that the elemental composition of materials can be determined using X- ray fluorescence. Objects with specific compositions are identified based on this analysis. By using glass, ceramics, metals, minerals, and plastics can all be treated using sorting systems[24-30]. The electrostatic separation or induction sorting method is proposed in to sort granular mixtures caused by electric forces acting on particles with an average size of 5mm. Three different electrostatic separation methods are presented in the paper. The following methods Separators of various types are used to process various types of mixtures: I role-type electrostatic separators used to sort metal/plastic particles (copper/PVC, for example); (ii) plate-type electrostatic separators used to sort metal/plastic particles (copper/PVC, for example). Metal/plastic particle mixtures (copper/PVC, for example); (ii) plate-type electrostatic separators, used to sort metal/metal particle mixtures (copper/lead, for example); and (iii) free-fall electrostatic separators, used to sort plastic/plastic particle mixtures (PVC/PE)[31-42].

IV. CONCLUSION

In this work, our intention is achieved to separate the garbage into Metallic, Dry, and Wet Waste, consequently attaining our favored outputs. Based on the things discussed above, we can conclude that many methods and techniques are found to manage the waste effectively and encourage waste monitoringtechniques. Solid waste management and segregation remain a huge threat in the present scenario, and the above, mentioned techniques have their disadvantages in their effective usage. Improvising the methods for SWM will further facilitate the management and disposal of solid waste. The traditional schemes were inefficient. In this paper, an alternate strategy was proposed to collect wastes effectively by monitoring their levels, which reduced human effort and resulted in a healthier environment. The prototype of the proposed management of waste method is effectively implemented. In this work, we help people to discover the management of waste control areas and expand the study techniques for future works. The above- mentioned method

facilitates the segregation of wastes at the very basic level which reduces helps to reduce the amount of pollution caused by the traditional ways of separation of garbage at the level of origin. It is easily transformable into a completely functional model for the enhancement of developed cities and nations.

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