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Automatic Waste Segregation System

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ABSTRACT
Rapid increasing urbanization growth and increasing population in all over the world, there is a dynamic increase in the amount of waste despisal dumping of waste has become a matter of concern all over the world because of the threat causes to the environment. There comes the pivotal role of the automatic waste segregation system which avoid this unfortunate's situation and also reduce the difficulty of recycling currently there is no such system for segregation of metal, dry, and wet waste. This project proposes a spot automatic waste segregation system that gives the solution to this problem. The benefits of this work are, there waste has a high potential for recovery and the occupational hazard of waste separating worker is also reduces.
KEYWORDS*: Automatic Waste Segregation, Arduino uno, Servo motor, Gsm Module, Ultrasonic Sensor, DC Motor, Moisture sensor, LCD Display.*

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I. INTRODUCTION

The economic value of the waste generated is not realized unless it is recycled completely. When the waste is segregated into basic streams such as wet, dry and metallic, the waste has a higher potential of recovery, and consequently, recycled and reused. The wet waste fraction is often converted either into compost or methane gas or both. The metallic waste could be reused or recycled. Even though there are large scale industrial waste segregators present, it is always much better to segregate the waste at the source itself. The benefits of doing so are that a higher quality of the material is retained for recycling which means that more value could be recovered from the waste. The occupational hazard for waste workers is reduced. Also, the segregated waste could be directly sent to the recycling and processing plant instead of sending it to the segregation plant then to the recycling plant. The purpose of this project is the realization of a compact, low cost and user-friendly segregation system for urban households to streamline the waste management process. As we move towards a more digitalized future, it is directly proportional to increase in urbanization and industrialization. This is the main cause of generation of large amount of waste. As per the report published by World Bank, approximately 1.3 billion tons of municipal waste is generated every year and it is expected to rise to approximately 2.2 billion tons per year by 2025. Due to this waste lies littered in the surrounding, dumped on open lands and this becomes major problem for various types of disease-causing bacteria and viruses which is why waste management is of vital importance. Segregation makes it possible to reuse and recycle the waste effectively. So, the waste management becomes an important concern for the health and well-being of the society. Presently, the waste segregation is done manually by installing different bins for collecting different type of waste such as wet, dry and metal etc. But this method has lot of discrepancy; one is being the Unawareness of most people towards waste management. Due to lack of proper segregation methods, a large amount of untreated waste is dumped as landfills. So, our idea is to make a garbage segregator which can identify the type of waste and put them in different bins accordingly and automatically. Implementing our project at household level will reduce the expenditure on waste disposal, manual effort required for waste segregation and the waste could be easily being recycled, reused and reduced.

Problem Identification

Rapid increase in volume and types of solid and hazardous waste due to continuous economic growth, urbanization and industrialization, is becoming a burgeoning problem for national and local governments to ensure effective and sustainable management of waste. It is estimated that in 2006 the total amount of municipal solid waste generated globally reached 2.02 billion tones, representing a 7% annual increase since 2003 (Global Waste Management Market Report 2007). The segregation, handling, transport, and disposal of waste needs to be properly managed to minimize the risk to the health and safety of patients, the public, and the environment.

Proposal of the project

❖ **EXISTING SYSTEM**

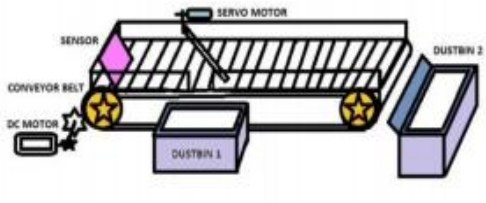
Intelligent solid waste bin is essential to develop an efficient and dynamic waste management system. This research presents the implementation and execution of an integrated sensing system and algorithm for solid waste bin to automate the solid waste management process. Several sensing methods have been integrated and have combined their verdicts that offer the detection of bin condition and its parameter measurement. The outcome showed that the sensing system with the algorithm is efficient and intelligent and can be simply used to automate any solid waste bin management process.

❖ **Proposed system**

The whole system is controlled by an Arduino Uno board. All other parts like ultrasonic sensors, inductive proximity sensor, DC motors, blower and electromagnet are interfaced to the Arduino board. The system comprises of different parts and mechanism such as Conveyor Belt, DC Motor, Ultrasonic Sensor, GSM Module, Monitoring System, and working software.

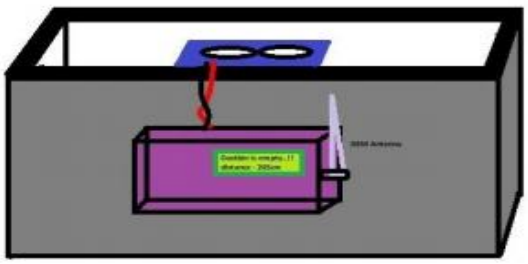
II. METHODOLOGY

1.For garbage segregating:



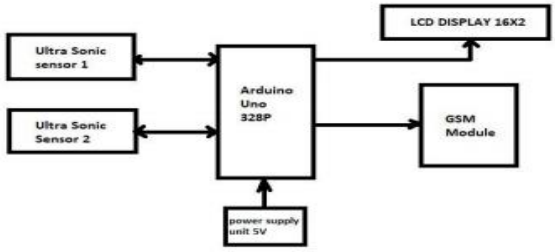
The waste is getting sorted as dry and wet waste. When the waste is placed on the conveyor belt, the moisture sensor attached at the start senses the moisture in the waste. If the moisture is above asset value, then such signals are sent to the Arduino. The servo motor which is also programmed through the same Arduino, starts rotating. A wooden block attached to the servo motor blocks the wet waste traffic and puts it in the dustbin of wet garbage which is dustbin1. If the moisture is not above the set value, the servo motor doesn't rotate and the garbage goes ahead on the conveyor belt and falls in dry garbage dustbin 2. Here the conveyor belt is rotated using dc motor.

2. Monitoring the garbage level:



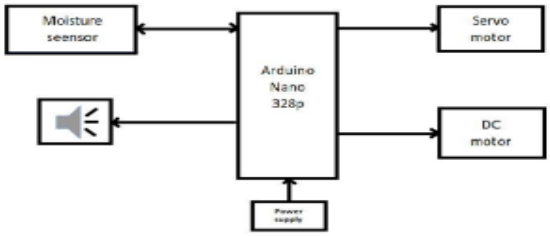
When the dustbins are about to get full, the level of garbage in the bin is detected by the ultrasonic sensors. These two sensors are set in both the dustbins to sense and send the details to the Arduino. If the bin is full, the message is sent to the municipal waste department with the location of dustbins using gsm module. The location is programmed in the Arduino code.

Block Diagram



BLOCK DIAGRAM FOR MONITERING

The overall block diagram for the garbage monitoring. The main blocks are ultrasonic sensor, Arduino 328p, power supply, gsm and LCD display. This display is used to show the dustbin status. The other blocks are explained in the equipment session.



BLOCK DIAGRAM FOR SEGREGATION

The block diagram for segregation of waste. The main blocks are moisture sensor, servo motor, dc motor and buzzer. The buzzer is used to indicate the sensing completion. The other blocks are explained in equipment session.

Equipment's

Arduino Uno

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

Moisture Sensor

The Moisture sensor is used to measure the water content(moisture) of soil when the soil is having water shortage, the module output is at high level, else the output is at low level. This sensor reminds the user to water their plants and also monitors the moisture content of soil. It has been widely used in agriculture, land irrigation and botanical gardening. The Soil Moisture Sensor uses capacitance to measure dielectric permittivity of the surrounding medium. The dielectric permittivity is a function of the water content. The sensor creates a voltage proportional to the dielectric permittivity, and therefore the water content of the soil. The sensor averages the water content over the entire length of the sensor.

DC Motor

A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

LCD DISPLAY

A liquid-crystal display (LCD) is a level panel display or other electronically adjusted optical gadget that uses the light-tweaking properties of liquid crystals. Liquid crystals don't discharge light straightforwardly, rather utilizing a backlight or reflector to deliver images in shading or monochrome. LCDs are accessible to

display subjective images (as in a universally useful PC 24 display) or settled images with low information content, which can be displayed or covered up.

GSM Module

A GSM Module is basically a GSM Modem (like SIM 900) connected to a PCB with different types of output taken from the board – say TTL Output (for Arduino, 8051 and other microcontrollers). The board will also have pins or provisions to attach mic and speaker, to take out +5V or other values of power and ground connections.

Servo Motor

A servomotor can be called as a rotary actuator or linear actuator. It is used for the precise control of angular or linear position, velocity and acceleration. It has of a suitable motor connected to a sensor for position feedback.

III. CONCLUSION

Automatic Waste Segregator has been successfully implemented for the segregation of waste into metallic, dry and wet waste at a domestic level. The system can segregate only one type of waste at a time with an assigned priority for metal, wet and dry waste. The experiment has been conducted for wet, dry and metallic wastes. It is found that the change of moisture value is greater for wet waste and very less for dry waste. Other objects like glass and wood have intermediate relative dielectric constant and thus are detected as dry waste. Experimental result shows that the waste has been successfully segregated into metallic, wet and dry using the Automatic Waste segregator.

FUTURE SCOPE

The waste materials can be segregated into biodegradable, non-bio degradable and metals by using more sensors. The discarded things can be processed to extract or recover materials in an effective way and resources or convert them to energy as usable heat, electricity, or fuels. The large-scale introduction of automatic waste management in villages, platforms, hospitals, industries, etc. Real time monitoring and controlling of waste management by using IoT. A prediction system by analyzing the given data to predict the variation in the amount of waste and to adjust the timing of management.

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