Automatic Waste Segregator using Arduino

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Abstract - **This system uses metal sensor and ultrasonic sensor to separate the metal waste from the waste in the dust bin. The proposed system consists of two doors and opens depending on the wastes. This system uses a metal sensor to detect the metal parts in the garbage. When it detects the metal, the system will open the corresponding door else for the other waste it will open other door.The ultrasonic sensor will detect the presence of the waste either metal or other waste. Based on the commands given by the metal detector the system will open door accordingly. The system have motors interfaced with the micro controller.**

Keywords - Embedded system, Arduino, Metal sensor, Embedded C

INTRODUCTION

Automations deals with the design of robots their manufacture and applications. Automations gained more importance in the modern era since it requires less cost to operate than a human labour to do the same task. Now a days industry is turning towards computer based monitoring of tasks mainly due to the need for the increased productivity and delivery of the final products with maximum quality. Based on the commands given by the metal detector the system will open door accordingly. The system have motors interfaced with the micro controller. Recycling plays a vital role in saving the environment. It helps in reducing the wastes everywhere and therefore saves the environment from too much pollution. The first step to total waste management is segregation. It is by segregating wastes properly that people can easily identify which materials are recyclable and which are not. Today, only 11% of the total amount of waste in Metro Manila is recycled. This is mainly due to incomplete segregation. A survey conducted by TaoPo showed that 22.8% of their respondents does not segregate wastes because it is inconvenient for them. A system was developed to automatically segregate plastic bottles and tin cans. The system differentiates the waste based on the sound resonant frequency produced when it hits the platform. After the waste has been identified, it will then be separated in the trash bin. The study, however, showed findings that there were few cases when the system mistakenly identifies the plastic bottle as a tin can especially when its cap hits the platform which means that the system is not accurate enough. Moreover, the system developed still needs a laptop or PC in order to run. This may not be convenient and cost efficient because it will require having computers near the device when applied in waste management facilities. This study aims to create a Standalone Frequency Based Automated Trash Bin and Segregator of Plastic Bottles and Tin Cans. In order to attain the main objective, the following specific objectives are to be achieved:

(1) To observe and record the other frequencies produced by the object when it hits the platform.
(2) To create a program in microcontroller that will interpret the gathered frequencies.
 (3) To test the accuracy of the system and to compare its accuracy with the previous study.

Embedded System

An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today.

Ninety-eight percent of all microprocessors are manufactured as components of embedded systems. Examples of properties of typically embedded computers when compared with general-purpose counterparts are low power consumption, small size, rugged operating ranges, and low per-unit cost. This comes at the price of limited processing resources, which make them significantly more difficult to program and to interact with. However, by building intelligence mechanisms on top of the hardware, taking advantage of possible existing sensors and the existence of a network of embedded units, one can both optimally manage available resources at the unit and network levels as well as provide augmented functions, well beyond those available. For example, intelligent techniques can be designed to manage power consumption of embedded systems. Modern embedded systems are often based on microcontrollers but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also common, especially in more-complex systems. In either case, the processor used may be types ranging from general purpose to those specialized in certain class of computations or even custom designed for the application at hand.
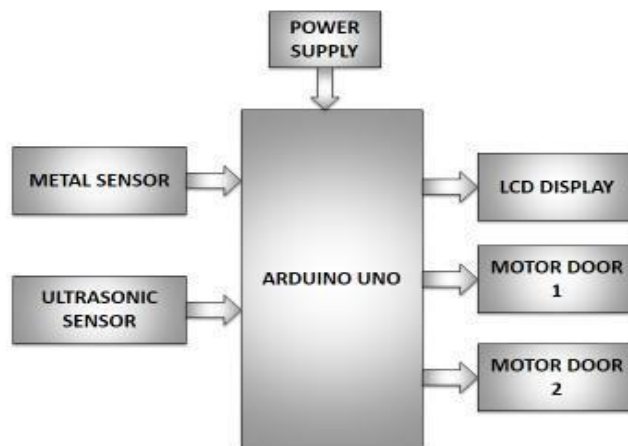
A common standard class of dedicated processors is the digital signal processor(DSP). Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale. Embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, and

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largely complex systems like hybrid vehicles, MRI, and avionics. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

Characteristics of Embedded system
- Speed (bytes/sec)
- Power (watts)
- Size (cm3) and weight (g)
- Accuracy (% error)

Implementation of AWS using Arduino

- Adaptability

Existing system using microcontroller

The existing system uses pic microcontroller. It is controlled manually through wireless technology. It doesn't detect any metal automatically. The user must give every command to the system. Automatic waste segregator is designed to sort the waste into three main categories namely; metallic, organic and plastic, thereby making the waste management more effective. Ultrasonic sensors are added for monitoring waste collection process.

The proposed system uses metal sensor and ultrasonic sensor to separate the metal waste from the waste in the dust bin. The proposed system consists of two doors and opens depending on the wastes. It uses a metal sensor to detect the metal parts in the garbage. The metal sensor contains metal detector which works on the basis principles of electromagnetic induction. Metal detectors contain one or more inductor coils that are used to interact with

metallic elements on the ground. A pulsing current is applied to the coil, which then induces a electromagnetic field. When the magnetic field of the coil moves across metal, such as the coin, the field induces eddy currents in the coin. When it detects the metal, the system will open the corresponding door else for the other waste it will open other door.The ultrasonic sensor will detect the presence of the object. LCD display unit displays the status of the segregation process. DC motor is responsible for motion of the objects. Conveyor belt is used for separation of waste particles. Arduino controls the whole process.

Software implementation

The software implementation of Arduino is done through embedded C**.** Embedded C is preferred over other software languages for the following reasons:

- It is small and reasonably simpler to learn, understand, program and debug.

- C Compilers are available for almost all embedded devices in use today, and there is a large pool of experienced C programmers.
- Unlike assembly, C has advantage of processor-independence and is not specific to any particular microprocessor/ microcontroller or any system.

This makes it convenient for a user to develop programs that can run on most of the systems.

Embedded C requires compilers to create files to be downloaded to the microcontrollers/microprocessors where it needs to run. Embedded compilers give access to all resources which is not provided in compilers for desktop computer applications.

CONCLUSION

The waste segregator as the name suggests, segregates the waste into two major classes: non-metallic, metallic. The permanent magnets placed within the metallic bin further sorts ferrous and non-ferrous metals. The inlet section is provided with open and close mechanism to regulate the flow of waste on to the conveyor. Inductive metal sensor is used to detect the metallic waste. The signal from the metal sensor initiates the push mechanism to discard the metallic waste. Conveyor belt is used for segregation process. In conclusion the objectives of this project are accomplished. A successful development of a

metal based automated waste segregator is done that is faster in picking and placing. Depending on the input from the metal detector and ultrasonic sensor the door will open and close for metal waste.

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