



## Automatic Medical Waste Segregation System by Using Sensors

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# AUTOMATIC MEDICAL WASTE SEGREGATION SYSTEM BY USING SENSORS

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## Abstract:

In India, the collection of medical waste is becoming an issue. Unwanted dumping of waste on outskirts of towns and cities creates nerdy and these overflowing landfills are impossible to reclaim. In the existing system, the manual effort has been needed so it may cause chronic disease to the person involved. Developing a mechanized system to save the lives of many people and making the world a cleaner and a greener place is the noble objective of the proposed system. To overcome those problems, an automated waste segregator at the hospital and medical clinic is used. For we are using proximity sensor, moisture sensor, gas sensor, ultrasonic sensor are used to detect and segregator the types of waste. This information can also be indicated to the head or the in-charge through a message by using cloud through arduino controller. For this system arduino IDE has been used to implement the program. This proposed system will save the lives of many people from toxic wastes.

## 1. INTRODUCTION

Waste disposal may be a huge cause for concern within the present world. The disposal method of a large amount of generated waste has created an adverse effect on the environment. The open dumping at landfill sites may be a common method of disposal of waste. Human health, plant and animal life are affected thanks to this method. The harmful

method of waste disposal contaminates surface and groundwater. It can produce to disease vectors which spread harmful diseases. This also degrades the aesthetic value of natural environment can degrade the aesthetic value of the natural environment and it's an unavailing use of natural resource. In India, rag pickers play a crucial role within the recycling of urban solid waste. Rag pickers and conservancy staff have higher morbidity thanks to infections of the skin, respiratory, alimentary canal and multisystem allergic disorders, additionally to a high prevalence of bites of rodents, dogs and other vermin. Dependency on the rag-pickers is often diminished if segregation takes place at the source of municipal waste generation. The value of the waste generated isn't realized unless it's recycled completely. Several advancements in technology have also allowed the refuse to be processed into useful entities like Waste to Energy, where the waste are often wont to generate synthetic gas (syngas) made from carbon monoxide gas and hydrogen. The gas is then burnt to supply electricity and steam; Waste to Fuel, where the waste are often utilized to get bio-fuels. When the waste is divided into wet, dry and metallic, it provides a higher potential of recovery and consequently recycled and reused. The wet waste fraction is usually converted either into compost or methane-gas or both. Compost can replace demand for chemical fertilizers, and biogas is often used as a source of energy. The metallic waste might be reused or recycled. Although there are large-scale industrial waste

segregators present, it's always far better to segregate the waste at the source itself. The advantages of doing so are that a better quality of the fabric is retained for recycling which suggests that more value might be recovered from the waste. The hazard for waste workers is reduced. Also, the segregated waste might be directly sent to the recycling and processing plant rather than sending it to the segregation plant than to the plant.

## 2. RELATED WORK

Anitha P, Amirthaa Sri K S [1] proposed the minimal distance to succeed in the locations of virtually filled waste bins and bins which produces harmful gases. the present system uses Dijkstra's algorithm minimal distance selection. Here we propose Low-Energy Adaptive Clustering Hierarchy (LEACH) Algorithm for hierarchical selection. This project is implemented and simulated by using Network Simulator version 2 and Arduino UNO developer board.

S.A.A. Jude, S. Selva Prabhu [2] proposed an automatic waste segregator (AWS) which is a low cost, easy solution for a segregation system at households, after which the wastes are sent directly for processing. Automatic waste segregator is meant to distinguish the waste into three main categories namely; metallic, organic and plastic, thereby making the waste management simpler. Ultrasonic sensors are used for checking waste collection process. The sensors would be placed altogether the rubbish bins. When the waste reaches the extent of the sensor, then the indication is going to be given to a microcontroller. The microcontroller will give indication to the driving force of garbage pickup truck by sending SMS using GSM technology.

Manikandan.R, Ramya.R [3] provided solution using embedded system technology with the

help of MATLAB. Here, we use robot, ultrasonic sensor, image processing, zigbee, human machine interface. The Robot segregate the waste into two types as degradable and non-degradable waste by using the ultrasonic sensor. The foremost important equipment is image processing, obtained by camera which capture the image entering then the image processing will compare it with the predetermined pictures. Thus directing the wastes to their respective bins.

Wesley Pereira, Saurabh Parulekar [4] The smart bin also will have an analysis done to inform the user the quantity and sort of garbage they eliminate. Daily, weekly and monthly disposal are going to be analyzed through graphs and data through live data reception. The bin also will have a reminder sent to the phone from the app connected to the bin to inform us that it's time to throw the rubbish. This concept will help us eliminate the wastes separately and thus even be ready to distinguish the recyclable and non-recyclable waste. The smart bin is an efficient and hygienic waste disposal and segregation system which can eventually help in waste optimization.

Gaurav Pawar, Abhishev Pisal,[5] proposes an Automatic Waste Segregator (AWS) which may be a cheap, easy to use solution for a segregation system at households. The AWS uses an inductance sensing mechanism to spot metallic items and resistive sensors to differentiate between wet and dry waste.

Sapna Suryawanshi, Rohini Bhuse[6] proposes a efficient alert system for garbage clearance by giving a warning to the municipal web server for fast cleaning of dustbin with proper verification. This process is aided by the ultrasonic sensor which is interfaced with Arduino UNO to see the extent of garbage filled within the dustbin and sends the aware of the

municipal web server once the bin is filled. After cleaning the dustbin, the driving force confirms the task of emptying the rubbish with the help of RFID tag to enhance the smart garbage alert system by providing automatic identification of waste in the dustbin and sends the status of clean-up to the server affirming that the work is completed . This will be also updated within the mobile by the app.

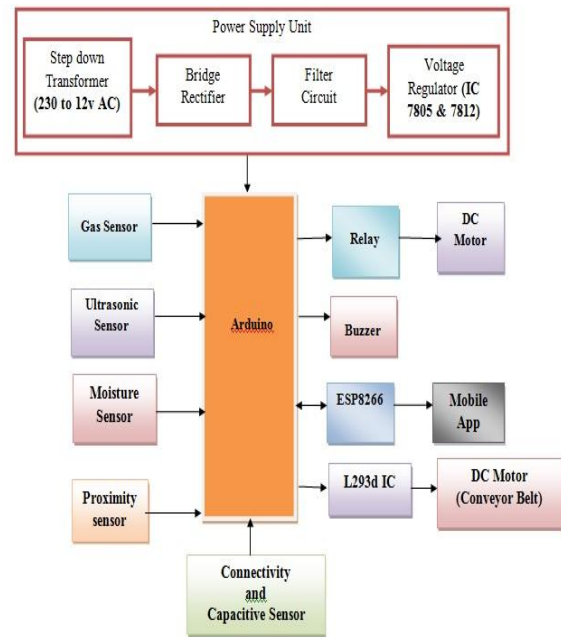
P.K.S. Kumari, T.H.N.L. Jeewananda[7] has proposed a solution to notify the user and other authorities when the waste bins are becoming filled or when there's an unusual condition inside the bins like having heat or high humidity. Users can take necessary action supported the small print. Researchers have used the layered architecture to develop this model and therefore the main objective of the project is to collect waste collecting data and inform householders and relevant authorities online. The proposed model provides dashboard, sound and lightweight alerts within the system.

Dr.A. Gnanasekar, Akshaya M[8] has provided that IoT can play a vital role in healthcare domain by controlling chronic diseases at one end as well as prevent the spreading of those diseases on the other end. The risk posed by overflowing bins in the hospital itself is quite alarming and plays a major role in the later of the former statement- preventing the spreading of the disease because of the presence of recuperating patients. Hence it is of utmost importance that bins in hospital premises and wards be cleared immediately as and when they get filled. In case of manual checking of bins, it must be done every now and then to ensure that no bin overflows. However the frequent interruptions may cause discomfort to the residing patients. Hence our project ensures that bins get cleaned only when needed and the manpower required will be reduced.

### 3. PROPOSED SYSTEM

In this proposed system we are implementing sensor based waste detection .So our idea is to make a garbage segregator which can identify the type of waste and put them in bins accordingly and automatically. Implementing our project at hospital or medical level will reduce the expenditure on waste disposal, manual effort.

#### 3.1 BLOCK DIAGRAM



**Figure 1 Block diagram of the proposed system**

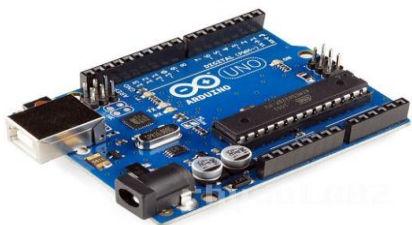
When the waste enters the conveyer belt motor activates and therefore the conveyer belt starts moving. The micro controller, all the motors, and sensors are turned on. The waste is sensed by the inductive proximity sensor to detect if it's a metal or no. If the waste is metal waste then the conveyer belt is turned off and motor for running metal is turned on and therefore the waste is pushed into the metal waste bin. Also, the counter 1 is incremented (keeps a count of variety of metal is kept on when it comes in touch with the moisture wastes dumped). If not a metallic waste, the conveyor sensor that

decides whether the waste may be a wet waste or dry waste by monitoring the moisture content of the waste. If the waste has some humidity it's detected as wet waste and therefore the refore the refore the conveyer belt is turned off and the motor for running wet waste is turned on and the waste is pushed into the wet waste bin. Also, the counter 2 is incremented. If not a wet waste the conveyer belt is kept on then the waste is dropped into the dry waste bin placed at the top of the conveyer belt. Finally the wastes are dropped into the respective bins and therefore the segregation process is completed.

## 4. HARDWARE DESCRIPTION

### 4.1 Arduino UNO

The Microcontroller or the processing module is an interfacing and controlling module, that interfaces the varied peripherals and other modules utilized in the circuit. It integrates the function of varied modules like the zero.



**Figure 2 Arduino UNO**

The Arduino UNO may be a microcontroller board which supports the ATmega328 and it contains Crossing Detector (ZCD), X-OR gate, Relay driver (ULN2003A) etc. It's 14 digital input/output pins (of which 6 are often used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, an influence jack, an ICSP header, and a push button . It contains the items that support the microcontroller with a USB cable or power it with a AC-to-DC adapter or battery to urge started.

### 4.2 Inductive Proximity Sensor

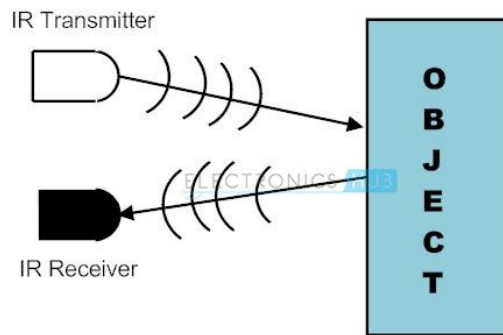


**Figure 3 Inductive Proximity Sensor**

This metal sensor is inductive sensor which suggests that it induces current when metal is almost it. This sensor may be a non-contact electronic sensor that's used detect positions of a metal objects. The sensing range depends on the sort of metal being detected. Ferrous Metal objects like iron and steel, leave a extended sensing range, while nonferrous metal objects like aluminum, copper, can reduce the sensing range by 60 percent. Since the output of an induction sensor has two possible states, an inductive sensor sometimes mentioned as an inductive proximity switch. The inductance of the loop changes consistent with the fabric inside it and since metals are far more effective conductors that other materials the presence of metal increases the present flowing through the loop. this alteration are often detected by sensing circuitry which signal pass faithful another device whenever metal is detected. This device is usually utilized in traffic lights, car washes, manufacturing machinery ,automated industrial machinery, elevators and building automatons this device is usually used because can adopt during a rugged and dirt environment.

### 4.3 Infrared Sensor

Infrared technology addresses a good sort of wireless applications. The most areas are sensing and remote controls. Within the spectrum, the infrared portion is split into three regions: near infrared region, mid infrared region and much infrared region.



**Figure 4 IR Sensor**

The frequency range of infrared is above microwave and lesser than light. For optical sensing and optical communication, photo optics technologies are utilized in the near infrared region because the light is a smaller amount complex than RF when implemented as a source of signal. Optical wireless communication is completed with IR data transmission for brief range applications. An infrared sensor emits and/or detects infrared to sense its surroundings.

#### 4.4 L293D MOTOR DRIVER

L293D may be a 16-pin IC which may control a group of two DC motors simultaneously in any direction. It means you'll control two DC motor with one L293D IC. Dual H-bridge Motor Driver microcircuit (IC). It works on the concept of H-bridge. H-bridge may be a circuit which allows the voltage to be flown in either direction. As you recognize voltage got to change its direction for having the ability to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor. In a single L293D chip there are two h-Bridge circuit inside the IC which may rotate two dc motor independently. Due its size it's considerably utilized in robotic application for controlling DC motors. Given below is that the pin diagram of a L293D motor controller.



**Figure 5 L293D Motor Drivers**

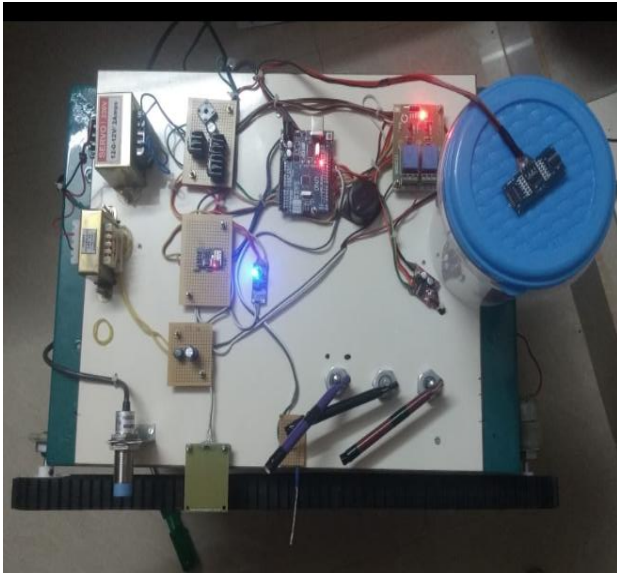
## 5. SOFTWARE DESCRIPTION

### 5.1 PROTEUS

Proteus may be the best simulation software for various designs with microcontroller. it's mainly popular due to availability of just about all microcontrollers in it. So it's a handy tool to check programs and embedded designs for electronics hobbyist. you'll simulate your programming of microcontroller in Proteus Simulation Software. After Simulating your circuit in Proteus Software you'll directly make PCB design. The purpose of this tutorial is to point out you ways to conduct an interactive simulation with a microcontroller using Proteus VSM and therefore the VSM Studio IDE. the stress are going to be on practical usage of the simulator and IDE, with more detailed coverage of every topic being available within the reference manuals. This tutorial doesn't cover schematic entry; if you're not conversant in drawing in ISIS then you ought to take the time to figure through the tutorial content within the ISIS manual . ranging from the fundamentals of driving the simulation from the VSM Studio IDE we'll then check out a number of the varied debugging and measurement tools available inside the Proteus.

## 6. RESULTS AND DISCUSSION

The output of the proposed system is shown in the figure 6.



**Figure 6 Output of the proposed system**

When the power is switched ON, the motor starts working so that the conveyor belt rotates. The waste moves through the belt so that the sensors can detect the different types of waste and move it to the dustbin.

## 7. CONCLUSION

Implementation of this technique at an area level like societies, educational institutes, etc. can reduce the burden on the local authorities. The automated waste segregator is an efficient and economic waste collection system with a minimum amount of human intervention and also causes no hazard to human life. Employing a conveyor belt makes the system much more accurate, cost-effective and also easier to put in and use at a domestic level. Segregating of these wastes at a domestic level also will be time-saving. While implementing our system we found many problems just like the sensing range of inductive proximity sensor, the accuracy of the moisture sensor, adjusting the range of IR sensors and a few more, but using some modifications we tried to make the system as reliable as possible but not completely perfect.

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