



AUTOMATED BIO-MEDICAL WASTE SEGREGATOR

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ABSTRACT:

Medical care is crucial for our life and health, but the waste generated from medical activities causes a real problems to the living beings. Improper management of Bio-medical wastes (BMW) because a direct health impact on the society, the health care workers and on the environment. Effective BMW management is mandatory for healthy humans and cleaner environment. Bio- medical wastes segregation by using Arduino, Inductive and Capacitive proximity sensor can be used to detect types of wastes and sorted based on the waste detected. This system sorts the wastes into three different categories namely metal, plastic and contaminated (Wet) wastes. Sensors were mounted on fixed frames. On the detection of medical waste, the sensor triggers the signal voltage, which is processed and output will be assessed based on the sensor's signal. By implementing this system man power required for manual sorting of waste can be reduced, thereby reducing the threat to workers prone to infections. This paper proposed system of automated waste segregator detects the waste and based on the response of the Inductive and Capacitive proximity sensor the wastes are sorted.

KEYWORDS:

INTRODUCTION

According to Bio-Medical Waste (Management and Handling) Rules, 1998 of India "Any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological. There are generally 4 different kinds of medical waste: Infectious, Hazardous, Radioactive and general. Biomedical waste may be solid or liquid. Examples of infectious waste include discarded blood, sharps, unwanted microbiological cultures and stocks, identifiable body parts (including those as a result of amputation), other human or animal tissue, used bandages and dressings, discarded gloves, other medical supplies that may have been in contact with blood and body fluids, and laboratory waste that exhibits the characteristics described above. Unwanted wastes produced in the medical sector can prove highly hazardous. If not medicated, these biomedical wastes can result in the outbreak of viral infections. Biomedical waste is distinct from normal trash or general waste, and differs from other types of hazardous waste, such as chemical, radioactive, universal or industrial waste. Medical facilities generate

Waste which contains hazardous chemicals and radioactive materials. While such wastes are normally not infectious, they require proper disposal. Some wastes are considered multi-hazardous, such as tissue samples preserved in formalin.

MATERIALS

SENSORS

A sensor is a device that detects and responds to some type of input from the physical environment. The specific input could be light, heat, motion, moisture, pressure, or any one of a great number of other environmental phenomena. The output is generally a signal that is converted to human-readable display at the sensor location or transmitted electronically over a network for reading or further processing. We live in a World of Sensors. You can find different types of Sensors in our homes, offices, cars etc. working to make our lives easier by turning on the lights by detecting our presence, adjusting the room temperature, detect smoke or fire, make us delicious coffee, open garage doors as soon as our car is near the door and many other tasks. All these and

many other automation tasks are possible because of Sensors.

ARDUINO

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board. There are different variants of the Arduino board available in the markets Example: Nano, Uno, Mega, etc. each one of them vary in shape and sizes. It also provides a Software IDE for their boards, which helps the developer to program the board in Language, this IDE also gives the liberty to the user to provide input instruction directly from the system. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

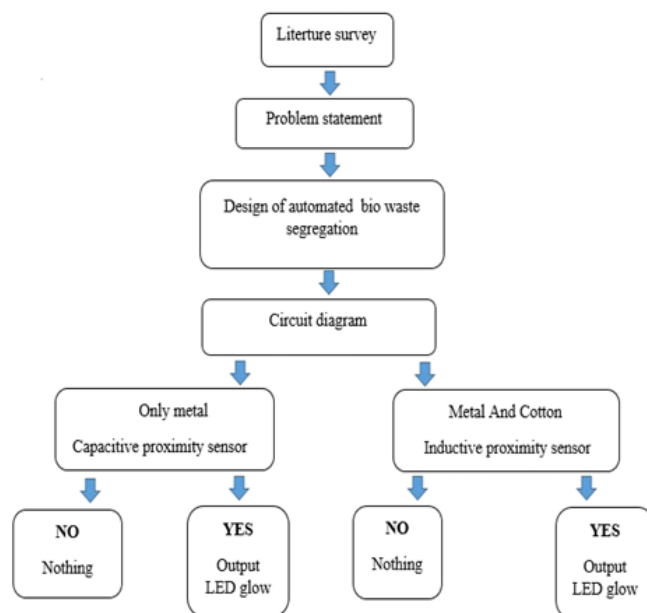
RELAY MODULE



RELAY MODULE

A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an electrical circuit. Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. The traditional form of a relay uses an electromagnet to close or open the contacts, but other operating principles have been invented, such as in solid-state relays which use semiconductor properties for control without relying on moving parts.

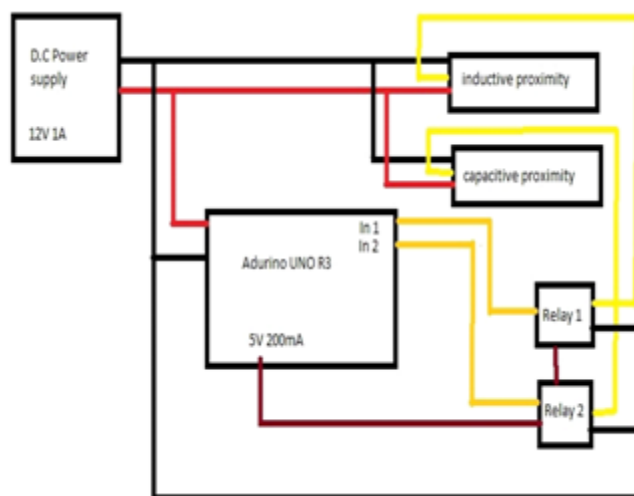
METHOD



METHODOLOGY FLOWCHART

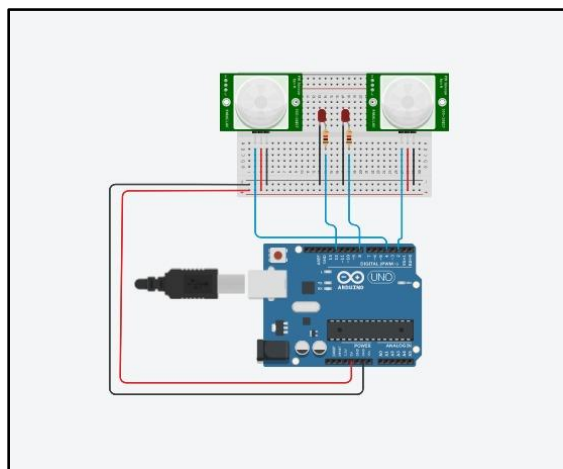
Capacitive proximity sensor and Inductive proximity sensor are powered using the 12V Adaptor. When Capacitive proximity sensor detects the wastes, the signal wire is triggered. The signal wire is connected to the negative pin of the relay as the sensor used is of type NPN. Thus the relay switches the coil position. The common of relay is given a supply of 5V. So, the output of the relay will be 5V. The output of relay is connected to an Arduino digital pin and according to the code, respective LED glows. Similar concept when Inductive proximity sensor is considered as the signal wire is connected to separate relay and digital pin.

CIRCUIT DIAGRAM



CIRCUIT DIAGRAM FOR AUTOMATED BIO-MEDICAL WASTE SEGREGATOR

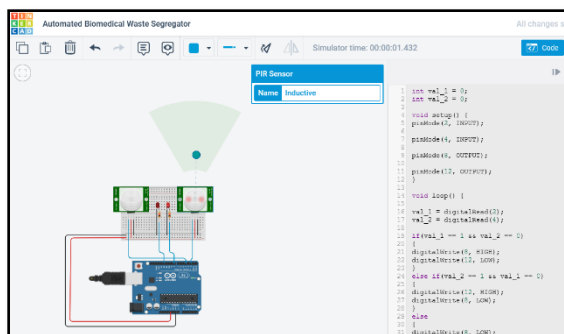
SIMULATION



SIMULATION USING TINKERCAD

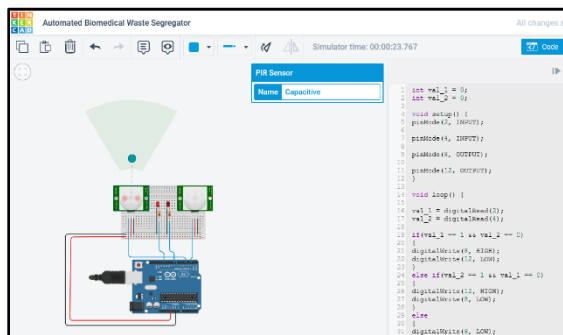
Both the sensors are powered with a supply of 5V. The signal pin of the first and second sensors is connected to digital pin 2 and digital pin 4 of Arduino respectively. The Arduino board is programmed. When the digital pin 2 reads as HIGH, digital pin 8 goes HIGH and the LED 1 glows. Similarly, when the digital pin 4 reads as HIGH, digital pin 12 goes HIGH and the LED 2 glows. Both the LEDs are given with resistors as the output from any digital pin of Arduino is 5V and we cannot give it directly to a LED, which will lead to damage the LED.

RESULT



WORKING OF INDUCTIVE SENSOR

When the first sensor (say Inductive proximity sensor) detects object, digital pin 2 reads HIGH and LED connected with digital pin 8 goes HIGH. Thus the sensor connected to the pin 8 glows.



WORKING OF CAPACITIVE SENSOR

When the second sensor (say Capacitive proximity sensor) detects object, digital pin 4 reads HIGH and LED connected with digital pin 12 goes HIGH. Thus the sensor connected to the pin 12 glows.

CONCLUSION

Capacitive proximity sensor detects the cotton wastes as they are wet, contaminated with bloods. Inductive proximity sensor detects the metal wastes. Sensor signals are sent to LEDs and they glow when the sensors detect the appropriate wastes. The waste is segregated into metallic, wet and plastic waste. The system can segregate only one type of waste at a time with an assigned priority metallic, wet and plastic waste.

Sensor output can be sent to servo motors for segregation of wastes. Expanding the domain of types of wastes to be segregated. Segregating various types of waste at a time by increasing the number of sensors used.

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