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Smart Recycle Dustbin with WIFI Monitoring System

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Abstract: Smart recycle bin with a WIFI monitoring system has taken place to improve waste management. Therefore, objective of this project is to make recycling easier. It also makes it easier for people to put their trash in the bin. This project produces because of three problem statement which is the location of the dustbin is usually filthly and smelly, animal constantly open the lid of trash cans to find food and difficult for garbage collectors to collect unseparated rubbish. This project would include four types of sensors to detect four types of garbage: plastic, metal, paper, and wet garbage. This is due to the fact that in this project, the system would sperate the garbage when the items are contained within the garbage. The wastes are tracked by smart bins using a wifi system integrating the telegram based information system. As a result, the employee connected to a wireless network from the dustbin to monitor the level of garbage in the bin. Finally, this project would make the environment cleaner and healthier for humans.

Keywords: Garbage, Waste, Separation

1. Introduction

This project represents and discusses an attractive design of an intelligent dustbin for assisting in the recycling process. This is because people nowadays required intelligent products which reduce the number of manpower, particularly in the industrial sector. This smart dustbin with wifi monitoring system is designed for industrial use to aid employees in garbage monitoring. Furthermore, recyclable materials such as plastics, papers, metal, and wet garbage would be automatically separated. Smart dustbin project is very useful because helpful for the garbage disposal by segregating it according to its type thus contributing in a green means to the society and environment [3]. In ensuring that the desired goals of the recycling programme are achieved, an effective implementation of the 3R (reduces, reuse, recycle) concepts and practices in solid waste management is therefore crucial. Efforts to promote the 3R (reduce, reuse and recycle) program are increasing to encourage the reduction of waste going into landfills for protecting and conserving natural resources, environment and energy.

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2. Sensor Diversity

For sensor density, author from [11] was develop a system. In this project sensors and converters are always designed with some physical or chemical law or principle. In addition, sensors have been used for measure physical quantities such as distance, linear position, angular position, displacement, acceleration, pressure, flow, force, linear velocity, angular velocity, temperature, light intensity and vibration [11]. Next, in [13] project used sensor as equipment for sense is Efficient IOT Based Smart Bin for Clean Environment. Throughout this project, an ultrasonic sensor was used to automatically close the lid of a dustbin. In the same project, an ultrasonic sensor was used to detect the height of the dustbin. Furthermore, infrared sensors (IR) are used to prevent waste from accumulating around the dustbin. Furthermore, an infrared sensor is used to detect objects. Other project that has used sensors for their dustbin is Smart bin and intelligent waste segregator using IoT project [14]. In this project they have used ultrasonic sensor is used to measure distance accurately and consistently. Then, metal waste is detected using an inductive proximity sensor. After that, used capacitive proximity sensors to differentiate between paper and plastic. Lastly, used moisture sensor to detect whether debris is wet or dry.

3. Materials and Methodology

The title of this project is 'Smart Recycle Dustbin with WIFI Monitoring System. This aim of this project to provide industry to have the environment in good condition and clean. This project was designed using IoT project. This project used of an Arduino uno, NodeMCU ESP8266, sensors, motor, light-emitting diode, and light-crystal display. In this section it would include with project flowchart, block diagram, components use and circuit design.

3.1 Materials

In this project Arduino Uno is used as microcontroller because of the requirement of port. Next is NodeMCU is an open-source Lua-based firmware and development board designed specifically for IoT applications. It includes firmware based on expressive systems' ESP8266 Wi-Fi SoC and hardware based on the ESP-12 module. Therefore, in this project NodeMCU used for host Telegram application to send notification. Then, this project also used moisture sensor, inductive proximity sensor and capacitive proximity sensors. That sensor is used for detect wet thing, metal thing, plastic thing and paper thing. Actually, capacitive proximity sensor can set to detect plastic and paper. Infrared sensor also used to detect human to open the lid of dustbin. This sensor can detect human. In addition, ultrasonic and infrared sensors were used. In this project, ultrasonic are used to detect the level of rubbish when full, the dustbin was then filled using a buzzer. When the dustbin is completely full, the buzzer will sound. Next, in this project, servo motor and servo motor MG995 were used. This motor was used to open the dustbin lid and push the trash to their section. LCD is also used to show the types of things they throw.

3.2 Methodology

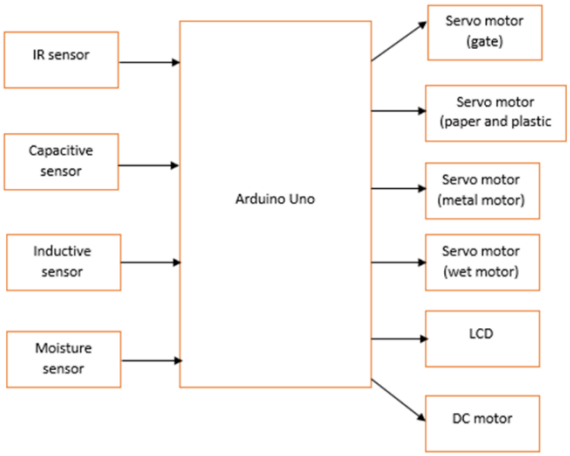


Figure 1: Segregation System Block Diagram

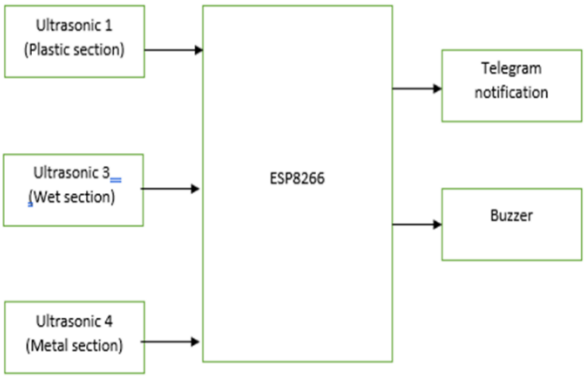


Figure 2: Monitoring System Block Diagram

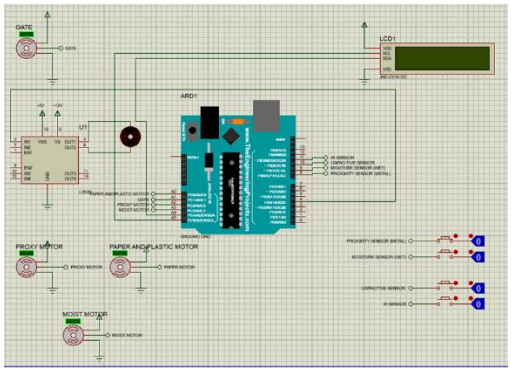


Figure 3: Segregation Circuit Diagram

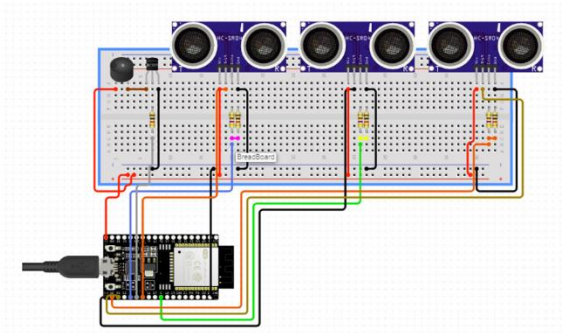


Figure 4: Monitoring Circuit Diagram

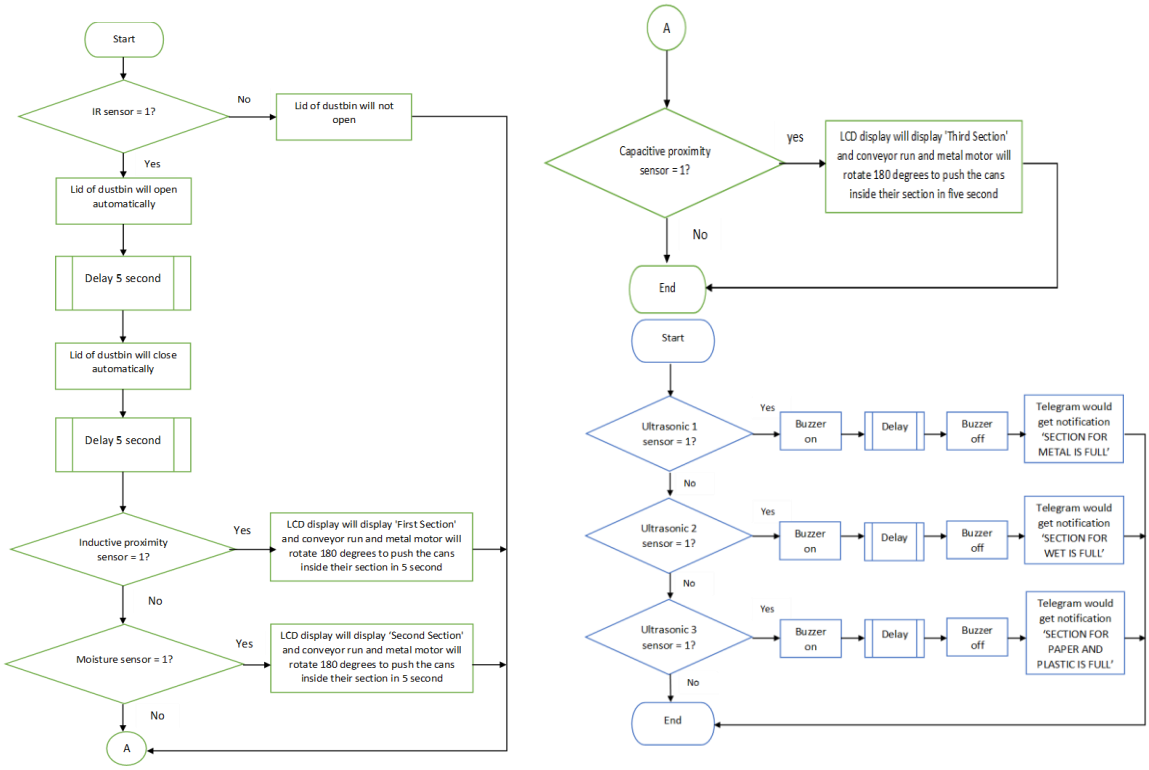


Figure 5: Flowchart for Segregation System and Monitoring system

4. Results and Discussion

This part will explain finding and results from this project. This section will go over all of the data that was collected, including how the problem was solved and the outcome. In addition, the accuracy sensor is 100% with 3.3cm range and the segregation process are smooth follow the system. The system not able to segregate a bundle of trash in one time. All the trash will be process one by one.

4.1 Results

Figure 6: Prototype Project

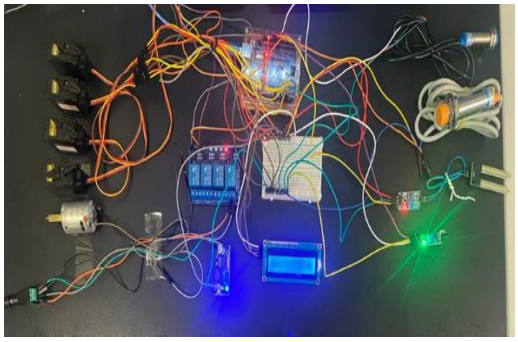


Figure 7: Actual Circuit for Segregation System

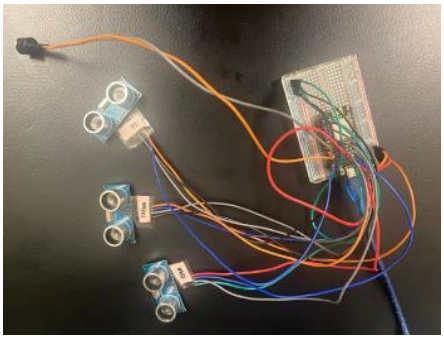


Figure 8: Actual Circuit for Monitoring System

Figure 9: System was started

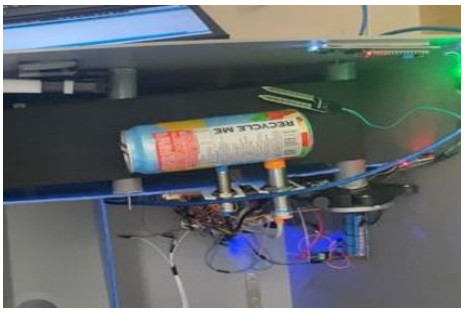
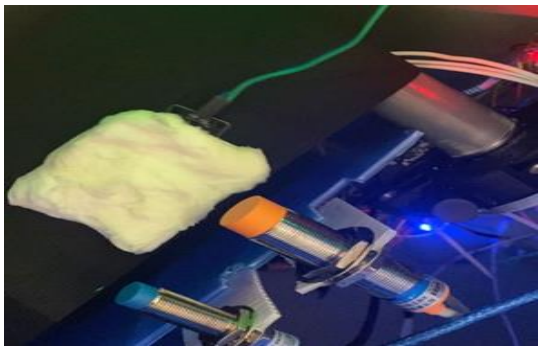


Figure 10: Inductive Sensor Detected



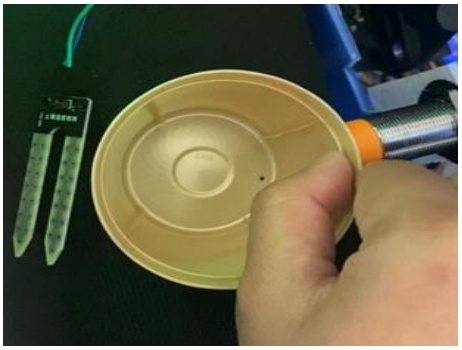


Figure 11: Moisture Sensor Detected **Figure 12: Capacitive Sensor Detected**

Figure 9 shows liquid-crystal display (LCD) display 'Hello Darling' for three second when power supply is ON. In addition, Figure 10, 11 and 12 shown when sensor started to senses waste whether metal, wet or paper and plastic waste. This to ensure the waste go into the correctly section which is first section for metal, second section for wet and third section for paper and plastic waste. The motor will rotate for 20 second then the system will reset.

(a) (b) (c)

Figure 13: Waste turn into their section (a) Metal -First Section, (b)Wet - Second Section,

(c) Paper and Plastic - Third Section

Figure 13 (a) –(c): shows when waste go into their own section. This was a last step for this segregation system.

Figure 14: LCD display section for each waste

When sensor is detected, liquid-crystal display (LCD) will display which section actually for the waste. Figure 14 is showing how the LCD display the section for each waste that put into the dustbin. This will show after sensor detected the waste.

Figure 15: Telegram display for each section if full.

This Telegam app has been configured as a warning system. This is because it will send a notification if the ultrasonic sensors are detected. Figure 15 showing when Telegram get notification. Firstly, when the ESP8266 is connected to the hotspot or wifi it would send wifi is connected and system has started. After that, when the ultrasonic1 sensor is detected and the telegram will get the notification 'SECTION FOR METAL IS FULL!!'. Next, if ultrasonic2 is detected the telegram will get a

notification 'SECTION FOR WET IS FULL!!'. Same goes for ultrasonic 3 sensor which is detect bin for paper and plastic.

4.2 Discussions

In this project, the segregation system was tested more than ten times to ensure that it performed exactly as expected. This occurred because the simulation result did not always match the actual result during the hardware test. This situation actually occurred on this project during the testing phase. This testing takes a long time to ensure that the separation system works properly. Finally, during the final test, the system performed flawlessly and smoothly, as expected. This issue also affected the wifi monitoring system. A programmable problem is a common issue when creating a product that requires a programme to run automatically. Then, during testing, it would reveal whether or not the components used were damaged. This is due to the fact that all components must be checked before use. The testing phase then begins. Finally, after all testing has been completed successfully, all data must be collected in order to write the final report known as the thesis.

3.3 Ultrasonic Sensor Reading Result

Table 1: Ultrasonic Reading Result

Ultrasonic sensor	Distances	Result	Telegram notification
Ultrasonic 1	< 3cm	Buzzer on for 10 second	'METAL SECTION IS FULL!!'
	> 3cm	Buzzer off	-
Ultrasonic 2	< 3cm	Buzzer on for 10 second	'WET SECTION IS FULL!!'
	> 3cm	Buzzer off	-
Ultrasonic 3	< 3cm	Buzzer on for 10 second	'PAPER AND PLASTIC SECTION IS FULL'
	> 3cm	Buzzer off	-

5. Conclusion

The general, goal of this project was to make the factory environment clean and safe. At the same time, to make the factory's dustbin area cleaner and less smelly. Furthermore, this project provided assistance in the recycling process, which will reduce recycling procedures such as separating systems. Furthermore, this project has made use of an IoT system in order to integrate a dustbin with a WIFI monitoring system. It would allow people to keep track of the number of cans in the trash can. As a result, this project has been achieved its final goal, which is to evaluate the functionality of a dustbin. This system will assist the country in becoming more ecologically responsible.

Acknowledgement

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