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Prototype Smart Trash Can for Implementation Smart Environment in the Smart City based on Arduino and Android

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Abstract

The government provides different trash cans so that people can dispose of garbage according to the type of garbage and waste will be easily recycled, and this is done in order to be a smart city. However, there are some people who do not understand in which vats they have to dispose of so that in the end they immediately throw garbage in any barrel without seeing the type of garbage in each trash can. This study aims to create a trash can that can determine the type of waste that is discarded and automatically dispose of it in the right barrel. The research method used is device design, device making, data retrieval, and data analysis. So that the results of this study are that it can be made a smart trash can prototype to be implemented in smart city based on arduino and android. Which later can also be a device for education about the type of garbage in children from an early age.

Keywords: smart trashcan, smart city, Arduino

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1. Introduction

Garbage is a material or solid object that is no longer used by humans, or solid objects that are no longer used in an activity humans and discarded [1]. Many people think that all garbage is dirty, disgusting and useless again so it must be discarded or burn it. Government have began to have trouble finding a place of final disposal from garbage because of a lot people who don't want their area to be used as a landfill. This can be understood because the accumulated waste is very disturbing to comfort and health, especially from the smell and presence of flies [2].

For this reason, in the process of becoming a smart city, the government also makes waste bins separated by the type of waste, so that waste processing can be processed properly according to the type of waste.

But based on the analysis and observations made on the behavior the community can be said that some people in Padukuhan Hamlet have bad behavior in processing waste. This is shown as much (45.5%) the community has a good attitude and as many as (54.5%) people have a bad attitude in processing waste. These results indicate that some Dukuh Hamlet communities have behavior that is not good in processing waste, this is shown by still at least the people who have awareness of processing their own garbage, in the processing of waste is still limited to the activities of sorting trash, namely separating wet waste and dry waste, and utilizing it again items that are still suitable for use by reselling them. But, though many people understand about waste processing but desire or the implementation of good waste processing has not been done fully. Based on the results of observations made that in Dukuh Hamlet there was a pile of garbage collected by each head of the family and later the garbage is burned so that the surrounding environment is not visible a lot of garbage is scattered, and some people choose to throw garbage they have in a garbage shelter in the area around the market [3].

Therefore, to increase public knowledge about the type of waste, a trash can prototype was made to be implemented in the smart city based on arduino and android. This prototype device will also later be a device to teach children about the importance of separating waste according to its type from an early age.

Making things automatic reduces burden on the humans. The cost and effort used in manually controlled products is much higher than the automated systems. Considering the fact, that the problem of efficient waste management is one of the major problems of the modern times, there is an utmost need to address this problem [4].

2. Data Collection Techniques and Procedures

2.1. Data collection techniques

The method used in this study is a laboratory experimental research method, namely by making and testing programs Arduino and Android to be applied to the smart trash prototype. The stages of the method carried out in this study include designing and manufacturing as well as testing and analysis.

2.2. Data collection procedures

The design and manufacture of smart trash prototypes to be implemented in the smart city based on Arduino and Android consist of several stages, namely:

2.2.1. Making a model design device

The model is made using an acrylic material with a size of pxlxt = 40x20x25cmas shown in Figure 1 dan Figure 2. Installation of servo motors as the automatic drive of the trash door at the bottom of the trash door hinges. Installation of ultrasonic sensors on the top of the trash can so that it can detect the full or not of the trash can. And the installation of the red led indicator lights as an indicator of whether or not a trash can is full.

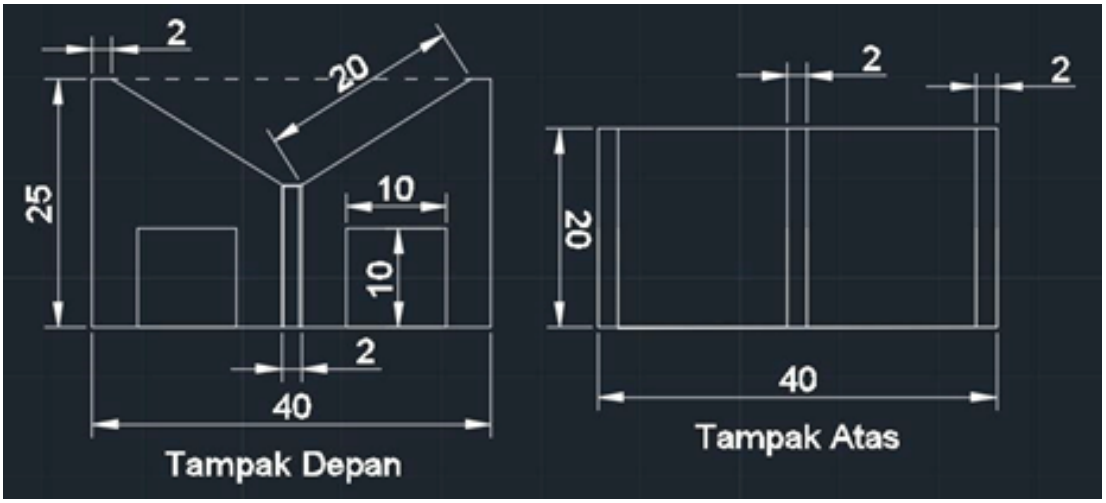

Figure 1: 2D design smart trash can.

2.2.2. Test the Arduino and android programs

Arduino is programmed to detect the type of garbage that enters the trash so that it can control the servo motor to open the door according to the type of garbage. Android in the program as a display to display information obtained by sensors and Arduino.

2.2.3. Test the servo motor driver

Servo used in the device must be able to rotate according to the degree entered in the program.

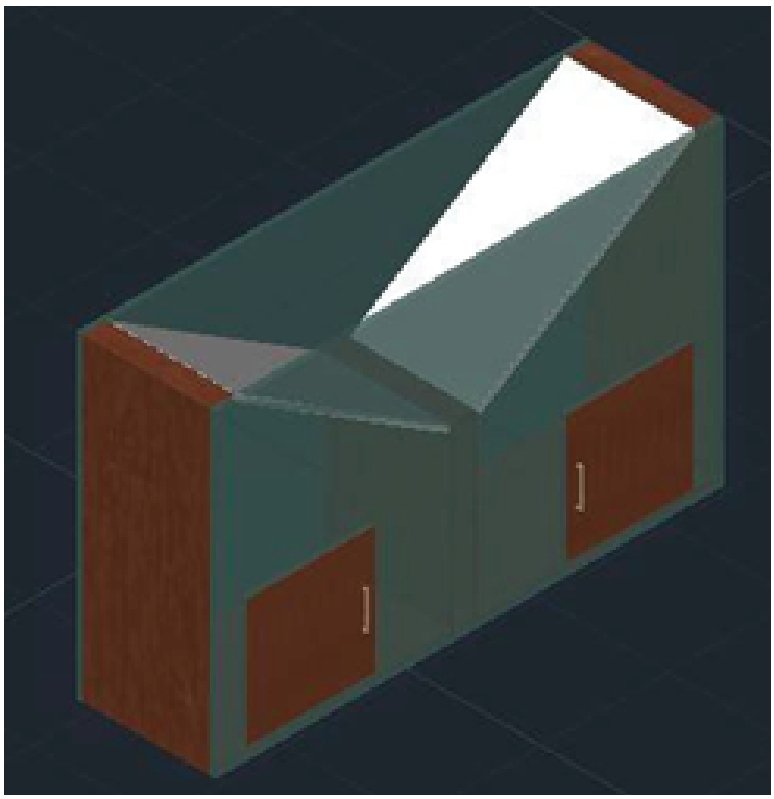

Figure 2: 3D design of smart trash can.

2.2.4. Test the ultrasonic sensor

The ultrasonic sensor used in the device must be able to detect the distance of the object in the trash can.

2.2.5. Test the conductive and capacitive sensors

Conductive and capacitive sensors must be able to detect the type of material attached to the sensor [5].

2.2.6. Test the device

The devices that have been programmed and assembled are then tested by detecting two types of material, namely the type of plastic and iron materials.

2.2.7. Record the results obtained

The results of the trial were recorded and the data obtained were analyzed to be used as research results.

3. Result

The results of the smart trash prototype design realization to be implemented in a smart city based on Arduino and Android are shown in Figure 3, the smart trash can consists of an Arduino board which is placed on the back of the model, then connected with a servo motor, ultrasonic sensor, inductive sensor, capacitive sensor, and Bluetooth.

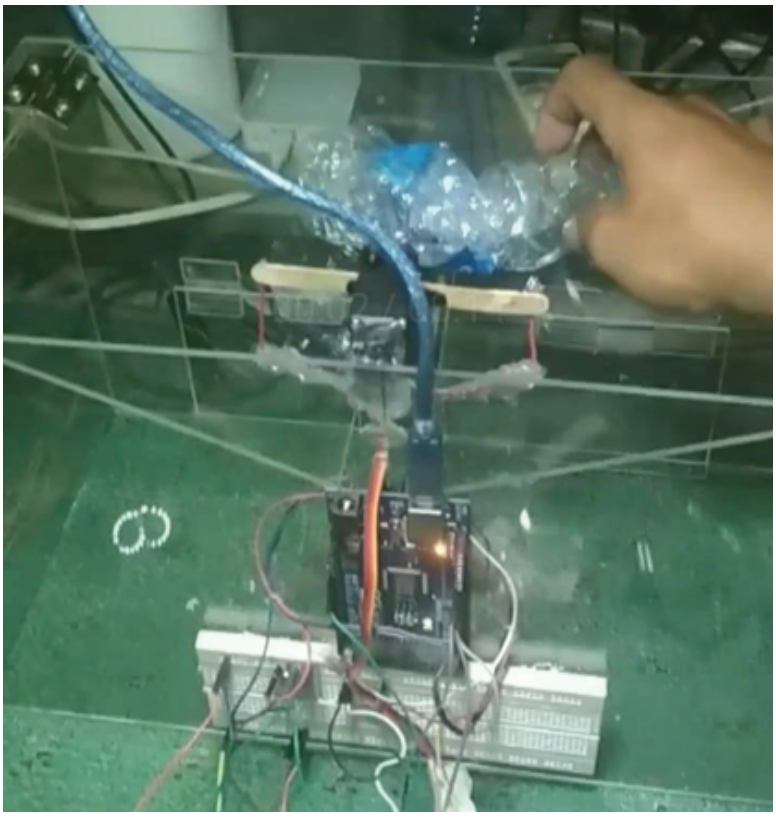

Figure 3: The smart trash prototype design realization to be implemented in a smart city based on Arduino and Android.

This test is done by removing 2 types of waste material, namely plastic waste and iron waste using an Arduino and android based smart trash prototype with results that can be seen in Figure 3.

Based on the results above the iron waste enters the iron tank and starts a video about iron waste on an android display.Based on the results above the plastic waste enters the plastic tank and starts a video about plastic waste on the Android display,

and the Arduino program test results that can detect the type of waste that is inserted into an Arduino-based smart trash can be seen in Figure 4.

Figure 4: The results of displaying a smart trash can on android.

4. Conclusion

Arduino-based smart trash system and Android can work in accordance with the design that has been made, both the circuit design and the program and its visualization. The input can be detected the type of material between plastic or iron using an inductive sensor and capacitive sensor well. The Android program on this device can run well, where when the input is a type of plastic waste, the device display will display an educational video about plastic waste and likewise when the input is a type of iron waste, the device display will display an educational video about iron waste.

Noteworthy is the initial design that was previously placed on the bottom of the door but moved to the top, this was due to an error in calculating the door movement and sensor diameter so that it could not use the previous design in combat. And the prototype smart bin to be implemented on a smart city can work and separate the type of waste material according to the material.

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Conflict of Interest

The authors have no conflict of interest to declare.

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