

(Smart Garbage System: *using microcontroller*)

A real life implementation of garbage controller combining sensor, motor, Arduino UNO microcontroller
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Abstract—The project is based on microcontroller in the target of building a smart garbage system that opens up the cover itself whenever a user is before the system within its Range. Arduino UNO R3 board, servo motor and sonar sensor is used to construct the system. The target of this project is to ensure a system of dirt collection through technology and maintaining a clean and healthy environment in offices, schools, restaurants and home. The system will automatically work whenever it is needed to be used for throwing garbage while the system lights up.
Index Terms—microcontroller, Arduino, garbage, range

1. Introduction:

The process includes the circuit connection to be ensured properly. All the instrument must be working efficiently and the code needs to be uploaded in the Arduino IDE. After the code being successfully uploaded in the IDE, the system must be checked whether it works or not. The code should not be contradicted to the connection made to produce the hardware. However, the vision is to make the smart garbage system to work successfully without any disturbance or Intervention to ease the human life. As technology is developed in the sense of meeting the daily activities with comfort. That is what this developed system will do.

2. Background studies: A sensor is a physical phenomenon that converts the light, sound, hit signals to the device to digital signal. If this sensor is used in garbage system that may detect the presence of user in front of it and then the cover may open up [2]. If the LED light is on when the cover is down, it will be easy for the user to detect the place of the garbage system in the dark. The code functionality can be done in Arduino IDE and the system wiring is done through the Arduino UNO board. That is how the system can be implemented.

3. Methodology:

The project hardware is basically focused on a small 1 feet bucket. The bucket has holes all around its body. The ultra-sonic sensor is placed in the bucket to the outside environment for sensing. The servo motor is actually used to produce the mechanical power to open up the cover just when the sensor detects the presence of a user. The motor is tied with thin threads which pulls the cover of the bucket to open up during this process. Then after 2 seconds the cover is down on the bucket as it was.

LED light is connected with the Arduino board and the sensor. So that, it can light up when it is needed.

The picture of the system is given below:

The connecting wires are used to make connection between Arduino UNO board, sensor and the servo motor, the three major components of the project. In the connection part the pin configuration is briefly demonstrated and showed. The

cover of the bucket is cut from a plastic board and made a circular shape to fit over the bucket. The 9 volt battery is connected with the Arduino pin. The battery is technically placed inside of the bucket but, it can also be placed outside. This is the vital component which powers up the heart of the system, the Arduino UNO.

4. Project equipment list:

servo motor: The mechanical power motor used to pull the plastic cover. It works by coded and generated signals. There is an output shaft that can swing from its place.

Ultra- sonic sensor: The device is HC-S04 model. It is actually a sonar sensor.

Arduino UNO R3: The microcontroller model that is the most updated version available. Used to combine between hardware and software. It has 20 digital I/O pins. Can be connected with a computer port.

bucket : To contain the garbage.

board / cover : Plastic made board to cover the bucket.

connecting wires : Male to male and male to female jumpers to connect among the pins of Arduino, motor and sensor.

battery: A 9 volt battery for power supply to power up Arduino.

Threads : Thin threads to pull up the plastic cover

5, Cost Analysis:

The cost analysis for the equipment of the project is shown below

SL NUMBER:	PRODUCT OR PROJECT EQUIPMENT	COST (TAKA)
1	Ultra- sonic sensor (HC-SR04)	90.00
2	Servo motor	235.00
3	Arduino UNO R3	550.00
4	Bucket (for garbage)	70.00
5	Board/ cover	40.00

6	Connecting wires (male-male, male-female jumper)	40.00
7	Battery of 9 V	50.00
8	Threads	20.00
9	LED	10.00
TOTAL		1105.00

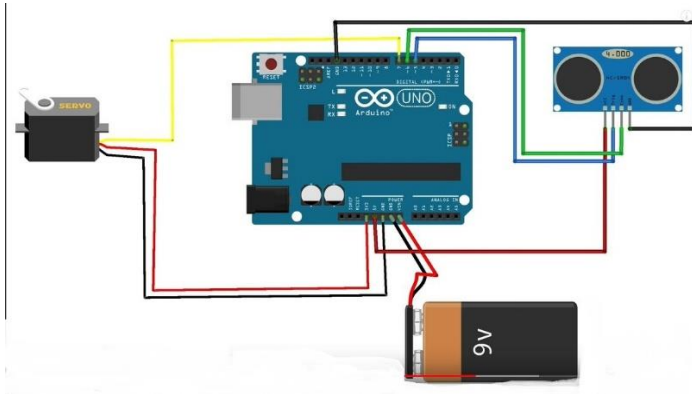
Connection:

The Arduino UNO board is wired with all the components of the design. Basically the connection with Arduino with all the components are discussed one by one.

Arduino with servo motor: Ground of servo motor to the GND of the Arduino. Then, the pin number of the Arduino 7 to the servo motor.

Arduino with HC-SR04 sensor: Ground of sensor to the ground of Arduino. Echo pin of sensor to the -6 pin of Arduino. Trigger pin of sensor to -5 of Arduino and Vcc of the sensor to the 5V of Arduino.

Arduino with the battery: The vin and ground of Arduino to one point of the battery. Also, the 5V and GND of Arduino is connected to another twisting point of the battery.



Discussion and conclusion: The system functionality is verified over and over again after the connection and code upload. The functionality was implemented and developed in a large number of iterations. That is how the Smart Garbage collection System was implemented. It was put on use at the member's home right after it was totally built and it is certainly a useable project. The status of the bucket while the cover open and close is shown below. The shots were taken after the successful implementation of the project.



In future, the system can be improved and created more user friendly. The sensor of the system can be made more intelligent and vision is to implement artificial intelligence in detecting the presence of a user. Thus, this sort of system is considered a must in recent times, as pollution is a very big issue. It can help to satisfy the need of human beings and the offices, schools, halls would have a Smart and user friendly garbage maintenance system. The users may be keen to use the system at ease and the cleanliness of a place will be ensured.

References:

[1] Anon, (2019). [online] Available at: <https://www.youtube.com/watch?v=9yrP1CZN3Ds> [Accessed 8 Dec. 2019].

[2] Sharma, N., Singha, N., & Dutta, T. (2015). Smart bin implementation for smart cities. *International Journal of Scientific & Engineering Research*, 6(9), 787-791.