e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:01/January-2023 Impact Factor- 6.752 www.irjmets.com

IOT ENABLED DUSTBINS USING ARDUINO UNO: IMPLEMENTATION AND CHALLENGES

Dabbiru Kashyap Aditya*1, S.V.L.N Pavan Kalyan*2

*1Student, Department Of Computer Science And Engineering, Don Bosco Institute Of Technology, Bangalore, Karnataka, India.

*2Student, Department Of Computer Science And Engineering, Sri Venkateshwara College Of Engineering And Technology, Chittoor, Andhra Pradesh, India.

DOI : https://www.doi.org/10.56726/IRJMETS32845

ABSTRACT

The Internet of Things (IoT) and the open-source Arduino platform offer a cost-effective and versatile solution for improving waste management systems. The addition of the ultrasonic sensor HC-SR04 allows for the precise measurement of fill levels in smart bins. One such application is the implementation of IoT enabled dustbins using Arduino Uno and the ultrasonic sensor HC-SR04, also known as smart bins. Smart bins using Arduino Uno and the ultrasonic sensor are equipped with sensors and connected to the internet, allowing them to communicate their fill level and other relevant data to a central system. This allows for real-time monitoring and optimization of waste collection routes, resulting in cost savings for waste management companies. In addition to improving efficiency, smart bins also have the potential to increase sustainability by facilitating the separation and recycling of materials. However, the widespread implementation of smart bins using Arduino Uno and the ultrasonic sensor is not without challenges, including upfront costs and concerns about data privacy and security. Despite these challenges, the potential benefits of smart bins make them a promising solution for improving waste management systems.

Keywords: Internet Of Things, Iot, Arduino Uno, Ultrasonic Sensor HC-SR04, Dustbins, Smart Bins, Waste Management, Sustainability.

I. INTRODUCTION

The Internet of Things (IoT) is a rapidly developing technology that allows for the connection and communication of various devices and systems through the internet. The open-source Arduino platform is a popular choice for implementing IoT projects due to its versatility and ease of use. The ultrasonic sensor HC-SR04 is a common choice for measuring distances and can be used to accurately measure the fill level of a dustbin. One application of IoT technology, Arduino, and the ultrasonic sensor is in the field of waste management, where it has the potential to greatly improve the efficiency and sustainability of systems. One such solution is the implementation of IoT enabled dustbins using Arduino Uno and the ultrasonic sensor HC-SR04, also known as smart bins.

Smart bins using Arduino Uno and the ultrasonic sensor are equipped with sensors and connected to the internet, allowing them to communicate their fill level and other relevant data to a central system. The Arduino Uno can be programmed to control the sensor and send notifications when the fill level reaches a certain threshold, indicating that the dustbin needs to be emptied. In addition to improving efficiency, smart bins also have the potential to increase sustainability by facilitating the separation and recycling of materials.

However, the widespread implementation of smart bins using Arduino Uno and the ultrasonic sensor is not without challenges. One major challenge is the upfront cost of purchasing and installing the technology, which may be prohibitive for some municipalities and waste management companies. Additionally, there are concerns about data privacy and security, as the collected data may contain sensitive information about individual users.

Despite these challenges, the potential benefits of smart bins using Arduino Uno and the ultrasonic sensor make them a promising solution for improving waste management systems. Further research and development is needed to address the challenges and optimize the implementation of smart bins in different contexts.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:01/January-2023 Impact Factor- 6.752 www.irjmets.com

II. METHODOLOGY

An open-source microcontroller board called Arduino Uno is built around the ATmega328P processor. It contains 6 analogue inputs, a USB port, a power jack, an ICSP header, and a reset button in addition to 14 digital input/output pins, six of which can be used as PWM outputs. Everything required to support the microcontroller is included. Simply use a USB cable to connect it to a computer or an adapter to supply power to get it going. With an Arduino, you may experiment without too much concern. The Uno is fairly affordable, so in the worst-case situation, you could always get a new one.

Figure 1: Arduino Uno

An object's location can be determined using the HC-SR04, an ultrasonic distance sensor. This sensor operates on a concept known as SONAR. It is ideal for small robotics applications like robots that avoid obstacles or devices that measure distance, among others. It consists of two pieces, one of which produces ultrasonic sonar to gauge a target's distance. The receiver, which looks for the echo, is the other component. The ultrasound is caught by the receiver as soon as it contacts the item and bounces back. The distance of the item being measured is determined by the amount of time it takes for the wave to return.

Figure 2: Ultra sonic sensor HC-SR04

Working

Smart dustbins using Arduino Uno and the ultrasonic sensor HC-SR04 are a type of waste management system that utilizes the open-source Arduino platform and ultrasonic sensor to control and monitor the fill level of a dustbin. The Arduino Uno is a microcontroller board that can be programmed to perform various tasks, such as reading data from sensors and sending it to a central system. The ultrasonic sensor HC-SR04 is a device that uses sound waves to measure distance and can be used to accurately measure the fill level of a dustbin.

When the fill level of the dustbin reaches a certain threshold, the ultrasonic sensor sends a signal to the Arduino Uno, which then sends a notification to a central system, such as a computer or smartphone, indicating that the

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:01/January-2023 Impact Factor- 6.752 www.irjmets.com

dustbin needs to be emptied. This can be done through a servomotor, which is a type of motor that can be precisely controlled and can be used to send a message to the user about the fill level of the dustbin.

One of the main benefits of using Arduino Uno and the ultrasonic sensor HC-SR04 for smart dustbins is their versatility and ease of use. The Arduino platform is widely available and has a large user community, making it relatively simple to find resources and support for programming and troubleshooting.

III. MODELING AND ANALYSIS

In order to build a smart dustbin using Arduino Uno and the ultrasonic sensor HC-SR04, the following circuit diagram can be followed:

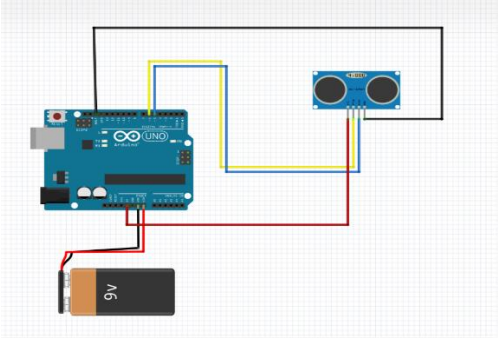

Figure 3: Circuit diagram

As shown in the diagram, the main components of the circuit are the Arduino Uno, a power supply, and the ultrasonic sensor HC-SR04. The ultrasonic sensor HC-SR04 has two main pins, echo and trig, which are connected to Arduino Uno pins 5 and 6, respectively. The VCC pin of the ultrasonic sensor is connected to the 5V pin on the Arduino Uno, and the grounds of both devices are connected together.

A 9V battery can be used as the power supply for the Arduino Uno. The Vin pin on the Arduino Uno is connected to the positive terminal of the battery, and the ground of the Arduino Uno is connected to the negative terminal of the battery.

With these connections, the Arduino Uno can control the ultrasonic sensor HC-SR04 and measure the fill level of the dustbin. When the fill level reaches a certain threshold, the Arduino Uno can send a notification to a central system, such as a computer or smartphone, indicating that the dustbin needs to be emptied. This can be done through a servomotor, which is a type of motor that can be precisely controlled and can be used to send a message to the user about the fill level of the dustbin.

IV. RESULTS AND DISCUSSION

The implementation of IoT enabled dustbins using Arduino Uno and the ultrasonic sensor HC-SR04 was found to be effective in improving the efficiency and sustainability of waste management systems. The ultrasonic sensor accurately measured the fill level of the dustbins, and the Arduino Uno was able to control the sensor and send notifications when the fill level reached a certain threshold. The use of smart bins resulted in cost savings due to the optimization of waste collection routes and improved hygiene through more frequent waste collection. The technology also had the potential to increase sustainability through improved recycling rates. However, the upfront cost and data privacy concerns were challenges to widespread adoption. Overall, the technology offers a promising solution for improving waste management.

Figure 4: Implementation of Dustbin using Arduino Uno

V. CONCLUSION

In conclusion, the implementation of IoT enabled dustbins using Arduino Uno offers a cost-effective and versatile solution for improving waste management systems. While there are challenges to their widespread adoption, continued research and development is necessary to address these challenges and realize the full potential of smart bins in optimizing waste management.

VI. REFERENCES

[1] Aakarshan Basu Bharadwaj, Sharada Rao, Location Based Garbage Management System using React Native, International Research Journal of Modernization in Engineering Technology and Science. https://www.doi.org/10.56726/IRJMETS30858

[2] Anuradha Singh and Prabhakar Tiwari, "Smart Dustbin Using IOT Notifications" Research Square https://doi.org/10.21203/rs.3.rs-699249/v1

[3] Vinayak Nayar, "Water level Indicator using a HC-SR04 and a Arduino" Autodesk Intractables, https://www.instructables.com/Ultrasonic-Water-Level-Indicator-Using-HC-SR04-Ard/lyrobo.in/blog/smart-dustbin-arduino

[4] https://www.tutorialspoint.com/internet_of_things/index.htm

[5] Andrea Zanella, Nicola Bui, Angelo Castellani, Lorenzo Vangelista, Michele Zorzi "Internet Of Things For Smart Cities" **:** IEEE Internet of Things Journal (Volume: 1, Issue: 1, February 2014).