1) **A review of Arduino board's, Lilypad's & Arduino shields**

Abstract:
The word “Open Source” is everywhere with Linux Technology and GNU foundation. In addition to open source software's and operating systems, Open Source Hardware is also progressing and becoming center point of attraction for researchers across the nook and corner of the world. The most widely adopted Open Source hardware available right now is “Arduino”. Arduino has various products like boards, Lilypad's and shields. The aim of this research paper is to explore the world of Arduino technology in terms of Boards, Lilypad's and Shields covering in depth regarding-Technical Specifications, features and real-world applications. Arduino technology has enabled various manufactures and research enthusiasts to come out with their own customized boards and shields as per their research requirements and area of implementations. Arduino Open Source community is also providing platform for researchers to come up with innovative research applications and market ready products in terms of Home Automation, Robotics, Wireless Connectivity, Drones and many others.

Published in: 2016 3rd International Conference on Computing for Sustainable Global Development

2) **Smart Dual Dustbin Model for Waste Management in Smart Cities**

Abstract:
As urbanization is spreading rapidly, there is an increase in production of waste. Waste management is a crucial issue to be considered at public places where waste is overflowed from the bins and may cause different diseases. The present work focuses to develop a model of smart dustbin which can be effectively used at public places in smart cities. The model has two dustbins (named as Dustbin A and Dustbin B) which will be kept at public places mostly. Dustbin A can be used but Dustbin B cannot be used until Dustbin A is full. Dustbin B can only be used once Dustbin A is full and then Dustbin A will not open until the waste is cleared in the Dustbin A. Whenever any dustbin is filled up, a message is sent to the concerned authority. This will avoid overflow of waste in the bin. Dustbins have automatically close and open feature depending on the presence of an obstacle. In our system, the garbage level in the dustbins is detected with the help of Ultrasonic sensor and presence of the obstacle is detected by IR Sensors and communication to the authorized control room by GSM system.

Published in: 2018 3rd International Conference for Convergence in Technology (I2CT)

3) **Smart E-dustbin**

Abstract:
As the second most populous country in the world India face a major problem in waste management. As of now there are traditional waste management systems like periodic and routine clearing by the various civic bodies like the municipal corporation. But even

though these routine maintenances is carried out we often come across overflowing garbage bins from which the garbage spills on to the streets. The smart city concept is still new in India, although it has received a lot of attention in few years when our present prime minister gave the idea of building 100 smart cities throughout India. Now, with the upcoming large number of smart cities, large numbers of responsibilities are also required to be fulfilled. The prime need of a smart lifestyle begins with cleanliness and cleanliness begins with dustbin. A society will get its waste dispatched properly only if the dustbins are placed well and collected well. The main problem in the current waste management system in most of the Indian cities is the unhealthy status of dustbins. In this paper we have tried to upgrade trivial and vital component of the urban waste management system, i.e. dustbin. The basic Idea behind project is to implement a smart way of handling the garbage in a smart way which is done by using the IOT protocol for transmitting the dustbin status wirelessly, which can generate email to notify to the concerned person that system is filled with garbage and need to be replaced We have selected the Espresso chip which is a node MCU ESP8266 platform. The ultrasonic sensor will show the level of garbage filled in dustbin, whereas the proximity sensors will detect the obstacle present in front of dustbin to avoid collision. LCD interfacing has been done to show the current situation of dustbin.

Published in: 2018 International Conference on Smart City and Emerging Technology (ICSCET)

4) Cloud Based Smart Dustbin System for Metro Station

Abstract:

RFID based Smart Dustbin System is a prototype model of next generation dustbin which would be highly equipped with sensors. This model mainly focuses on the security aspects. Some of bomb blasts during 2008 Serial blasts in Delhi were placed in dustbins. After the blasts dustbins were removed from all the metro stations in Delhi. This is because dustbins are an easy way to put the explosives. In this paper we present a viable solution for dustbins at metro stations. We have built this prototype model of this smart dustbin system using RFID tags, RFID reader, Ultrasonic sensor, geared motors, servo motors, Arduino UNO, raspberry-pi and solar panel for power supply. The system uses cloud based monitoring system for garbage monitoring. With the use of cloud based system there is no need of routine checking of dustbins. To make the system ecofriendly and preserve carbon neutral footprint of metro we are using miniature solar panel for power supply.

Published in: 2018 3rd International Conference On Internet of Things: Smart Innovation and Usages (IoT-SIU)

5) Arduino Based Smart Dustbin for Waste Management during Covid-19

Abstract:

India has perceived an enormous upsurge in garbage during 21st century due to adopting urbanization rapidly. In addition, as the population increasing drastically, which

inherently produce huge amount of garbage. The overflow of the garbage and lack of maintenance are the main reasons for many diseases and also for spoiling earth environment. However, the entire world has faced the problems due to spreading of Covid-19 through the air due to the hazard waste is being generated in specific Covid hospitals, quarantine zones are directly dumped into the dustbins. The frontline warriors (doctor, nurse, police) working in these unorganized dustbin environments are getting infected with Covid-19 and are became a primary contact for spreading of virus. Thus, it is very much essential to implement a systematized and well-designed mechanism to overcome this problem. In this work, a hardware prototype for smart dustbin based on Arduino has been proposed that can be installed in hospitals, medical centres, municipalities, households for the sake of environment as well as front-line workers. The proposed model of smart dustbin has PIR sensor and ultrasonic sensor for human motion detection and sense the level of garbage present in the bin respectively. An alert system based on GSM has been interfaced with Arduino which sends the alert messages based on level of the garbage at regular intervals. The proposed model work with very low power and increase the security for front-line workers from the Covid-19.

Published in: 2021 5th International Conference on Electronics, Communication and Aerospace Technology (ICECA)

6) **Smart Dustbin: An Efficient Garbage Management Approach for a Healthy Society**

Abstract:

As the population is increasing day by day, the environment should be clean and hygienic. In most of the cities the overflowed garbage bins are creating an unhygienic environment. This will further lead to a rise of different types of diseases. This will degrade the standard of living. To overcome these situations an efficient smart garbage management method has to be developed. In recent decades there is a quick development in the rate of urbanization and therefore there is a need of economical urban improvement designs. Presently utilizing new age innovation and vital approach, the idea of brilliant urban areas is coming up all around the globe. A brilliant city is inadequate without an efficient waste administration framework. This paper depicts the utilization of our model of “Smart Dustbin” in dealing with the waste accumulation management. The dustbin itself works as a robot, when it is full on command from authorized person it goes to prelearned path (for first time user has to guide towards garbage dumping area) and empties itself. An authorized person gives command from Webpage where dustbin status is updated regularly.

Published in: 2018 International Conference on Information , Communication, Engineering and Technology (ICICET)

7) **Efficient IOT Based Smart Bin for Clean Environment**

Abstract:

Dustbins are containers used for collecting household waste all around the world. In our day to day life, we dispose variety of waste materials categorized as industrial waste,

sewage wastes, domestic wastes etc. Dustbins are used for collecting the domestic waste materials. Indoor dustbins are used to collect wastes from household, which are then disposed into the outdoor dustbins maintained by the Corporation or Municipality. Indoor dustbins are smaller in size, whereas municipal dustbins present outdoors are so big in size since it has to accommodate all the wastes from many household users in that area. Hence our main focus is on the dustbins placed outside every corner in the streets in order to keep the environment clean. Road side dustbins are not monitored and cleaned properly most of the times. In this paper we propose a new system for managing garbage within Smart Cities. This Efficient Waste disposal or Management System is considered as an essential for Modern Smart Cities (MSC). Internet of Things (IoT) can be implemented both in IS and MSC creating an highly developed proposal for future Operations. Special methods can be applied to enhance technology used for high Quality of Service (QoS) in our waste management system. Specifically, IoT components like sensors, detectors, and actuators are integrated into Intelligent System (IS) and Inspection systems for efficient waste management. We recommend a sophisticated IS for efficient waste management in Smart Cities. The proposed system is an automated alert based smart bin or garbage collection system and to alert the authorities like corporation or local waste disposal team. Using this, we can monitor the complete waste disposal in an efficient way.

Published in: 2018 International Conference on Communication and Signal Processing (ICCSP)

8) Smart Waste Collection Monitoring System using IoT

Abstract:

Timely cleaning of dustbin is a big challenge and if left unaddressed, it may pose several health risks by making the place unhygienic. Current system for the waste management in local areas of small and highly populated cities is sluggish which leads to a lot of garbage strewn all over the city. The rate of generation of waste is so high that if the garbage collector doesn't visit a place for a couple of days it creates the conditions adverse. In covid-19 pandemic situation, it was very important to monitor and decompose medical waste properly. The handling of normal home garbage was also challenging due to lockdown. In this situation automatic monitoring and controlling of garbage using IOT can play a significance role in garbage management. This paper proposes a smart and fast approach for waste management by creating a network of smart dustbins equipped with sensors and microcontrollers in a city which is monitored by a central control unit to speed up the process in an intelligent and smart way thereby eliminating such hazardous conditions caused by the current sluggish system. The proposed system also takes into account the issue of improper internet connectivity.

Published in: 2021 Third International Conference on Inventive Research in Computing Applications (ICIRCA)

9) Intelligent Waste Management for Smart Cities

Abstract:
With accelerated technology development, much focus has shifted towards a green economy, concentrating on sustainability, recycling, and reuse. A smart waste collection is the center of a smart waste management system and an intelligent bin is a pivot for any step towards the development of an Integrated Platform for Waste Management. This paper presents an IoT-based smart dustbin that is capable of integrating with contemporary society as well as catering to future smart cities. The proposed implementation presents an end-to-end scalable solution for disposal as well as collection and transfer. Beyond just bin level detection, the smart bin can also detect odor and flames inside the bin, ensure bin safety, consider the weight capacity of the container, and provide a non-touch interface for disposal to ensure hygiene. The proposed system resolves the nuisances of spilling garbage bins, ill-maintained bins, untimely and unorganized collection. Insightful data is collected to facilitate future ventures. The paper also attempts to highlight some of the prevailing hurdles in devising and achieving sustainable development plans.

Published in: 2021 International Conference on Industrial Electronics Research and Applications (ICIERA)

10) IoT enabled dustbins

Abstract:
Nowadays, waste management is one of the problems on which million of dollars are spent worldwide. the key issue in waste management is waste collection and sorting. Also, one of the issues in the waste management is that the garbage bin at public places gets overflowed in advance before the commencement of the next cleaning process. This, in turn, leads to various hazards such as bad odor & ugliness to that place which may be the root cause for the spread of various diseases. To tackle this problem, we propose the IOT enabled dustbins in this paper. these bins, use RFID tags for tracking of the wastes linked with a web-based online system and according to the weight of waste added, host server calculates the points and updates in the database of virtual wallet. Also, it measures the fullness of the dustbins and updates the status of each dustbin on the municipal server. It notifies them when the dustbin is full and provides the shortest route to empty all the dustbins based on the capacity of the municipal waste loading vehicles. The Capacity of trucks is calculated and updated each time according to the number of dustbins serviced by the trucks, as soon as it completes a route assigned to it. Furthermore, the user is assisted in material waste classification through our application and also the smart bin knows its content and can report back to the rest of the recycling chain about its contents. Our system, target two crucial problems, cost efficiency in waste sorting and waste collection processes.

Published in: 2017 International Conference on Big Data, IoT and Data Science (BID)

11) IoT BasedSmart Waste Management System: India prospective

Abstract:

For building smart cities there is requirement of such a smart system which monitors the dustbin and providesits real time status. In present scenario Municipal Corporations in India doesn't get real time information about the dustbins. In this concern, we are implementing a system based on Internet of Things (IoT) that can send a message to corporation about the overflow and toxicity level of the dustbins. A website is also developed to supervise the data related to the dustbins. Message is sent using GSM module to the mobile phone and data related to the dustbin status is updated on the website. At this website citizens can also submit complaints related to dustbin or waste management. In recommended system, Arduino is used as a microcontroller to interface between GSM/GPRS module with sensors. Ultrasonic sensor and gas sensor are used for measurement of dustbin level and toxicity respectively.

Published in: 2019 4th International Conference on Internet of Things: Smart Innovation and Usages (IoT-SIU)