Smart Waste Management System

TITLE : An Internet of Things Based Smart Waste Management System Using LoRa and Tensorflow Deep Learning Model

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YEAR: 2020

ABSTRACT : Traditional waste management system operates based on daily schedule which is highly inefficient and costly. The existing recycle bin has also proved its ineffectiveness in the public as people do not recycle their waste properly. With the development of Internet of Things (IoT) and Artificial Intelligence (AI), the traditional waste management system can be replaced with smart sensors embedded into the system to perform real time monitoring and allow for better waste management. The aim of this research is to develop a smart waste management system using LoRa communication protocol and TensorFlow based deep learning model. LoRa sends the sensor data and Tensorflow performs real time object detection and classification. The bin consists of several compartments to segregate the waste including metal, plastic, paper, and general waste compartment which are controlled by the servo motors. Object detection and waste classification is done in TensorFlow framework with pre-trained object detection model. This object detection model is trained with images of waste to generate a frozen inference graph used for object detection which is done through a camera connected to the Raspberry Pi 3 Model B+ as the main processing unit. Ultrasonic sensor is embedded into each waste compartment to monitor the filling level of the waste. GPS module is integrated to monitor the location and real time of the bin. LoRa communication protocol is used to transmit data about the location, real time and filling level of the bin. RFID module is embedded for the purpose of waste management personnel identification.

TITLE : IoT-Based Smart Waste Bin Monitoring and Municipal Solid Waste Management System for Smart Cities

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Abstract : Increasing waste generation has become a signifcant challenge in developing countries due to unprecedented population growth and urbanization. From the literature, many issues have been investigated that signify direct connection with the increase in waste material generation and related difculties to handle it in a smart city. These issues are the resultants of an improper collection and disposal mechanism used for waste material, the increase in moving trends of peoples toward big cities and lack of intelligent technology used to support the municipal solid waste management system. Consequently, the management of waste material has become a challenge due to a large amount of waste littered everywhere. Furthermore, various problems also occur due to the existing systems that are not only inadequate and inefcient but also their non-scientifc procedures involved in the solid waste management. In this paper, an IoT-based smart waste bin monitoring and municipal solid waste management system is proposed. This system helps to solve the problems associated with management of waste material and the IoT-based waste collection for the smart city as discussed above. The proposed system is capable in the collection of waste efectively, detection of fre in waste material and forecasting of the future waste generation. The IoTbased device performs the controlling and monitoring of the electric bins. These devices are wirelessly connected with the central hub to transmit the information about the bins flling level with the existing location. The signifcant advantage of the system is to collect waste material on time in order to avoid the overfow of bins that would help in saving the environment from pollution. Keywords IoT · Bins · Waste material · S

TITLE : A Smart Waste Management with Self-Describing objects

AUTHOR : Yann Glouche Paul Couderc INRIA, Unite de Recherche Rennes-Bretagne-Atlantique ´ Campus de Beaulieu, Rennes,

YEAR : 2019

ABSTRACT : Radio Frequency Identification (RFID) is a pervasive computing technology that can be used to improve waste management by providing early automatic identification of waste at bin level. In this paper, we propose a smart bin application based on information self-contained in tags associated to each waste item. The wastes are tracked by smart bins using a RFID-based system without requiring the support of an external information system. Two crucial features of the selective sorting process can be improved using this approach. First, the user is helped in the application of selective sorting. Second, the smart bin knows its content and can report back to the rest of the recycling chain.

TITLE :A Smart Waste Management Solution Geared towards Citizens

AUTHOR : Kellow Pardini , Joel J.P.C. Rodrigues * , Ousmane Diallo , Ashok Kumar Das , Victor Hugo C. de Albuquerque 7and Sergei A. Kozlov

YEAR : 2020

Abstract: Global industry is undergoing major transformations with the genesis of a new paradigm known as the Internet of Things (IoT) with its underlying technologies. Many company leaders are investing more effort and money in transforming their services to capitalize on the benefits provided by the IoT. Thereby, the decision makers in public waste management do not want to be outdone, and it is challenging to provide an efficient and real-time waste management system. This paper proposes a solution (hardware, software, and communications) that aims to optimize waste management and include a citizen in the process. The system follows an IoT-based approach where the discarded waste from the smart bin is continuously monitored by sensors that inform the filling level of each compartment, in real-time. These data are stored and processed in an IoT middleware providing information for collection with optimized routes and generating important statistical data for monitoring the waste collection accurately in terms of resource management and the provided services for the community. Citizens can easily access information about the public waste bins through the Web or a mobile application. The creation of the real prototype of the smart container, the development of the waste management application and a real-scale experiment use case for evaluation, demonstration, and validation show that the proposed system can efficiently change the way people deal with their garbage and optimize economic and material resources.

TITLE : Smart Waste Management using Internet-of-Things (IoT)

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YEAR : 2020

Abstract: To make the cities greener, safer, and more efficient, Internet of Things (IoT) can play an important role. Improvement in safety and quality of life can be achieved by connecting devices, vehicles and infrastructure all around in a city. Best technological solutions can be achieved in smart cities by making different stakeholders to work together [5][6][7]. System integrators, network operators and technology providers have a role to play in working with governments to enable smart solutions. But, building such solutions on an open, standardsbased communications platform that can be continuously used is a challenge. We present a waste collection management solution based on providing intelligence to wastebins, using an IoT prototype with sensors. It can

read, collect, and transmit huge volume of data over the Internet. Such data, when put into a spatio-temporal context and processed by intelligent and optimized algorithms, can be used to dynamically manage waste collection mechanism. Simulations for several cases are carried out to investigate the benefits of such system over a traditional system. We try to replicate the scenario using Open Data from the city of Pune, India stressing on the opportunities created by this type of initiatives for several parties to innovate and contribute to the development of Smart waste management solutions.