Effective Garbage Disposal Management in Urban Cities Using VANETs

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Abstract─ Dramatic increase of the population in the metropolitan cities has led to the increase in industries, unplanned sanitarians, hotels etc which results in more waste production and this leads to the improper management of wastes, which results in increase of deadly diseases, pests and many health problems. An effective method is proposed to dispose this by the use of wireless sensor network using VANETS. A benchmark of IEEE802.11p and multicast routing has been anticipated to be put into practice in the 'On Board Units' (OBU), 'Bin Control Units' (BCU) and 'Garbage Collecting Vehicles' (GCV's) for proper communication in an effectual way. 'Road Side Units' (RSU's), dustbin sensors are being used in the response system. The manifold dustbins are filled up simultaneously and reserved GCV's are considered for the disposal of the filled bins. The prototypes has been proposed by using above all components for the proficient garbage clearance management system is provoked in the urban metropolis backdrop and this is imitated in NS2 for the real time and outcome are encouraged to realize in the real time environment

Keywords-VANETS, OBU, RSU, GCV, BCU.

I. INTRODUCTION

A. Overview

India is the 2nd vastly inhabited nation in the globe, with an overall populace of 1.21 billion, holding for just about 18% of world's human inhabitants, however there is lack of supply or unambiguous systems in circumstances such as disposal of its unyielding wastes. India is facing a spiky dissimilarity between its raising metropolitan population and reachable provisions and supply. Solid waste management (SWM) is one such provision where India has a gigantic scope. Garbage is a superfluous derivative created by human deeds. Cost-effective improvement, urbanization and augment in living standards in cities, have led to a mount in the amount and eminence of spawned waste. Brisk clamber of population and industrialisation mortify the urban locale and places sombre strain on likely resources, that dent even-handed and property development uneconomical supervision and clearance of solid waste is an understandable motive for dilapidation of the setting in the majority of the cities of the budding world. Civic firms of the developing countries aren't equipped to knob the elevation in quantities of waste, which end up in unmoved waste of roads and in substitute communal places. There's a requisite to figure in the direction of a property waste management system, which needs ecological, Institutional, fiscal, profitable and societal property.

The endeavour of Municipal Solid Waste management (MSW) system is to heighten the contemporary practices of MSW in several developing countries, wherever it's received scarce attention. In prehistoric cities, garbage was tossed onto caliches topped boulevard and roadway, where they were left to amass. It had been not till 320 B.C in Athens that the most important prominent law, unwelcoming this practice was established. At that point a system for waste elimination began to progress in Ella's and within the Greek-dominated cities of the Japanese Mediterranean. In ancient Rome, property homeowners were liable to tax for cleaning up the streets facing their property. However organized waste assortment was coupled exclusively with state funded proceedings like parade. Disposal ways were intolerably unsophisticated, involving open depths situated simply exterior to town walls. As populations amplified, people worked hard to move waste out from the cities.

Another sort of solid waste, maybe the fastest increasing factor in quite a lot of developed countries, is electronic waste, or e-waste, which integrate discarded pc instrumentation, televisions, telephones, and a range of alternative electronic devices. In 2006 e-waste created was up 5 percent of the entire solid waste stream, and therefore the global organization atmosphere Programme premeditated that developed countries would triple their output of e-waste by 2010. Anxiety over this sort of waste is getting higher. Lead, mercury, and metal are among the supplies which are of concern in electronic devices, and law-making guidelines could also be needed to manage their exploitation and clearance.

Variation in solid wastes fluctuates broadly. In United States, for instance, urban refuse

is created at a standard tempo of pretty nearly two kg (4.4 pounds) per personage every day. Japan produces generally a part portion of this sum, yet in Canada the tempo is three kg (right around

Seven pounds) per individual every day. In some imminent or developing nations (e.g., India) the typical rate can be less than half kg (1 pound) per entity every day. This information incorporate reject from business, institutional, and mechanical and in totting up private sources. The unadulterated rates of deny era must be consciously decided when a group organize a strong garbage administration venture.

The per capita solid waste generation rate in India has accrued from 0.44 kg/day in 2001 to 0.5 kg/day in 2011, fuelled by ever-changing standard of living and accrues getting power of urban Indians. Urban expansion and increase in per capita waste generation have resulted in an outstandingly five hundredth increase in the waste spawned by Indian cities within solely a decade since 2001. There square measure fifty three cities in India with 1,000,000 and population, that along generate 86,000 TPD (31.5 million tons per year) of MSW at a per capita waste generation rate of 500 grams/day.

The full MSW generated in urban India is calculable to be 68.8 million tons each year (TPY) or 188,500 tons per day (TPD) of MSW. Such a steep raise in waste generation inside a decade has cut off the strain on all obtainable natural, infrastructural and fund resources. Big cities collect regarding 70-90 % of MSW generated, whereas smaller cities and cities collect but 50% of waste generated. Quite 91% of the MSW collected formally is land crammed on open lands and dumps. It's calculable that regarding a pair of the uncollected wastes square measure burnt brazenly on the streets. Regarding 100 percent of the collected MSW is brazenly burnt or is caught in lowland fires. Such open burning Of MSW and lowland fires along releases 22,000 a ton of pollutants into the lower atmosphere of city town per annum. The pollutants embrace CO (CO), malignant neoplastic disease hydro carbons (HC) (includes dioxins and furans), particulate (PM), element oxides (NOx) and dioxide (SO2).

The BBMP council has implemented many cement dustbins at every crossway to collect the waste and used many workers to clear that waster from the bins. The municipal idea and effort didn't give much success and thus it has to empty the bins since the people of the area would litter the garbage around the bins once it is full. Simultaneously the cement dustbins are replaced by the using the house to house gathering of waste by workers and it is also not effective.
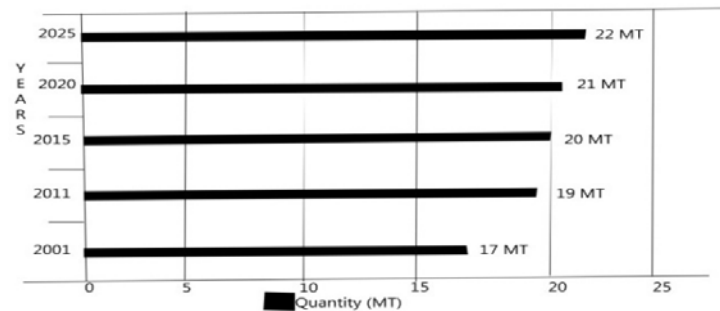

Fig 1: Statistics of solid waste projected (at 300 gm per capita per day)

B. Problem statement

In order to avoid solid waste spilling on the road, we proposed an effective garbage disposal management system using VANETs.

C. Objectives

1) To develop a Waste Management Sensor which would cater to the needs of the people of the society.
2) To Deploy Wireless network in dumpsters and monitor the situation via a graphical interface.
3) To optimize the calendar and course to dispose the waste into dumpsters will be created as needs be.

II. BACKGROUND

Solid waste managing is one among the basic necessary services provided by municipal authorities in the country to keep urban centres clean. Notwithstanding, it is among the most inadequately rendered administrations in the wicker container the frameworks connected are unscientific, obsolete and wasteful; populace scope is low; and the poor are underestimated. Waste is littered all over prompting insanitary living conditions. Civil laws administering the urban neighbourhood bodies don't have sufficient procurements to arrangement successfully with the ever- developing issue of strong waste administration. With fast urbanization, the circumstance is getting to be discriminating. The urban populace has grown fivefold in the most recent six decades with 285.35 million individuals living in urban ranges according to the 2001 Census.

No storage of solid waste at source
No Primary Collection system from the Doorstep
Improper Street cleaning
Waste Storage Depots
Transportation of solid Waste

III. LITERATURE SURVEY

Q. F. Huang, Q. Wang et al. [1] Together with the late conservative blast in China, the amount of strong waste created is expanding multi-fold, representing a gigantic test for natural administration in this manner worsening the state of strong waste administration. The requirement for keen waste items administration has prompted the idea of the chain of importance of waste administration that places the different means for managing Municipal Solid Waste (MSW) all together of natural inclinations. Waste To Strength (WTE) is turned out to be an unabated innovation in China. Of the evaluated one billion pack (907 million tonnes)of worldwide post-reusing MSW, close to two hundred million tons (181million tons) are handled in WTE plants that recuperate the vitality substance of waste items as power or warmth.

S. S. Profit et al. [2] In existing models, persistent seeing of status of canisters, estimation of measure of waste in and around them, reconnaissance for checking the development of vehicles, enhancement of ways and reallocation of pressing holders in accordance with the evaluated waste, supply of Management Information Program (MIS) reports for powerful arranging of asset routine and giving straightforwardness in municipal organization are tended to. Every holder is set up with a Radio recurrence Identification (RFID) mark having an one of a kind recognizable proof code, the Electronic Product Code (EPC).

Low recurrence repeating labels are proposed as they highlight lasting low evaluated options and are operational in compelling conditions invulnerable to ecological risks. As the textbox gets stacked onto the truck, the RFID target gathering of people peruses the serial amount of the tag on the holder, and in the meantime, a worldwide Positioning System (GPS) beneficiary on the pickup truck ascertains its area utilizing satellite information. The measure on amount of the label, area, date and time are transmitted continuous through the Global System for Mobile (GSM) system to the correspondence entryway of the control server. Taking after information preparing, it is exchanged to the Global Information System (GIS) airplane terminal. The synchronization data can be dispersed to customers by means of a web set up arrangement,

K. Kolla et al. [3] That they gives correspondence between the vehicles (nodes) i. electronic. Vehicle-to-Vehicle (V2V) correspondence and correspondence amongst vehicles and the roadside foundation, Vehicle-to-Infrastructure (V2I) correspondence. The vehicles and the related offices (all nodes) are furnished to gather information, process it to learn present activity conditions and scatter it over longer separations and give other movement related administrations identified with expense ticketing, observing, impact ready, street signal cautions thus stronghold. VANETs give essential security and solace to explorers through canny utilization of systems administration. Late research end eavors have found a solid spotlight on novel VANET plan models and executions. Accentuation has been put on territories like transmissions, steering, security and Top nature of Service (QoS).

M. Gupta et al. [4] A WSN contains spatially given away self-sufficient sensors to watch out for physical or ecological conditions, for example, light, temperatures, sound, vibration, weight, dampness, movement or poisons and agreeably go their information through the system to a primary area. The WSN is worked of nodes from a couple to a few bounty, where every hub is connected to one or a few sensors. Each such chaos more full system hub ordinarily has a few sections: an auto radio handset with an inside reception apparatus or association with an outside receiving wire, a microcontroller, an electronic outlet for interfacing with the sensors and a vitality source, for the most part an electric battery or an installed type of one's reaping.

A. S. Bhat et al. [5] Good waste strategy in the United States is finished for creating and executing appropriate instruments to successfully supervise strong waste. For strong waste strategy to be powerful, inputs ought to originate from partners, including natives, organizations, group based-associations, nongovernmental associations, government office buildings, colleges, and other evaluation associations. These advices condition the premise of set up structures that impact strong waste administration choices. In the us, the Environmental Protection Organization (EPA) directs family, modern, assembling and business strong and unsafe squanders under the 1976 Resource efficiency and Recovery Act (RCRA).

IV. PROPOSED SOLUTION

Proposed System:

Our system is designed like an automatic system which collecting the garbage's from dust bin's when they are getting filled. Every path is offered with a dustbin (separate for dry and wet waste) and occupants are instructed to dump the rubbish in these canisters just. Each of such dustbins is outfitted with light sensor hardware at three fourth separations from base of dustbin, so that when the canister is completely full, the GCV turn up and there is no extension for spillage. The LASER diode, controlled by a low power replaceable battery, transmits light to the

photodiode, put at its observable pathway straightforwardly inverse to the transmitter. The circuit is planned not to send any signs the length of the indicator gets light persistently from the transmitter. The dustbin being full, the light from the LASER diode is obstructed by the refuse being filled into it. The photodiode upon not getting light for a predefined measure of time triggers the transmitter RC11XXHP-RC232to send a sign to the closest RSU, demonstrating that the dustbin is full.

Architecture Diagram
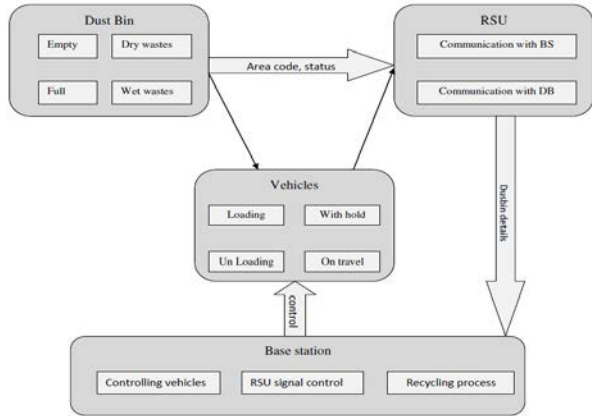
fig 4.1: Architecture diagram

The Architecture diagram gives the brief design of the proposed model, in which how the system should be designed and how the controls should be flow from one module to another module. The system architecture includes the all the modules which are used in the proposed system and then it is designed. The given below architecture diagram include modules like Dustbin sensor, Road side units, vehicle i.e. garbage collecting vehicle and the base station and the control flow is shown in the architecture.

A . VANETS:

Cellular communication network in the current years has seen the fast developing of the new technology called Inter-vehicular Communication (IVC), and the other one road-side communication (RVC) of the Mobile Ad-hoc network (MANETs). These new-technology has given rise to the development of the new Ad-hoc network called VANETs and these technology is used in efficient drive, Street Safety etc. Vehicular Ad-hoc Network is a kind of Mobile phone Ad-hoc Network (MANET), where the mobile units are vehicles. The concept being deployed in VANET is the endlessly altering vehicle activity. The nodes in VANETS can travel around following a road topology with their path and swiftness.

Vehicular Adhoc network (VANET) involves vehicle to vehicle (V2V), vehicle to highway (V2R) or vehicle to infrastructure (V2I)

communication. VANET normally is wearing Table Unit (OBU) and Street Side Units (RSUs). OBU equip a vehicle with short-range wireless capacity to form Adhoc network between vehicles. Global Positioning System (GPS) can be used to determine the best location information of each vehicle.

B. On Board Units (OBU) and Road Side Units (RSU):

The communication is of type Ad-hoc means in this each node can move freely and can get in touch with the other person with any wire connections and the Road area device can be used which acts as a router amid the vehicles that are on the road also to the other network devices. Each vehicle has OBU (on table unit), this unit links the vehicle with RSU Both of these standards provide an outlines for a motor network and these criteria are a category of IEEE standards of the special functions of IEEE802. 11 for vehicular network called Wireless Access in motor environment (WAVE), IEEE802. 11p an extended version of 802. 11 WLAN and these standards provide a specifications needed for a MAC and physical part of particular needs of a vehicular network.

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C. Garbage Collecting Vehicles (GCV's):

The communication is of type Ad-hoc means in this each node can move freely and can get in touch with the other person with any wire connections and the Road area device can be used which acts as a router amid the vehicles that are on the road also to the other network devices. Each vehicle has OBU (on table unit), this unit links the vehicle with RSU Both of these standards provide an outlines for a motor network and these criteria are a category of IEEE standards of the special functions of IEEE802. 11 for vehicular network called Wireless Access in motor environment (WAVE), IEEE802. 11p an extended version of 802. 11 WLAN and these standards provide a specifications needed for a MAC and physical part of particular needs of a vehicular network.

D. Bin Control Unit (BCU):

The bin control unit is a microcontroller device which can be used for communicating the communications between the dustbin sensors and the Road Side Models (RSU). The Bin Control unit uses a binary numbers with 0's and 1's and 0 implies the empty bin, one particular indicates the bin full status device help these binary notification the Trash can Control unit sends the messages to the local RSU's and GCV's about the status of the dustbin as well as for further communication. These sensors are the one which are located in the dustbin, at the wet and dried out bins.

E. *Dustbin Sensors:*

These sensors are configured with information about bins like location of the bin placed, about the trash can size, trash can unique identification number to distinguish with other containers and also about the timestamp so that at what particular time the bin sensor has sent out the message can be known. These sensors are constantly monitored so that whenever the signal from the bin sensors are handed to the BCU, then this BCU sends the communications to local RSU's and GCV's indicating the trash can is full status0communication.

Flow Chart:
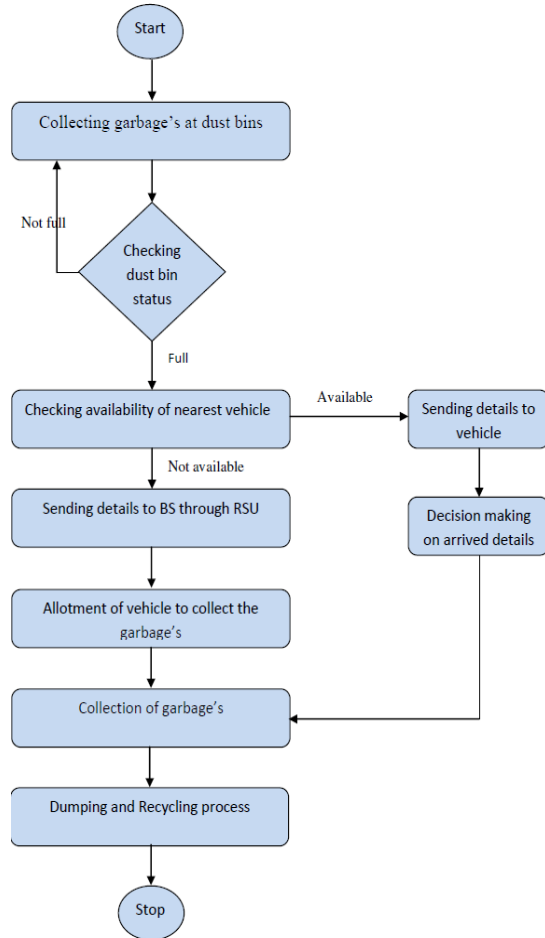
fig 4.2:Flow Chart

V.RELATED WORKS

A . SIMULATIONS AND RESULTS:

Network Simulator-2 (NS-2) a discrete event simulator targeted at networking research provides substantial support for simulation of Transmission Control Protocol (TCP), routing and multicast protocols over wired and wireless (local and satellite) networks. NS-2 was built in C++ and provides a simulation interface through OTcl, an object oriented dialect of Tcl. The user describes a network topology by writing OTcl scripts and then the main NS-2 program simulates that topology with specified parameters. It runs on Linux, FreeBSD, Solaris, and Mac OS X and on Windows using Cygwin.

A. Case Study

1) Network Creation:

The fig 5.1 snapshot gives a clear picture of creation of the network required for our proposed system. Its shows the locations of the bins placed in the specific place for the collection of the solid waste. It gives idea about the placements of RSU's,placement of the GCV's, and the Base Station.

2) Bins sensors sending signal to RSU's for Communication:

The fig 5.2 snapshot gives the information about the communication of the Dustbin sensors and the RSU's. The Dustbin sensor sends the signal along with the status message to the nearby RSU.
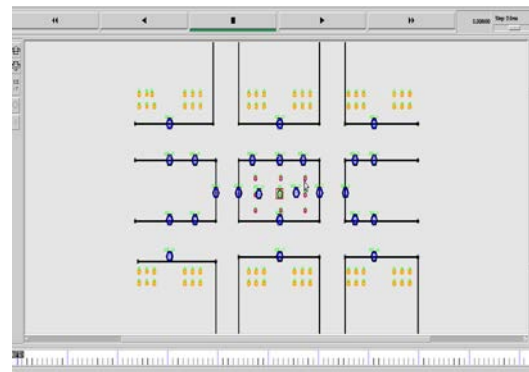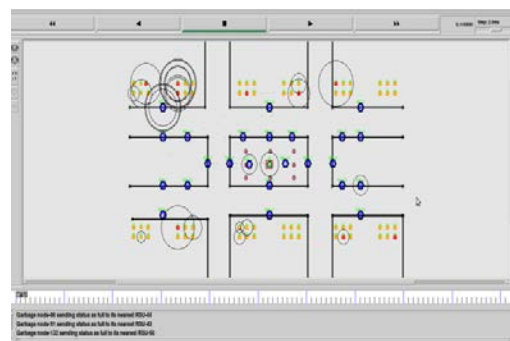

Fig 5.1: Network Creation.

Fig 5.2: Bins sensors sending signal to RSU's

1) RSU-RSU Communication:

The snapshots fig 4.3 shows the communication between the two RSU's, the transfer of the signal from dustbin sensor node to the Base station for the collection of garbage, from the filled bins and to allocate the vehicle based on the status message
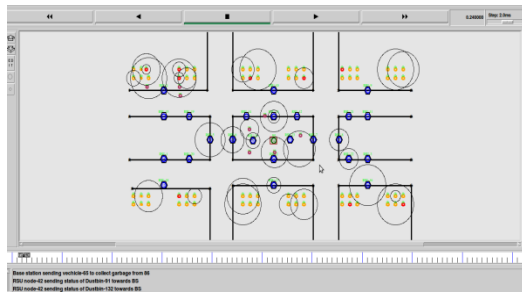
Fig 5.3: RSU-RSU Communication

2) Base station allocating GCV to collect waste

The fig 5.4, base station is allocating the Garbage collecting vehicle to collect the waste from the Dustbin upon receiving its Dustbin full status message and the GCV moves towards the location from where the message has come.
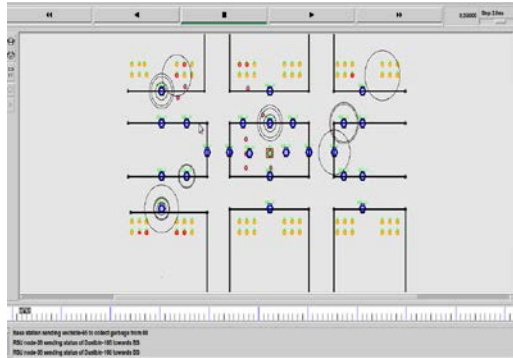

Fig5.4: Base station allocating GCV to collect waste

3) GCV moving towards the dump yard:

GCV's after collecting the waste from the dustbin, moves towards the dumping yard to dump the collected waste at place where the waste is dumped, shown in fig 5.5.
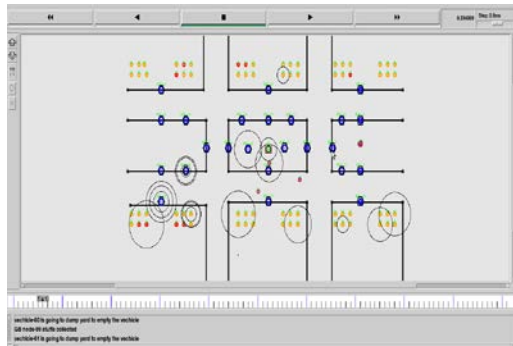

Fig5.5: GCV moving towards the dump yard

4) All GCV's moved to the dumping yard:

The snapshot it shows that all the GCV's after collecting the waste from the filled dustbin, all the GCV moved to the dumping yard to dump the collected waste and the process repeats.
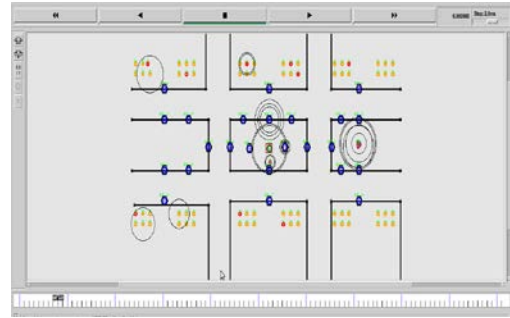

Fig5.6: All GCV's moved to the dumping yard

VI. CONCLUSION

The entire study address the condition regarding clearing of the waste or solid waste dumping on the highway and coming up with a new model, where empting of waste bin is made attractive by the deploying the sensors and for structure services. Response to this studies shows that the effectively changing routes of waste collecting vehicle is in comparison with the static solution, is much better structured and efficient and it is more effective. Once several dustbins fill sat the same instance of time, the predefined or existing planned routes are saved only when the real-time monitoring new data is received, then there will be a changes in the planned path based on the signal from it is coming. In the real time environment, supervisory by using detectors and wireless communication can be used as a capable function for arranging the shortest path available based on the shortest path algorithm.

The overflowing of garbage trash can be predefined by the sensors which we are using in the proposed model, senses the filling of dustbin at a right some transmits a signal to the BCU and from there to RSU and mailing the status message to the GCV's and Foundation Station as and when the bins and so are and clearing the bins and giving a cleaner city, better structure and raise the hygiene in the society

In the future enhancement we are going to implement this in the real time environment and the tracking of the GCV's can be done by implementing GPS technology

REFERENCES

[1] Q. F. Huang, Q. Wang, L. Dong, B. D. Xi, and B. Y. Zhou, "The current situation of solidwaste management in China", *Journal of Material Cycles and Waste Management – JMATER CYCLES WASTE MANAG,* vol. 8, no. 1, pp. 63-69, 2006

[2] S. S. Purohit, "RFID-based solid waste collection, *"Recent Advance in Intelligent Computational Systems (RAICS)*, vol. 22, no.2, IEEE, July 2012.

[3] K. Kolla, R.Rakesha, S.Tejus, and G. Narendra Kumar, "Real time incubator monitoringsystem using wireless sensor network (2012)," in *Proceedings of the 2012 InternationalConference on Wireless Networks,* Las Vegas Nevada, USA, 2012.

[4] M. Gupta, D. Prasad, and R. B. Patel. "FREEDOM: Fault revoking and energy efficientprotocol for the deployment of mobile sensor nodes in wireless sensor networks",*International Journal of Advanced Engineering Sciences and Technologies*, 2010.

[5] A. S. Bhat, B. Raghavendra, and G. N. Kumar, "Enhanced passive RFID based disastermanagement for coal miners, *"International Journal of Future Computer andCommunication 2013,* vol. 2, no. 5, October 2013,* Singapore, 2013.

[6] B.SmithaShekar, C. K.Divyashree, G. George, H. V. Usha Rani, A Murali, and G. Narendra Kumar, "GPS Based Shortest Path for Ambulances using VANETs," in *Proc.International Conference on Wireless Networks (ICWN 2012)*, vol. 49, Singapore, 2012.

[7] M. Aparajitha, K. Bhanupriya, B. Smitha Shekar, and G. Narendra Kumar, "Performanceevaluation of IEEE 802.11p for vehicular traffic congestion control (2011)", *Journal of Information and Communication Technologies,* vol. 1, issue 6, November 2011.

[8] L. J. Yin, Q. Chen, S. F. Kou, and J. Qin, "Research on avalanche photodiodebasedphoton imaging system," in *Proc. The International Symposium on Photonics and Optoelectronics (SOPO 2009),* China,2009