

# An IOT for Door-2-Door Residential & Commercial (Waste Generating Units) Authentic Data Collection for Municipal Solid Waste

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**Abstract**— Solid waste management play a major play role in the Municipal Administration. On days are going and increasing the population in the countries in the current ear SWM 2016 rules it becomes a difficult task to Municipal Administrative management. As per the SWM 2016 Rules in India garbage collected from sources individually. So many Urban Locale Bodies in India not have a proper mechanism, planning and authenticated sources. In this paper proposed a commercial collection for municipal solid waste for door-2-door as a solution using IOT Technology to solve waste management challenges in authentic manner. We proposed a single reliable and efficient structure to do the regular operations of Monitoring, Transportation and Collection in the municipalities.

**Keywords:** Door-2-Door, SWM, ULB, Authentic, waste, C&T, municipal.

## 1. INTRODUCTION

Solid Waste is something generated from many activities like medical disposals, wastes, industrial wastes etc. which can be either recycled or cannot be recycled. This solid waste which is generated in these days is more cautious than in olden days because of rapid industrialization and urbanization. Standard of living of people can also be affected if this waste is not managed properly. In olden days the industrialization is observed only in some areas and there is no effect of waste on the people and environment. And also the schemes that were used for the waste management in earlier days are manual only. This manual management is enough in those days because the garbage that is generated is biodegradable and is not much dangerous as of now. But now in this era, the waste is generated which is non-biodegradable also. This non-biodegradable waste causes imbalance in the environment which is very harmful. So this waste is to be handled and managed properly in order to overcome the consequences generated due to solid waste. The solid waste has to be categorized into required types and then the waste should be disposed. Due to rapid industrialization and technology the rural areas are also running to cities for their living. So due to this the chance of solid waste generation will be more in cities. In order to handle these waste management problems the government should adapt certain schemes to categorize these wastes and manage them properly.

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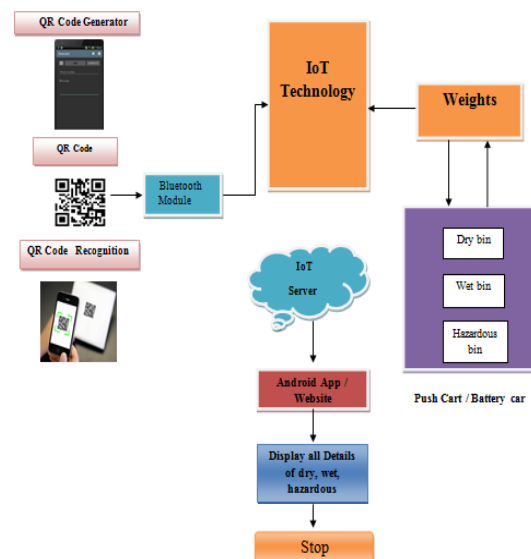
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## 2. EXISTING SYSTEM

In the present scenario in India, the collection of waste is being operated by using Carts/ Trucks / etc by facilitating them with Dry Collection/ Wet Collection / Glass Collection / etc., bins manually. The collected waste is being segregated to reproduce them in the form of fertilizers, reusable materials. With the help of reusable materials we can decrease the use of natural resources to manufacture many of the daily usable materials such as Plastic, Paper etc., with the help of reproduction of wet waste to be useful to use as Gas, Fertilizers etc., we can reduce the usage of natural resources, chemicals to meet the requirements of the society. The Srisailam Temple Town is having Bio-Toilets, complete green environment and also effective collecting mechanism of solid waste. This has led to establish the recycling plant which is now doing a fabulous job of segregating the waste to produce fertilizers, reusable plastic and also provided better opportunity to serve the society with employment. This mechanism has decreased more waste across the town and increased cleanliness and healthy environment. By using the technology and science we can create our environment healthy and also provide an employment to increase the life span.

**Proposed System Architecture:**



**Fig1: Wet/Dry/HHH Door-2-Door Authentic Data Collection – QR Technology Working Process**



In this model we collect the waste in three different categories such as Dry, Wet & Hazardous. This idea is not only for collecting the waste but also for knowing the quantity of waste generated by each household.

The Pushcart / Battery Cart contains the three plates (Iron Frame) each plate contains one iron ring for fix the bin because never clumsy or fall away from the carts or else mix up. Garbage Weight purpose load cell is fixed under the iron plates. Moreover our IoT Technology is embedded in the cart.

#### Working Process:

1. Garbage is dropped into bins That IoT is used to take the input from the app which we have made to scan the QR code. Coming to the app it is bluetooth / wifi based that scans the QR code which we provide to every house. The people who are living in that particular house will have that QRcode which is attached.
2. The amount of waste collected will be monitored regularly via Computer System, Android App with users of manager, administrator or any higher authorities.
3. Helps to improve the Working process and the mechanism accurately.
4. Time management and amount of waste collected and also their statistics will be available from time to time.
5. This authentic data will be useful for further to that house.

Therefore when workers scan the QRcode through our app it reads the code, dry, wet, hazardous weights and it has three options present in it. They are:

- 1) Garbage collected
- 2) No garbage
- 3) Not at Home

Whenever the QR code is scanned in through this app then the worker will click the options according to the wastage he/she collected.

Also if the QR code is not identified then the worker can manually enter it by typing the QRcode which is present in the below of the QRcode. Then the worker chooses the option as follows:

- 1) **No garbage:** If there is no garbage is collected by the worker from the particular house then they can choose the no garbage option on the app.
- 2) **Garbage Collected:** When the garbage is collected by the garbage collector then he/she places that garbage is collected in the Bluetooth app.
- 3) **Not at Home:** If no one is at home, then simply the worker places this option on to the app.

Therefore after the selection of options in the app immediately the info is sent to the IoT device. Through this IoT device the info about the daily wastage collected from every house and every day is given to the website.

In the website we have the QRcode number and the info about the owner of the house and the garbage they give every day to the garbage collector. Moreover this website will analyze the weights of everyday collection, every month collection of garbage and also every year garbage collection. Therefore this also consists of the data of the worker who

collected the garbage from different houses.

**Advantages:** There are several advantages present in this technology. They are as follows.

Firstly, QRcode which we are providing is highly secured so that no one can get the info about the owners of the house even to the worker who is scanning the QRcode in the app. The info about the owners will be in the website with high security.

We can monitor the working of the workers who are collecting the wastage and reporting them.

The database used to store this info is accessed by the authorities only.

#### TECHNOLOGY ENABLED PUSH CART/SMART CART FOR SWM - BENEFITS

- By having 3 type weighments at Door-2-Door level we get SWM Rules 2016 compliant collection and data generation.
- Nowhere in the country have we authentic data generation on Type of Waste and Quantity of Waste from Residential & Commercial (Waste Generating Units).
- Video on Smart Cart will record worker and waste generator behaviour without manual monitoring thereby giving clear picture to the Commissioner and Council what is happening in the field.
- No need for GPS as QR code based C&T (Collection and Transportation) work recording automatically generates Cart movements thereby giving Transportation route followed by Smart Cart in C&T activities.
- We can also generate statistics on daily basis how many did not dispose how many did not segregate and if any houses which complained the cart did not go in that route at all.
- Daily, Weekly, Fortnightly and Monthly report data will give opportunity to Data Analytics on Wet, Dry and HHH for future planning.

#### *IoT Technology for Authentic Wet/Dry/HHH Data Collection System for the 1st time in the Country*

1. Using the IoT technology the door-2-door waste collection becomes easy from each house hold.
2. Each house hold collected items of dry, wet, hazard items weights can be regulated discretely per house.
3. The Grand Total will be attained from the collected separate house hold dry, wet and hazard items.
4. The unavailable house hold information will also be available as they may not deposit the waste because of any reason. This information will be recorded for further reference.
5. This authentic data will be available online in the form of web and also mobile app.
6. The actual reports of individual, per day, weekly and monthly reports will be available.

#### *The effective uses of IoT technology:*

- a. As the updated chipset is available, it is easy to operate and also very informative.

- b. Easy to use, operate for even a layman.
- c. Peripherals available at low cost.
- d. Maintenance is also easy.

### 3. RESULTS – SCREEN SHOTS

ID	Status	House No.	Owner Name	Address	Area	Collection Status							
89	4	11	G.Sajjanna, Dr.No-1-11-5, Medak, 93630305	46.60	0.3	39.6	0	60.09	2.03	2019-07-11	08:14:30	18.0496, 78.2082	Garbage Collected
90	4	11	K.Arana, Dr.No-1-11-811, Medak, 93630305	46.60	0	39.6	0	60.15	0.06	2019-07-11	08:15:03	18.0496, 78.2098	Garbage Collected
91	4	11	T.Gangamma, Dr.No-1-11-4711, Medak, 964875966	46.14	0.69	39.6	0	60.85	0.5	2019-07-11	08:15:14	18.0495, 78.2090	Garbage Collected
92	4	11	T.Rudra, Dr.No-1-11-4732, Medak, 979162932	46.14	0	39.6	0	60.95	0	2019-07-11	08:17:59	18.0482, 78.2062	Not At Home
93	4	11	B.Bajamma, Dr.No-1-11-4732, Medak, 979162932	46.14	0	39.6	0	60.95	0	2019-07-11	08:18:27	18.0482, 78.2062	Not At Home
94	4	11	P.Ramesh, Dr.No-1-11-4711B, Medak, 979162932	46.14	0	39.6	0	60.95	0	2019-07-11	08:18:56	18.0482, 78.2062	No Garbage
95	4	11	M.Kamalya, Dr.No-1-11-4711, Medak, 979162932	46.34	0.2	39.81	0.01	60.76	0.11	2019-07-11	08:22:03	18.0447, 78.205	Garbage Collected
96	4	11	B.Bajamma, Dr.No-1-11-4732, Medak, 979162932	46.65	0.31	39.81	0	61.26	0.5	2019-07-11	08:23:35	18.0445, 78.2043	Garbage Collected
97	4	11	Venilamma, Dr.No-1-3-80315, Medak, 770274874	46.65	0	44.97	5.16	61.26	0	2019-07-11	08:24:49	18.0481, 78.2042	Garbage Collected
98	4	11	T.Gangamma, Dr.No-1-11-4716, Medak, 979162932	46.74	0.09	44.97	0	61.26	0	2019-07-11	08:25:17	18.0489, 78.2015	Garbage Collected
99	4	11	A.Yashoda, Dr.No-1-11-942, Medak, 979162932	47.95	0.32	44.97	0	61.32	0.06	2019-07-11	08:28:20	18.0489, 78.2015	Garbage Collected
100	4	11	B.Sathesh, Dr.No-1-11-5011, Medak, 917791982	47.1	0.04	44.97	0	61.96	0.04	2019-07-11	08:29:37	18.0486, 78.2052	Garbage Collected

**Fig2: House Hold Data – Garbage Collected, Not at Home, No Garbage**

ID	House No.	Owner Name	Address	Area	Collection Status
1	MS021009137	K.Shankarama, Dr.No-1-11-871E, Medak, 979148067			Not Disposed
2	MS021009138	K.Arana, Dr.No-1-11-871A, Medak, 960015463			Not Disposed
3	MS021009144	K.Sajana, Dr.No-1-11-79AB, Medak, 773188691			Not Disposed
4	MS021009146	D.Shankarama, Dr.No-1-9-79205, Medak, 819816169			Not Disposed
5	MS021009148	T.Gangamma, Dr.No-1-11-4717, Medak, 837483758			Not Disposed
6	MS021009149	T.Rudra, Dr.No-1-11-4716, Medak, 9648327			Not Disposed
7	MS021009150	K.Pohamma, Dr.No-1-11-572, Medak, 9348327			Not Disposed
8	MS021009152	T.Rajaram, Dr.No-1-11-4718, Medak, 7315468702			Not Disposed
9	MS021009153	K.Laxmi, Dr.No-1-11-512, Medak, 837483758			Not Disposed
10	MS021009154	G.Narasimha, Dr.No-1-11-58, Medak, 960305344			Not Disposed
11	MS021009155	G.Lalitha, Dr.No-1-11-59, Medak, 959271951			Not Disposed
12	MS021009156	Kamraj Begam, Dr.No-1-11-54B11, Medak, 959271951			Not Disposed
13	MS021009161	K.Yashoda, Medak, 959271951			Not Disposed
14	MS021009162	K.Budamma, Medak, 959271951			Not Disposed
15	MS021009163	K.Budamma, Medak, 959271951			Not Disposed

**Fig 3: Not Disposed Data**



**Fig 4: Longitude and latitude Screen**

### 4. CONCLUSION

➤ We have given a solution for establishing smart cities with real case application. According to this work, there are many advantages for using smart waste management system. Moreover, this study shows that smart city applications are needed by municipalities.

➤ With IoT accomplishment, establishment and monitoring will become easy and reduce costs to the

government in turn provides better provide healthy environment.

➤ This model can be enhanced to multiple levels of hierarchy for any kind problems faced by metropolitan cities, villages or country level.

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### REFERENCES

1. A. Alkhamisi, M. S. H. Nazmudeen and S. M. Buhari, "A cross-layer framework for sensor data aggregation for IoT applications in smart cities," 2016 IEEE International Smart Cities Conference (ISC2), Trento, 2016, pp. 1-6. doi: 10.1109/ISC2.2016.7580853
2. D. Bonino et al., "ALMANAC: Internet of Things for Smart Cities," 2015 3rd International Conference on Future Internet of Things and Cloud (FiCloud)(FICLOUD), Rome, Italy, 2015, pp. 309-316. doi:10.1109/FiCloud.2015.32
3. R. Fujdiak, P. Masek, P. Mlynek, J. Misurec and E. Olshannikova, "Using genetic algorithm for advanced municipal waste collection in Smart City," 2016 10th International Symposium on Communication Systems, Networks and Digital Signal Processing (CSNDSP), Prague, 2016, pp. 1-6. doi: 10.1109/CSNDSP.2016.7574016
4. M. Arebey, M. A. Hannan, H. Basri, R. A. Begum and H. Abdullah, "Solid waste monitoring system integration based on RFID, GPS and camera," 2010 International Conference on Intelligent and Advanced Systems, Manila, 2010, pp. 1-5. doi: 10.1109/ICIAS.2010.5716183
5. Y. Kai, Z. Junmei, G. Lin, Y. Liu, L. Wenbin and X. Huixia, "Weighing System of Fruit-Transportation Gyrocar Based on ARM," 2011 Third International Conference on Measuring Technology and Mechatronics Automation(ICMTMA), Shangshai, China, 2011, pp. 1146-1149. doi:10.1109/ICMTMA.2011.253
6. Arebey, M., M A, H., Basri, H., & Abdullah, H. (2009). Solid waste monitoring and management using RFID, GIS and GSM. In SCORED2009 - Proceedings of 2009 IEEE Student Conference on Research and Development (pp. 37-40). [5443382] https://doi.org/10.1109/SCORED.2009.5443382
7. C. Tao and L. Xiang, "Municipal Solid Waste Recycle Management Information Platform Based on Internet of Things Technology," 2010 International Conference on Multimedia Information Networking and Security, Nanjing, Jiangsu, 2010, pp. 729-732. doi: 10.1109/MINES.2010.155