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Automatic Solid Waste Removal from Water to Prevent the Contamination, Pollution and Waterborne Diseases

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Abstract:

Water is a indispensable need for survival of human life on earth. Though 70-78% water exists on earth foremost part of it is not appropriate for drinking purpose. It is indispensable to clean the existing water and make its apposite usefulness for the purpose of domestic, industry and commercial purposes. Proper disposal of solid waste is an exigent job nowadays. Solid waste includes empty plastic bottles, polythene bags, and papers etc. which contaminate the water which leads to numerous diseases. Cleaning of such disposal sometimes may also affect human lives. In order to evade such situation cleaning system may be incorporated which removes these solid wastes and throw it into a waste bucket or into a safe place. The present work incorporates automatic systems that replace the human intervention in cleaning water with this contamination. The objective of this project is to implement an efficient working system which automatically cleans the water filled with these solid wastes and impurities. To reduce human intervention and labor in cleaning the wastes thereby reducing contamination, pollution and water borne diseases.

Keywords — **solid wastes, human, intervention, contamination, pollution, waterborne diseases**

INTRODUCTION

India is the second largest nation in the world, with a population of 1.21 billion, accounting for nearly 18% of world's human population, but it does not have sufficient resources or adequate systems in place to take care of its solid wastes. According to the Indian survey: "Its urban population grew at a rate of 31.8% during the last decade to 377 million, which is greater than the entire population of US, the third largest country in the world according to population). India is facing a sharp contrast between its increasing urban population and available services and resources. Solid waste management (SWM) is one such service where India has an enormous gap to fill. Proper municipal solid waste (MSW) disposal systems to address the burgeoning amount of wastes are absent. The current SWM services are inefficient, incur heavy expenditure and are so low as to be a potential threat to the public health and environmental quality. Improper solid waste

management deteriorates public health, causes environmental pollution, accelerates natural resources degradation, causes climate change and greatly impacts the quality of life of citizens

Solid waste is the unwanted or useless solid materials generated from combined residential, industrial and commercial activities in a given area. Management of solid waste reduces or eliminates adverse impacts on the environment and human health and supports economic development and improved quality of life. A number of processes are involved in efficiently organizing waste for a municipality [8]. These include monitoring, collection, transport, processing, recycling and disposal.

The symphony of urban MSW in India is 51% organics, 17.5% recyclables (paper, plastic, metal, and glass) and 31 % of inert. The moisture content of urban MSW is 47% and the average calorific value is 7.3 MJ/kg (1745 kcal/kg). The composition of MSW in the North, East, South and Western regions of the country varied between 50-57% of organics, 16-19% of recyclables, 28-31% of inserts and 45-51% of moisture The calorific value of the waste varied between 6.8-9.8 MJ/kg (1,620-2,340 kcal/kg".

Table 1 Physical characteristics of MSW in Indian metropolitan cities

Characteristics (% by weight)								
Name of metrocity	Paper	Textile	Leather	Plastic	Metals	Glass	Ash, fine earth and others	Compostable matter
Ahmedabad	6.0	1.0	–	3.0	–	–	50.0	40.00
Banglore	8.0	5.0	–	6.0	3.0	6.0	27.0	45.00
Bhopal	10.0	5.0	2.0	2.0	–	1.0	35.0	45.00
Mumbai	10.0	3.6	0.2	2.0	–	0.2	44.0	40.00
Calcutta	10.0	3.0	1.0	8.0	–	3.0	35.0	40.00
Coimbatore	5.0	9.0	–	1.0	–	–	50.0	35.00
Delhi	6.6	4.0	0.6	1.5	2.5	1.2	51.5	31.78
Hyderabad	7.0	1.7	–	1.3	–	–	50.0	40.00
Indore	5.0	2.0	–	1.0	–	–	49.0	43.00
Jaipur	6.0	2.0	–	1.0	–	2.0	47.0	42.00
Kanpur	5.0	1.0	5.0	1.5	–	–	52.5	40.00
Kochi	4.9	–	–	1.1	–	–	36.0	58.00
Lucknow	4.0	2.0	–	4.0	1.0	–	49.0	40.00
Ludhiana	3.0	5.0	–	3.0	–	–	30.0	40.00
Madras	10.0	5.0	5.0	3.0	–	–	33.0	44.00
Madurai	5.0	1.0	–	3.0	–	–	46.0	45.00
Nagpur	4.5	7.0	1.9	1.25	0.35	1.2	53.4	30.40
Patna	4.0	5.0	2.0	6.0	1.0	2.0	35.0	45.00
Pune	5.0	–	–	5.0	–	10.0	15.0	55.00
Surat	4.0	5.0	–	3.0	–	3.0	45.0	40.00
Vadodara	4.0	–	–	7.0	–	–	49.0	40.00
Varanasi	3.0	4.0	–	10.0	–	–	35.0	48.00
Visakhapatnam	3.0	2.0	–	5.0	–	5.0	50	35.00
Average	5.7	3.5	0.8	3.9	1.9	2.1	40.3	41.80

Table 2 Municipal solid waste generation rates in different states in India

S. No.	Name of the state	No. of cities	Municipal population	Municipal solid waste (t/day)	Per capita generated (kg/day)
1	Andhra pradesh	32	10,845,907	3943	0.364
2	Assam	4	878,310	196	0.223
3	Bihar	17	5,278,361	1479	0.280
4	Gujrat	21	8,443,962	3805	0.451
5	Haryana	12	2,254,353	623	0.276
6	Himachal pradesh	1	82,054	35	0.427
7	Karnatka	21	8,283,498	3118	0.376
8	Kerala	146	3,107,358	1220	0.393
9	Madhya Pradesh	23	7,225,833	2286	0.316
10	Maharashtra	27	22,727,186	8589	0.378
11	Manipur	1	198,535	40	0.201
12	Meghalaya	1	223,366	35	0.157
13	Mizoram	1	155,240	46	0.296
14	Orissa	7	1,766,021	646	0.366
15	Punjab	10	3,209,903	1001	0.312
16	Rajasthan	14	4,979,301	1768	0.355
17	Tamil Nadu	25	10,745,773	5021	0.467
18	Tripura	1	157,358	33	0.210
19	Uttar Pradesh	41	14,480,479	5515	0.381
20	West Bengal	23	13,943,445	4475	0.321
21	Chandigarh	1	504,094	200	0.397
22	Delhi	1	8,419,084	4000	0.475
23	Pondichery	1	203,065	60	0.295
		299	128,113,865	48,134	0.376

The trend of making the manually controlled things automatic has become a common practice these days. The process of making the things automatic is being exploited in almost all the major fields of life. Making things automatic reduces burden on the humans. The cost and effort used in manually controlled products is much higher than the automated systems. The present day solid waste collection system is not as efficient as it should have been taking into consideration the advancements in the technologies that arose in the recent years.To overcome this problem a new approach, Automatic solid waste collection system is proposed. It is a step forward towards making the solid waste collection process automatic and efficient in nature.

Pervez Alam, Kafeel Ahmade (2013) [1] described "an impact of solid waste on health and the environment. It is found that with increase in

the global population and the rising demand for food and other essentials, there has been a rise in the amount of waste being generated daily by each household. Waste that is not properly managed, especially excreta and other liquid and solid waste from households and the community, are a serious health hazard and lead to the spread of infectious diseases".

Parag S. Dawane and Sagar M. Gawande (2015) [2] proposed "a review of waste management system, its elements and disposal system of waste It has seen that the waste management system should adopt by Proper collection, storage, processing, transport and disposal of waste so that the impacts of waste can be minimized and the quality of life can be improved".

Chadar SN and Keerti Chadar (2017) [3] explained "solid wastes are hazard to environment as it adversely affects both biotic as well as abiotic components of the environment. It can be controlled effectively through solid waste management. Various methods are practiced to control solid waste pollution as composting, recycling, incineration, pyrolysis, disposal, landfills etc. Hence, solid waste management reduces or controls the solid waste pollution and its hazardous effects".

G.l.Parvathamma (2014) [4] performed "an analytical Study on Problems and Policies of Solid Waste Management in India –Special Reference to Bangalore City. The existing solid waste system in Bangalore city is effective in carrying out the functions of primary collection and transport. Decentralized systems of the future can provide greater sustainability but will require a higher level of waste generation and handling discipline. Finally, concludes that the problem of solid waste needs some holistic approaches such as reuse of solid waste to produce energy and biomennures".

Ranjith Annepu [5] in his article on: -"Solid Waste Management – India's Burning Issue. He says, for the first time in the history of India, in the year 2012 has seen several public complaints against poor waste management in the country. A fight for the right to clean environment and environmental justice led the people to large scale demonstrations, counting an indefinite hunger strike and blocking roads leading to local waste handling services. Inadequate waste management has also initiated a Dengue Fever occurrence and creep up further epidemics. In present-day, waste managing is the only other merging factor leading to community demonstrations all across India, afterward corruption and fuel prices. Public nervousness resulted in some jurisdictive action and the government's remedial response, but the waste problems are still unsolved and if this continues for too long without any long term planning and policy it will lead to crisis These several issues are clear suggestions that tell us "while moving forward with industrialization, urbanization, towards development, we must pay attention towards what we are generating and how it will react with nature

and if we can't find solution to these problems then nature will not so long tolerate this**.**

Mufeed Sharholy,(2008) [6];presented the major environmental protection in Indian cities. He expressed the solid waste contamination hazards to inhibitants. In his paper he brought out the 90% of MSW in disposal of the support of open dumps

PROBLEM IDENTIFICATION

Solid wastes dumped in water will cause the water contaminated. Thus water has to be cleaned with these contaminations so as to prevent waterborne diseases. These diseases may also effect human existence and life. Proper disposal of solid waste is a challenging job now a day's.

Conventional methods used for collection of floating waste are manual basis or by means of boat, thrash skimmers etc. and deposited near the shore of rivers. These methods are risky, costly and time consuming".

PROPOSED SYSTEM

By considering all the parameters of cleaning systems and eliminating the drawback of the methods used earlier, the solid wastes cleaning machine has designed which helps to remove solid wastes from water surface cleaning effectively, efficiently and eco-friendly

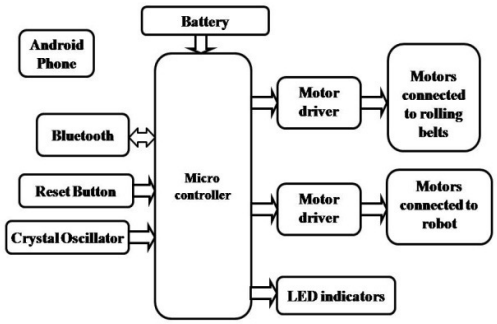

Fig 1.Block diagram of the project

OVERVIEW OF THE PROJECT

A designed system is programmed using proteus software with associated electro-mechanical devices to remove solid wastes. The system is placed over the contaminated water. The module is programmed to move in different directions based on the instructions given from the android phone connected through Bluetooth. The direction commands included front, back, left and right These commands are received by the controller section which in turn operate the motors. The water debris floating in water is lifted by a setup which is connected to the roller belts. As the module moves the motor makes the chain to circulate which lifts up and collect waste particles from the water surface and dump into the bin.

The proposed system would be able to monitor the solid waste collection process and management of the overall collection process. It would provide in time solid waste collection. The technologies which are used in the proposed system are good enough to ensure the practical and perfect for solid waste collection process monitoring and management for environment.

RESULTS

The designed project module consists of DC motors connected to rolling belts and is placed in water to can collect and remove the solid wastage from water surface. Bluetooth communication is used to operate the whole system. The software installed will be able to monitor the solid waste collection process and management of the overall collection process.

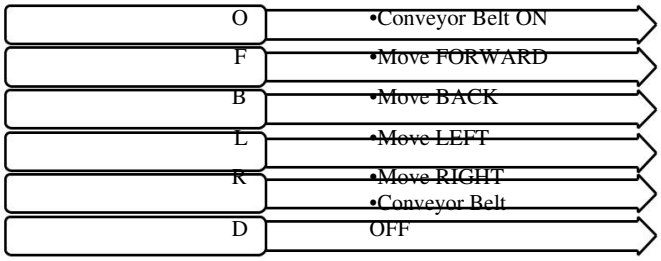

Fig 2. Commands used for the movement of module

The 'O' command makes the motors of the conveyor belt to rotate. This helps to collect the solid wastes from the water and dump it into the bin. The command 'F' is used to move the module forward so that the force is applied and wastes are collected. The command 'B' is used to move the module back to avoid the obstacle. The command 'L' makes the module to move in left direction and command 'R' makes the module to move in right direction. The command 'D' makes the motors of the conveyer belt to stop rotation. The developed module is shown in the figure 6.2

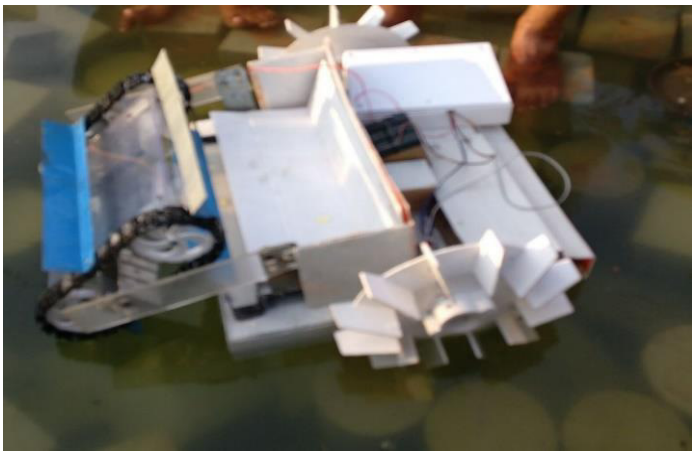

Fig 3.Automatic solid waste collector

The various directions of movement of the module are shown in the below figures

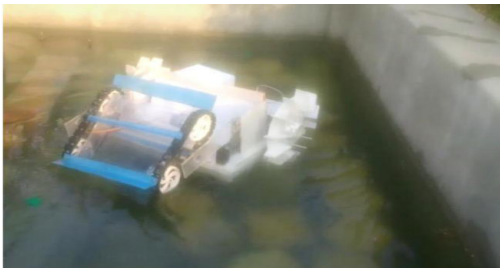

Fig 4: Module moving forward

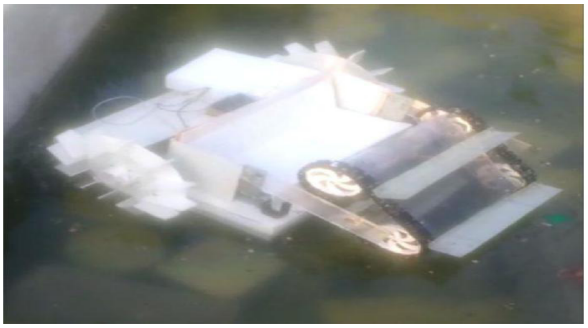

Fig 6: Module moving right

Fig 5: Module moving left

Fig 7: Module moving back

CONCLUSION

The technologies which are used in the proposed system are adequate to make certain the practical and perfect for solid waste collection process monitoring and management for environment. The solid waste collector has been developed successfully. This module has motors which move front, back, left and right. This developed module helps in removing solid wastes from water surface, to prevent contamination, pollution of water and in turn avoiding diseases that spread by the contamination of water.

FUTURE SCOPE

As future scope of work, this module can be improved by

1. Adding sensors to know whether the bin is filled or not.
2.
3. A wi-Fi module can be used instead of Bluetooth module to increase the range of operation
4. Camera may be fixed to the module to check the person who dump the waste in water and capture his image. By this captured picture and using wifi technology we can even send a message to that particular person which helps to change his attitude also., by sending a message as say " Do not pollute me, keep me clean, save inhabitants, save India".

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REFERENCES

1. *Pervez alam, kafeel ahmade, "Impact of solid waste on health and the environment,"Special Issue of International Journal of sustainable development and green economics, Vol.2, Issue 05, 2013*
2. *Parag S. Dawane, Sagar M.Gawande, "Solid waste management- A review", International Journal of Current Research Vol. 7, Issue 05, pp.16019-16024, May 2015.*
3. *Chadar S, Keerti C. "Solid Waste Pollution: A Hazard to Environment,"Recent Advances in Petrochemical Science 2017,Vol 2,Issue 03,2007.*
4. *G.l.Parvathamma, "An Analytical Study on Problems and Policies of Solid Waste Management in India – Special Reference to Bangalore City",IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT) ,Vol 8, Issue 10,Oct. 2014*
5. *Goorah, S., Esmyot, M., Boojhawon, R, "The Health Impact of Nonhazardous Solid Waste Disposal in a Community: The case of the Mare Chicose Landfill in Mauritius",Journal of Environment Health, Vol 72,Issue 1,2009.*
6. *Gaurav K. Singh, Kunal Gupta and Shashank Chaudhary, "Solid Waste Management: Its Sources, Collection, Transportation and Recycling", International Journal of Environmental Science and Development, Vol. 5, No. 4, August 2014*
7. *Sudha Goel, "Municipal solid waste management(MSWM) in India-A critical review" , Journal of Environmental science and Engineering,Vol.50,Issue 4, October 2008*
8. *Fahimuddin Shaik, Anil Kumar Sharma, Syed Musthak Ahmed, "Hybrid Model for Analysis of Abnormalities in Diabetic Cardiomyopathy and Diabetic Retinopathy related images", **Springer** Plus Journal, Springer Publications, April 2016. (ISSN:2193-1801)*
9. *N. L. Drobny, H. E. Hull, and R. F. Testin, "Recovery and utilization of municipal solid waste," EPA-SW-10C-71, U.S. Environmental Protection Agency, Office of Solid Waste Management Program, Washington D.C. (NTIS No. PB-204 922), 1971.*
10. *Mufeed Sharholy " Municpal solid waste management in Indian cities-A review",Journal of Elsevier,Vol 28,Issue 2,2008*