AUTOMATIC WASTE SEGREGATION SYSTEM

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Abstract – waste management has become a very big task for the humans to handle a lot of waste that's producing every single day. Fast increase in population has led to improper waste management in cities and in urban areas which has resulted in spreading of the diseases. The estimation is that 12.02 billion tons of solid waste was generated in 2006. The segregation, transportation and disposal of the waste must be managed efficiently and properly to minimize the risk to the public and also the environment. In order to achieve this efficient way of collecting and segregation of the waste we can use the current technology (machine learning) to build something called as "automatic waste segregator" which segregates the waste on its own without any human interventions. Hence reducing the human effort.

Key Words: Automatic waste segregator, waste management, machine learning

1. INTRODUCTION

In India alone, about 60 million tons of waste is generated in metropolitan cities on daily basis.

[1] The dump yards of the most of the cities are already overfilling producing a lot of unhealthy atmosphere and also resulting in less space to store the fresh waste that's been generated on the daily basis. Because of this major problem most of the cities have adopted a philosophy called "waste managementhierarchy".

According to the sanitization survey called "swachh survekshan-2016" conducted by the ministry of urban development under the swachh Bharath mission, it was found that about 50% of the people in India face the problem of improper waste collection and management. According to center of science and environment, innovative disposal and recycling methods must be introduced instead of dump yards and land fill sites. Thus, we have proposed a cost efficient "Automatic waste segregator system" for proper handling of waste.

[1] Automatic waste segregator system categorizes the waste as two main categorizes. They are, degradable and non-degradable. And the monitoring system helps in finding out the levels to which the dust bins are filled so that an immediate action can be taken to empty the dust bins. The well-known method of waste disposal is by unplanned and uncontrolled dumping of the waste in the dump yard of the cities.

[2] This method of waste disposal is very much hazardous to humans and also to the nature. Whenever the waste is classified before dumping the garbage as degradable and non-degradable, the waste has much higher potential of recycle, and recuse.

[3] The organic waste is converted to methane gas. Compost and replace demand for chemical fertilizers, and bio gas can be used a s a resource of energy. And the metal waste can be recycled andreused.

[4] in India, rag pickers play an important role in the recycling of the solid waste. Rag pickers and conservancy staff have higher morbidity due to infection of the skin, respiratory and many other disorders. The dependency on the rag pickers can be diminished if segregation takes place at the source of municipal wastegeneration.

[5] the economic value of the waste generated is not realized unless it is recycled completely. Several advancements in technology have also allowed the refuse to be processed into

useful entities such as waste to energy, where the waste can be used to generate synthetic gas made up of carbon monoxide andhydrogen.

1.1 EXISTINGSYSTEM

Municipal solid waste can be separated using various techniques

- Trommel Segregation
- Eddy current Segregation
- InductionSegregation
- Near infrared sensorsSegregation
- X-raySegregation
- Magneticseparation
- Airclassifiers
- Manual sorting.

Trommel separators/Drum screens

A trommel separation also known as rotary screen, is an essential unit which is used in the mineral and solid waste processing industries, it contains of a perforated cylindrical drum which is normally placed at an angle at the end of the feed.

Physical size separation is achieved as the objects on the feed move down the rotating drum, where the less sized garbage smaller than screen while the larger materials exit at another end ofdrum

Eddy Current Separator

Eddy current separation uses a powerful magnetic field to separate nonferrous metals from waste after all ferrous metals are separated. Eddy current separators are not efficient method to sort ferrous metals which become hot inside the eddy current field. This can damage eddy current separator

Induction sorting

In few cases, metallic components, like stainless steel and composite materials, cannot be removed using magnetic separator and nonferrous metals sorting process. The induction sorting system is the solution to suck kind of problem. The main measuring criterion is the electrical conductivity of the materials. Small sensors of about a thumb width in size positioned under a belt emit electromagneticwaves.

Electrical conductors traversing through the field change these waves and a computer detects the signal difference for each individual particle, which makes it possible to accurately sort particles with a conductor of thickness 1mm Near infrared sensors

When the garbage is subjected to light, it reflects light in near infrared spectrum. The sensor can differentiate between this and the identify what type of garbage it is

Magnetic separation

Magnetic separation technique uses powerful magnetic fields to separate the metallic waste like iron, steel, ferrosilicon, or other ferromagnetic materials from non-magnetic bulk materials. The magnetic field may be generated by permanent magnets or electromagnets. The metal items lift and stick to the magnetic band, and the ferrous metal items once removed, drop off into a skip.

Air classifier

air classifier uses a spiral air flow action, or acceleration within a chamber to separate or classify solid particles, have been updated and modified for MSWsorting.

The MSW air classifier uses an upward air current to lift paper and plastics out, while heavier materials like stone fall into a skip below. These are ideal for classification of light materials such as papers and plastics from heavier materials like aluminum and plasticbottles

X-ray Technology

X-ray method of waste separation, separates the waste materials by their density.

Manual sorting

The municipal waste is separated into plastic, paper, metallic, etc. manually.

1.2 DEMERITS OF EXISTINGSYSTEM

1.21 Though there are many awareness programs against the waste generation, handling, and maintenance of the urban and rural areas, people are not worried about what this negligence can lead us to. Fi this negligence in proper handling of the waste continues then the human kind will got through very big health problems hence affecting the economy of the country and the depletion of the environment to. In spite of the government awareness plans, it's the duty of the people to take care if the waste that they areproducing.

1.22 The existing systems for the automatic waste segregation of the waste, all the techniques are not applicable in all the rural areas of the country. In spite of having such an improved

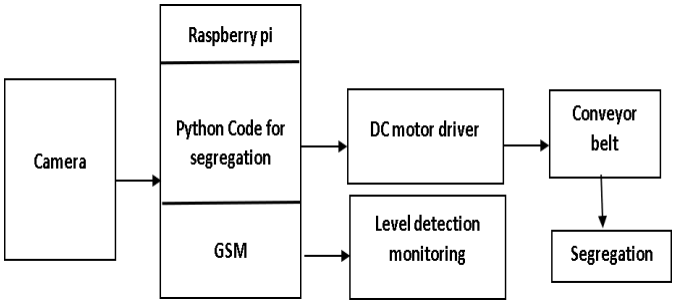
technology there are no efficient ways of handling the waste generation in the rural and urban areas.

1.23 All the systems that are developed now to handle waste require more number if dust bins for separate waste collection as per population in the city. This results in higher capital cost due to expensive smart dustbins compared to other methods. Due to a very huge population in the cities, more numbers of smart dustbins have to be placed in all the places of the city which is very much difficult considering the population of the cities and number of houses in thecities.

1.24 All the smart bins use one or the other kinds of the sensors and memory nits and GSM units. Due to the population increase in the country, these sensors and other electrical equipment's have to be produced in a large quantity so they every corner of the city is given a smart dustbin. and this increases the cost per smart dustbin in thecities.

1.25 The sensor node that are going to be placed in the dustbins have their own limits, like limited amount of memory, temperature of the sensors also matters and how well the smart dustbin is handled. We might have to assign a completely new team to ensure all the sensors in all the dustbins are working properly which makes service and maintenance very difficult for the municipal committee of thecities.

1.26 Smart dustbins are called smart bins because they use current technologies like wifi etc. wireless technologies used in these systems like zigbee have a very short range of wifi and have less data speed. RFID tags , In RFID based systems, are affected by metal objectsaround



1.27 Another major disadvantage is that due to all this automation, the unemployment rate in the country increases drastically.

1.28 Since everything is automated, people who are assigned to handle these things have to be very much skilled. People have to trained separately to handle and maintain these smart waste segregator machines which also results in increase of the capital amount.

1.29 Eddy current separation will not be able to separate ferrous elements which can result in serious damage in the eddy current and also requires a lot of energy to achieve eddy current to start the wastesegregation.

1.30 Air segregation is another current method of waste segregation which only differentiates between the light and heavy waste. It does not help in segregation of the degradable and non-degradablewaste.

1.31 All the current automated systems that are preset in the world are all very much complicated and also require a lot of technologically skilled labors and also the improved equipment to build thesegregators.

1.32 Since all the existing systems are using improved and costly equipment's they can only be used for industrial purposes but cannot be placed in the cities so that the waste is segregated at the root level from where the waste is getting generated.

2. LITERATURESURVEY

[1] Recent studies have shown the amount of untreated waste that is dumped on waste land how it harms the variousecosystems.

[2] The national geography magazine on e- waste rightly points out the harmful disposal method of hazardous waste. This inspired us to look into a method that helps in segregation of the basic waste that's generated at the house hold levelitself.

[3] this simple piece of technology helps in differentiating between the various waste materials even for children who are unaware of waste managementsystem.

3. PROPOSEDSYSTEM

3.1 DIAGRAM

3.2 MODULES

1. **Camera**: It's the first module of the system which snaps the pictures of the waste that's been kept and then sends the snapped data to a test directory. The camera is a component

of the raspberry pi which will be extended and mounted on top of the raspberry pi to snap a clear image of the garbage that's been kept on the conveyorbelt.

2. **Conveyor belt**: it's the only moving part in the system which will be connected to raspberry pi via a motor driver. The garbage is placed on the conveyor belt and once if the image is snapped and is compared to the dataset and the prediction is made, the conveyor belt moves either left or right based on the prediction made by the pythonprogram.

3. **GSM**: The GSM module is the one that allows the maintenance team to know the levels of the dustbins by sending them the messages of how much the dustbin is filled so that the maintenance team can clean the containers if the dustbin level is more than90%

4. **Raspberry pi:** It's the main heart of the machine, this controls all the operations. Camera, DC motor driver, python image classifier program, conveyor belt, GSM module all are driven by the raspberrypi.

5. **Level detector:** Level detectors are the sensors placed inside the dustbins to know how much the dustbins are filled and it updates the maintenance team of how much is filled so that the maintenance team can clean it if the dustbin is filled more than90%

3.3 SYSTEMOPERATIONS

This is a system that automatically segregates the garbage based on degradable or non-degradable garbage. For that to happen, the system will require modules called camera and etc... once the camera detects any kind of garbage or object kept on the conveyor belt, the camera snaps the picture of the garbage or any object for that matter and saves the image in a folder called "test data".

The control is the n switched to a efficient module of the system that's the python convolution neural network for image classification. The system is trained well with a huge amount of different data which will be stored in a file called "traindata".

The image of the garbage that's just been snapped and sent to the folder called "test data" will be compared to every image in the training set and a match percentage is then displayed.

Based on the match percentage of the test data with the train data, the image is classified either as degradable or non-degradable waste.

Once the program decides which type of waste it is, it produces a binary notation, 0 if the waste is degradable waste and 1 if the waste is non-degradable.

Based on this binary output of the python program, the dc motor turn left if the output is 0 and towards right if the output is 1. That way the degradable waste is collected at the left side of the conveyor belt and non-degradable waste at the right side, hence segregating the garbage efficiently without a humanintervention.

The segregated garbage is collected in a dustbin which will be having a level detector. This level detector keeps track of the amount of the waste that's been dumped into the dustbin. It is also connected to a GSM module which will send a message to the maintenance team when ever the dustbin is filled more than 90% so that the container can beemptied.

CONCLUSION

Our proposed system with a very less components and less cost, will be able to efficiently help in automatic segregation of the waste. Hence keeping the urban and rural areas clean there by reducing the health problems of the people and also help in obtaining a good environment aroundus.

REFERENCES

M.K Pushpa, ayushi Gupta
"Micro controller based automatic waste segregation system", IJIREEICE, volume 3, issues 5, may 2015
Pavitra, "Smart Trash System: an application using Zigbee", IJISET, volume 1, Issue 8, October 2014
Ruveena singh, Dr. Balwinder singh, "Design and development of smart waste sorting system", IJRECE, volume 3, Issue 4, October-December 2015
Ren C. Lou, "Sensor technologies and microsensor issues for mechatronics systems". IEEE/ASME transaction on mechatronics, volume 1, no. 1, march1996