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Enabling Plastic Disposal by means of money crediting in Railways

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Abstract:

It is known that the technological advancements are increasing at a faster pace. But the utilization of technologies in various sectors is very low. It is known that there are no proper measures for waste disposal. Since the use of plastics is constantly increasing in our day-to-day life, there is no proper waste disposal for plastics.The present work focuses to develop a system that captures the image of the plastic waste compares using Convolution Neural Networks and identifies the kind of waste that is disposed along with an automated money crediting technique that is used for increasing the plastic disposal awareness among public.

Keywords: Smart Dustbin, IoT, Image Processing. RFID technology, Arduino, Money Crediting

I. INTRODUCTION:

With the growth of technology, the disposal of waste has also increased. It is important to create awareness among the people to dispose the plastic wastes in a safer manner to avoid plastic pollution. Each year, an estimated 18 billion pounds of plastic waste enters the world's ocean from coastal regions. All that plastic is causing harm to the creatures that live in the ocean, from coral reefs smothered in bags, to turtles gagging on straws, to whales and seabirds that starve because their bellies are so jammed with bits of plastic that there's no room for real food. About 40% of all plastic produced is used in packaging, and much of that is used only once and then discarded. Less than a fifth of all plastic is recycled, though many countries and businesses are trying innovative solutions to increase that number. One of the main concerns with our environment has been solid waste management which impacts the health and environment of our society. The detection, monitoring and management of wastes are one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a cumbersome process and utilizes more human effort, time and cost which can easily be avoided with our present technologies.

II. SURVEY REPORT:

An ultrasonic sensor is used in [1] to detect the amount if waste in the dustbin, and the presence of obstacle is detected using the IR sensor. Once the dustbin is full, the same is communicated to the concerned authorities through the GSM module. If more than one dustbin is placed in the same place, only if the first dustbin is full, the second one can be used else the second one cannot be used. The first one remains closed till it is cleared once it is full.

In [2] the structural design working and overall hierarchical description of the system. In thissystem, without making much of the alterations to the traditional garbage vehicle the proposed system could be mounted on thetop of the vehicle canopy for automatically filled level detection. The design is based on two stereoscopic cameras dealing withdepth ranging information for filled level detection. Based on deep-simulation with image processing and trialling at day-to-daybasis, the core of the proposed design lies depth estimation through a 3D model construction of captured image in using opensource system.

In [3]advanced Decision Support System is developed inorder to provide real-time data to the truck drivers who are responsible for waste collection. The collected data is shared among the drivers to dynamically optimise the route and thus increase the efficiency. Surveillance cameras are used to capture any inaccessible areas or problematic area that serve as a proof to the concerned authorized. These surveillance cameras are used to ensure proper collection of waste.

In [4]photoelectric sensor is used to detect what kind of waste is dropped in the trash can. With the help of RFID Tags, the individual user is identified, using which an SMS is sent to the user about the information on what kind of waste they have dropped. A weight sensor is used to transmit the information about the amount of waste in the Trash can to the controller.

The data related to weight in the dustbin is transmitted to the central control station in [5]. Using this data, the route of the Municipality Garbage vans can be optimised. The weight in the dustbin is measured using load sensors and the moisture sensor data can be utilized for waste segregation.

Segregation of wastes at junk yards is a tedious and time consuming process hence recycling of wastes is not effectual. These drawbacks can be overcome by proper waste management at domestic level. The main objective of [6]is effective and efficient methods of waste collection and segregation at domestic level based on their nature of composition i.e. metal, plastic and biodegradable, the waste is stored accordingly in their respective segments of the dustbin. Moisture sensor, gas sensor, capacitive and inductive sensors are used in this system.

In [7] IoT enabled dustbins use RFID tags for tracking of the wasteslinked with a web-based online system and according to theweight of waste added, host server calculates the points andupdates in the database of virtual wallet. Also, it measures thefullness of the dustbins and updates the status of each dustbin onthe municipal server. It notifies them when the dustbin is full andprovides the shortest route to empty all the dustbins based on thecapacity of the municipal waste loading vehicles. The Capacity oftrucks is calculated and updated each time according to thenumber of dustbins serviced by the trucks, as soon as itcompletes a route assigned to it. Furthermore, the user is assistedin material waste classification through our application and alsothe smart bin knows its content and can report back to the rest ofthe recycling chain about its contents.

[8] Proposes the usage of Aadhar cards that will be linked to the RFID Tags of the user so that creation and maintenance of a new database is not necessary. Once the user accesses the dustbin they are identified by using their RFID tags. The ultrasonic sensors are used to make sure that the dustbins are emptied once they are full. Solar Panel is used to power the system.

A GSM module [9]is utilized to alert the concerned authority about the dustbin once it is full. The information is sent to the authority along with its geographical location. Ultrasonic sensors are used to obtain the data about the level of waste in the dustbin.

The microcontroller[10] sends the data related to the level of waste in that dustbin to the Municipality office. The same data is conveyed by the Municipality to the Truck driver. Hence the dustbins that need to be emptied are identified. The route is thus optimised saving fuel and money.

III. EXISTING SYSTEM:

The existing method, there is no method to segregate the waste based on their nature. Of all the method studied through literature survey and market survey, the existing methods found have ultrasonic sensor that is used to determine the amount of waste in the dustbin. The photoelectric sensor is used to determine the kind of waste. GSM Module is used to notify the concerned authority about the level of waste in the dustbin. RFID Tags are used to identify the user and Cloud database is used to manage the user data. Of all the systems, there is no mechanism to prevent overflow of dustbins or encourage the user to dispose plastics and other wastes in a proper manner so as to help the prevention of pollution. This can be achieved by the use of our proposed system

IV. PROPOSED SYSTEM:

The proposed system will help in proper way of plastic waste disposal during train travels. It encourages the plastic disposal by crediting money to the dustbin user's account. The money is equivalent to the amount of plastic disposed. It differentiates the user by the RFID tag. This system consists of a dustbin with ultrasonic sensor which is used to identify the status of the garbage bin. Plastic wastes are identified by the camera which is mounted on the top of the dustbin. These wastes are kept in a tray in order to capture the image of the waste by camera. The captured image is detected for plastic using convolution neural networks through Alex net. Once the plastic has been detected, the lid of the dustbin is opened and the tray flips automatically using dc motors. Further, IoT module is used to collect the information of the dustbin user through RFID for money transfer. Figure 1 shows the block diagram of the proposed system. Arduino Mega 2560 is a main controller unit to which all other modules are connected. It has RFID reader module and a LCD display. UART aids in transmission of data from other modules to the controller and vice versa.

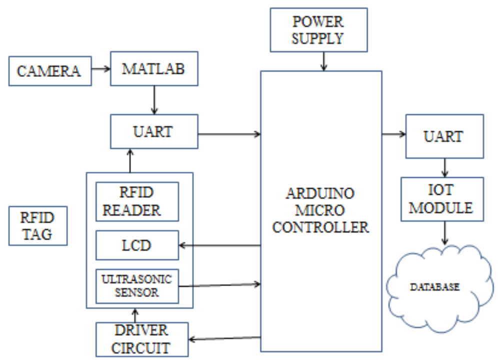

Fig 1.: Block diagram of proposed method

RFID Reader and Tag:A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to identify the individual objects. These readers send a signal to the tag and read its response. In our system, RFID tag is issued to every user. Each tag consists of a unique tag ID which is used to program the details of the user. RFID reader obtains the unique ID as the response on tapping the tag on the reader. Thereby, the details of the user are obtained. Name of the user and goggle pay or pay tm number are the important details of the user.

Fig 2: RFID Reader

Fig 3: RFID Tags

Arduino mega 2560:The mega 2560 is a microcontroller board based on the ATmega2560. It consists of 54 digital input and output pins in which 15 can be used as PWM output, 16 analoginput, 4 UARTs which is a hardware serial port, 16 MHz crystal oscillator, a USB connection. It also has reset button power jack and ICSP header. Operating voltage of the board is 5V.This can be powered via the USB connection or with an external power supply. ATmega2560 also supports I2C and SPI communication.

Ultrasonic Sensor:In our system, Ultrasonic sensor is used for monitoring the level of waste in bins. This sensor includes a transmitter, receiver and control circuit. Ultrasonic sensor creates an ultrasonic pulse. The sound pulse is created electronically using a sonar projector consisting of signal generator, power amplifier and electro-acoustic transducer array. A beam former is usually employed to concentrate the acoustic power into the beam. The sensor has an echo pin, trigger pin, VCC and ground.

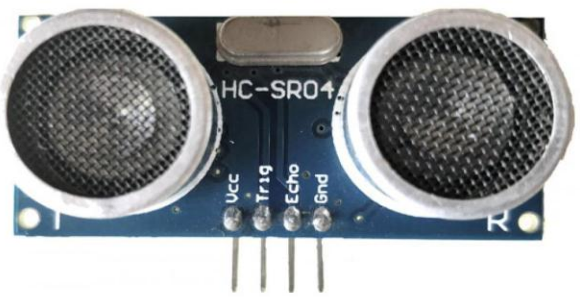

Fig 4: Ultrasonic Sensor

IoT module (ESP12-R4): This IoT device can push the sensor values instantly into the server without any interruptions. The user can dynamically push the values into the cloud server. Users can push up to 5 sensor values into cloud server at every second and control 9 different loads from anywhere. It also offers location services. This device consumes 5V DC power to operate. In our system, this module helps in collecting the details of the dustbin user in the database. The details are name of the user, type of plastic disposed and amount to be credited to the user's account.

Fig 5: IoT Module

Driver circuit (L293D): It is a dual H-bridge motor driver integrated circuit. Motor driver acts as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors. In its common mode of operation, two Dc motors can be driven simultaneously, both in forward and reverse direction. Input logic 00 or 11 will stop the corresponding motor. Logic 01 or 10 will rotate it in clockwise and anticlockwise direction respectively.

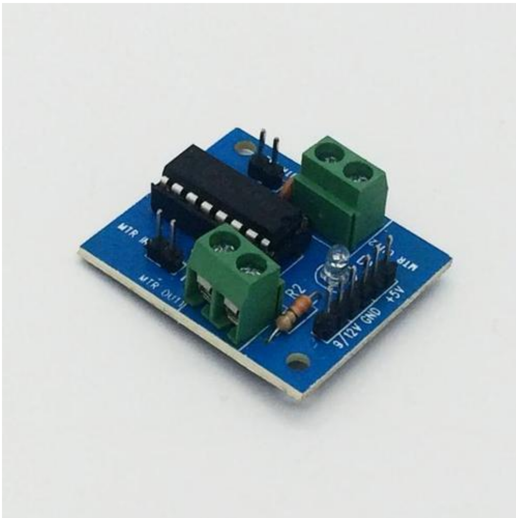

Fig 6: Driver circuit

V. WORKING:

When the user taps the RFID tag on the reader, the user is identified. The plastic waste is placed on the tray. This system consists of a camera which is used to capture the image of the waste. MATLAB aids in image acquisition and Convolution Neural Networks are used to perform classification and regression of images. It uses Alex net to identify the object by comparing with predefined datasets. It is trained on more than a million images from the ImageNet database.

When plastic waste is captured by the camera, it identifies the type of plastic by comparing it with already available images in the database. This data is forwarded to microcontroller by UART. The main purpose of the UART is to transmit and receive serial data. Based on the data from the UART, The microcontroller commands the driver circuit to drive the motors for tilting of tray and opening of bin simultaneously. This action is updated in the database by the IoT module.

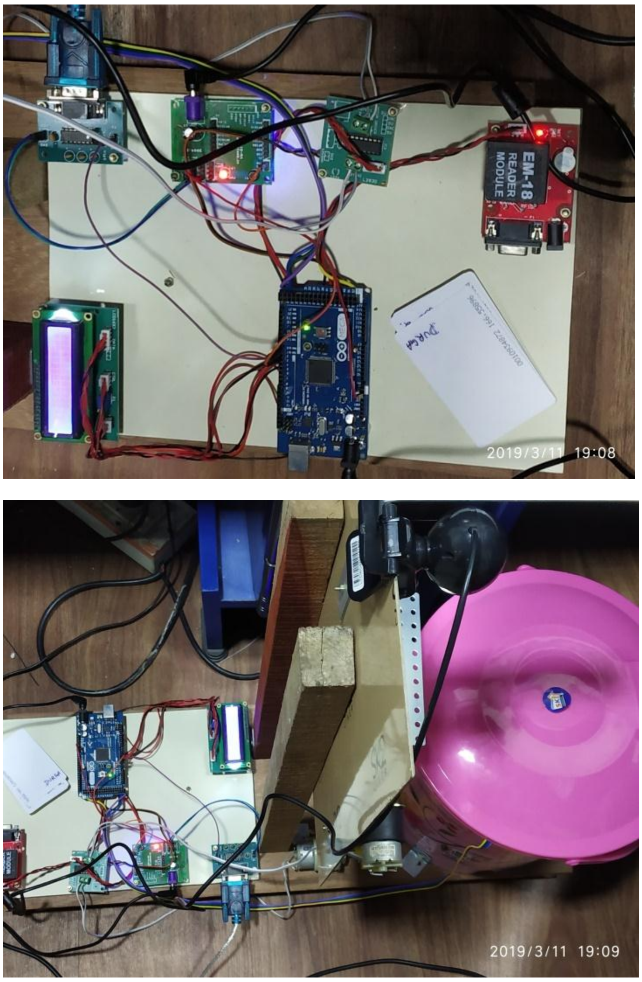

Fig 8: System set-up

VI. RESULT:

The issue of plastic waste disposal in Train compartments is solved by installing our system. This is implemented by using Image processing technique, RFID Tag & Reader, Ultrasonic sensor and IoT module. Based on the amount of plastic disposed, money is credited to the dustbin user's account. The same information is updated to the database. The status of the garbage and the amount credited is displayed on the LCD screen placed near the dustbin.

VII. CONCLUSION AND FUTURE WORK:

This system enables the disposal of plastic and eases the waste collection.In future, problem of waste segregation can be taken into account.Garbage compactor can be used for efficient use of the dustbin.

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