

# Smart City using Automated Self Navigated Dustbin Dispensary System and Wireless Power Generation Technology

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**Abstract:-** Today's main issue in the city is pollution especially land pollution and air pollution. In taking effort to control both air and land pollution, we have proposed a concept called smart city automation. It contains self navigated garbage disposal system in smart dustbin and wireless power transfer from road to cars while running on road in the separate lane provided. Overflow of garbage creates unusual condition in the city and creates bad odour around the surroundings this ends in spreading some deadly diseases & human illness. To avoid all these problems, we are going to implement a project called IoT based waste disposal system using smart dustbin. The Internet of Things (IoT) is a concept in which surrounding objects are connected by wire and wireless communication without the help of humans. Objects communicate and exchange information.

**Keywords-** IOT, Aurdino, RFID

## I. INTRODUCTION

Today's main issue in the city is pollution especially land pollution and air pollution. In taking effort to control both air and land pollution, we have proposed a concept called smart city automation. It contains self-navigated garbage disposal system in smart dustbin and wireless power transfer from road to cars while running on road in the separate lane provided. Overflow of garbage creates unusual condition in the city and creates bad odour around the surroundings this ends in spreading some deadly diseases & human illness. To avoid all these problems, we are going to implement a project called Iot based waste disposal system using smart dustbin. The Internet of Things (IoT) is a concept in which surrounding objects are connected by wired and wireless communication without the help of humans. Objects communicate and exchange information. In this concept number of dustbins are located inside the city. These dustbins are equipped with an ultrasonic sensor which will track the level of the bins and a unique ID is given for every dustbin in the city so it is easy to identify which bin is full. When the level of the garbage is high the device will send the reading along with the unique ID given to the dustbin. the dustbin will move to dispose the garbage at the particular place. To avoid the decaying smell the chemical are sprinkled when there is decaying. when the bins are full then user will not be able to use the bins. The status of the bin is controlled by the

corporation from their office and action will be taken to replace filled bins with the empty bins. The above concept will almost help to decrease land pollution. And next is to control air pollution the main cause for air pollution is vehicles pollution due to the automobile engines runs with fuel so we need to switch to electrically charged vehicles. Now here comes the major issue charging the electronic vehicles. The time consumption is more for charging the vehicles the solution for this issue is wireless electricity transmission. This method can transfer the electricity without contact it's a huge advantage that there is no need for waiting until the car gets charged. Here the charging takes place while running on the electric lane. Electric lane is a separate path in the road cars which has to charged can drive on separate electric lane which is contains transmitting node this is directly connected to supply the secondary node is kept in the car when the primary node and secondary node are got to contact on road the transmission takes place and charging is initialized then it is stored in batteries[1-5].

## II. SMART DUSTBIN



Fig 1:- Smart Dustbin

Figure 1 shows the smartdust bin. It is the combination of various electronic modules and embedded system. Together contributes this system to be efficient[6-10].

III. PROPOSED METHOD

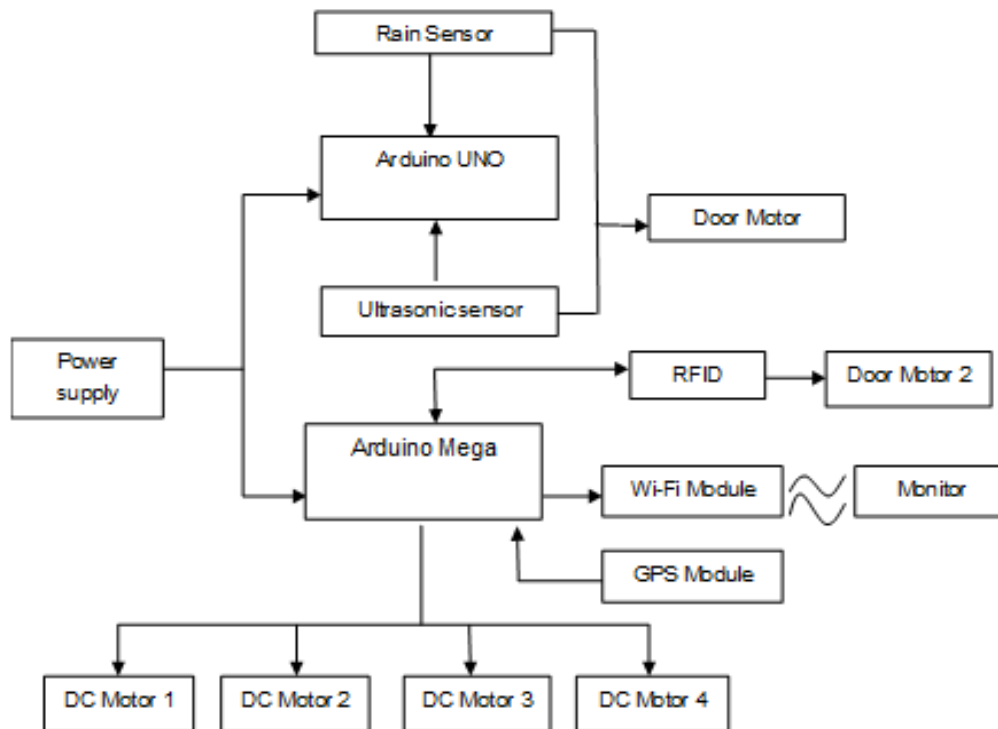


Fig 2:- Block Diagram

There are two sensors used in this system. The rain sensor module and ultrasonic module. Rain sensor is placed on the top of the dustbin door when the rain drop is sensed on the module the voltage variation is sent to the processor. The door of the smart dustbin is fixed with the servo motors will automatically open and close the dustbin according to the rains sensor's data received in the processor. And next the ultrasonic sensor is placed at the inner part of the dustbin on top corner to sense the garbage level the levels are calculated in the basis of volume. the ultrasonic sensor gives the data to the processor. The processor will operate the servo motors to close the door when garbage level is sensed full. All these data are sent to the server by nodemcu(esp8266) module which connects the server by IoT. This server is monitored in corporation office. when the dustbins are full it means that it is ready to dispense. The run time is given to processor the dustbin will start move when the threshold time is reached. The wheels attached with the (150 rpm) gear shaft motors. these are connected with the processor. the processor contains the predefined co-ordinates the dustbin moves according to these co-ordinates and reaches the dump yard where all the smart bins will dispense the garbage in the particular area. Each dustbin is given with unique I'd the RFID tag is fixed on the dustbin; the RFID reader is placed on the trash yard when the RFID tag is got read by the reader on that side. The dispensing door will automatically open. The dispensing door is attached with the servo motor. The processor controls the rotation of the servo and so the door is controlled by processor after the dispensary the back-door closes. And the dustbin is started to return to its home position. When it is reached to the position the main door is

opened and it is available for the consumers. The location while running the dustbin to trash yard and home place is tracked using neo6m GPS module the location update is sent to corporation's system. This dustbin avoids the decaying of garbage with gas sensor the decaying smell is. Sensed with this gas sensor and further the automatic chemical sprinkler is used to sprinkle the chemical and stop decaying for some time. Thus, we can avoid the spreading of diseases too

➤ Arduino

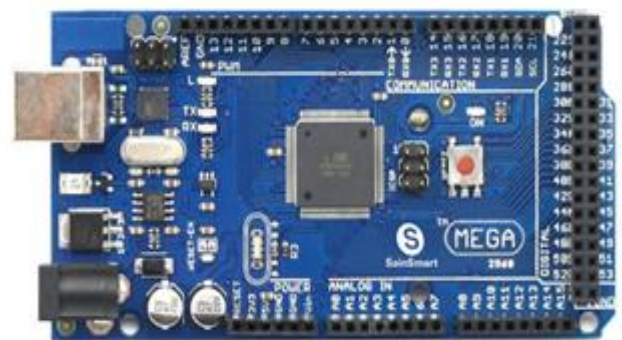


Fig 3:- Arduino Mega

The Arduino Mega 2560 is a microcontroller board based on AT Mega 2560. It is depicted in Figure 3. It has 54 digital input/output pins (In these 15 pins are used as PWM outputs), 16 analog inputs, 4 UARTs and a 16MHz crystal oscillator, a USB port, a power jack, ICSP header

and a reset button. Its operating voltage is 5V and the input voltage recommended is 7-12V.

➤ *Wi-Fi Module*



Fig 4:- Wi-Fi Module

**ESP8266** is an open source IoT platform. Figure 1.4 shows the wifimodule. It includes firmware which runs on the ESP8266 Wi-Fi module. The hardware is based on ESP-12 module. It has 32Kb of instruction RAM, 32Kb of instruction cache RAM, 80Kb of user data RAM, 16KB of ETS system data RAM. It will display the output in other external devices using internet. We can use Bluetooth module to display output but it covers short range up to 10m. And it cannot be connected with internet. But ESP8266 module can be connected with internet using mobile Hotspot.

➤ *GPS*

Global Positioning System (GPS) originally it is a Navistar GPS, is a satellite – based radio navigation system. GPS provides the geolocation and the time information to a GPS receiver anywhere on or near earth where there is an unobstructed line of sight of four or more GPS satellite. Its coverage is Global. Accuracy is up to (500-300) cm.

➤ *Rain Sensor*

The Rain Sensor module is an easy tool for detecting the rain. It can be used as a switch and it is also used to measure the intensity of rainfall. It has a rain board and a control board and an adjustable potentiometer. And the analog output is used in the detection of drops in the amount of rainfall.

➤ *Ultrasonic Sensor*

Ultrasonic sensor uses sonar to determine the distance to an object like bats or dolphins do. It offers an excellent non-contact range detection with high accuracy and the stable reading. Its range is up to 2-400cm. 0 to 1cm is blind spot of ultrasonic sonic sensor it can't able to detect in this range.

➤ *RFID*

Radio-Frequency Identification uses electromagnetic fields to automatically identify and to track the tags attached to another object. The tag contains electronically stored information. There are two types Active Tag's, Passive Tag's.

Applications are as follows. The door will close automatically after the garbage is fully filled inside the dustbin. So, people can't able to use the dustbin. This will avoid over flow of garbage. The dustbin doesn't need any help from the human; it moves on to the trash yard automatically and releases the garbage present in it. The dustbin's door closes automatically while raining, so the garbage inside the dustbin doesn't get wet and slurry. The manipulation of mosquitoes is avoided and the decaying smell is controlled. The dustbin indicates its level of fulfillment in percentage in the display fixed on it. So, it is easy to the people to use the dustbin.

Features are follows. It will stop overflowing of garbage in dustbin along roadsides and localities as smart bins managed at real time. It also aims at creating a clean as well as green environment. By using route algorithm, itself automatically find the route and it automatically dispense the garbage in trash yard. It will reduce the fuel consumption. Less amount of fuel consumed by vehicle thus can save a large amount of money as well.

Advantages are follows. Overflow of garbage is controlled. No Human intervention. There's no Decaying of wastes. Dumping of wastes is avoided. spreading of diseases are controlled. Generation of mosquitoes is controlled.

**IV. RESULTS**

➤ *Rain Sensor:*

Figure 5 and 6 shows the interface diagram of rain sensor and its output

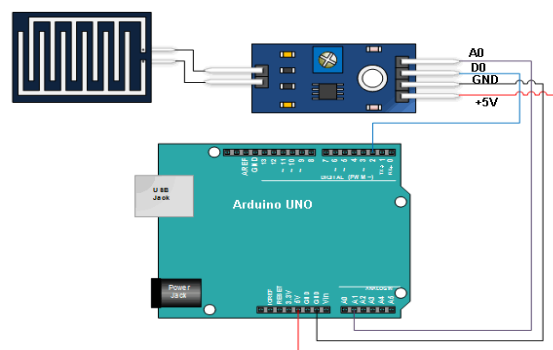


Fig 5:- Interfacing Diagram of Rain Sensor





**V. WIRELESS VEHICLE CHARGING SYSTEM**

The Embedded Technology is now in its heights and the source available is more. Embedded system plays a major role in automating the electronic world.

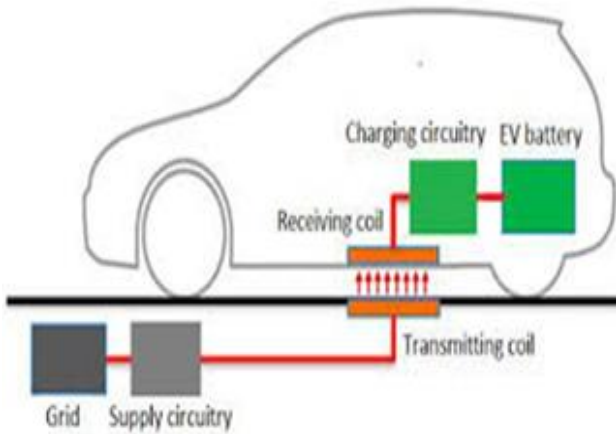


Fig 9:- Wireless Charging System

This proposed method is shown in figure 9 and greatly reduces the manpower, saves time and operates efficiently without human interference. This system will reduce the manpower and operates without human interference. In this proposed method the cars are charged on the road while running itself. In this smart city project the roads are designed for this structure there are separate lanes which charges the car. The cars which need to be charged is moved on to electric lane which is a transmitter the car contains the receiver it collects the electricity and stores in batteries [11-15].

**VI. PROPOSED METHOD**

Figure 10 shows the block diagram of the wireless recharging system.

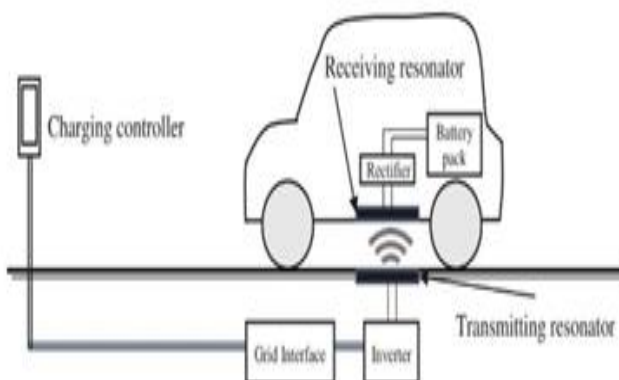


Fig 10

➤ *ARDUINO UNO:*



Fig 11:- Arduino Uno Board

The Arduino UNO is a microcontroller board based on MICROCHIP ATmega328P and it is shown in figure 11. That board consists of digital and analog, input and output pins which are interfaced to various boards and other circuits. The board is designed with 14 digital pins, 6 analog pins, and it is programmed with the Arduino Integrated Development Environment(IDE) using type B USB cable. The Arduino accepts 7V to 20V through it. It also accepts power given by USB cable and 9V battery. The operating voltage of Arduino is 5V. Out of 14 digital I/O pins 6 pins provides PWM (Pulse Width Modulated) output. It has flash memory of 32kb of which 0.5kb used by bootloader. The length and breadth of the board is 68.6mm and 53.4mm and its total weight is 25g. The clock speed of the board is 16MHz. The board is programmed under bootloader which allows uploading new codes without the use of an external hardware programmed as a USB – to – serial converter [14-19].

➤ *RADIO FREQUENCY COIL:*

RF coils are acts as the transmitter and receiver of radio frequency signals. The transmitter generates electromagnetic field and the resulting signal is received by the receiver.

The electromagnetic fields produce by the transmitting coil are in the RF range. The produced electromagnetic field from the transmitting coil is a magnetic near field with little associated changing electric field component. The RF power is not confined as radio waves, it is confined to the coil space. In this project the transmitting coil is placed in the last lane of the roads, no. of coils placed continuously.

The receiving coil accepts the electromagnetic radiation produced by the transmitter. The acquired signal by the coil is induced emf. In this project the receiving coil is lane where the transmitting coils are placed the receiver receives the electromagnetic waves produced by the transmitter and the received electromagnetic waves are stored in the battery of the car.

➤ **BATTERY:**

A battery is a device consists of electrochemical cells which is used to provide to the electrical devices. It has two terminals positive and negative. The positive terminal is cathode and the negative terminal is anode. There are two types of battery, firstly primary battery it is a single use battery, these batteries are used once and discarded. Secondly rechargeable battery or secondary battery, these batteries are used multiple times which can be discarded and recharged using an applied current.

➤ **DC MOTOR:**

Motor is a machine which converts electrical energy into mechanical energy. DC motor have internal mechanisms, either electro mechanical or electronic, to change the direction of the current periodically. ADC motor's speed is controlled using variable supply voltage or by changing the strength of current in its field windings. DC motors were the first type existing direct – current lighting power distribution systems.

➤ **RECTIFIER**

A rectifier is an electrical device that converts AC to DC or DC to AC. The process is known as rectification. Rectifiers are commonly used in power supplies. In this project the power supply is passed to the rectifier and the rectifier converts the DC to AC and passed to the transmitting coil.

The normal wireless electricity transformation system works mainly with the two nodes, transmitting coil and receiving coil the transmitting coil is placed stable is connected with the supply mains the continuous alternating supply is given to the coil gets energized and the magnetic field is created and when the receiver coil comes in contact to the transmitting coil's magnetic field the electricity is transferred from transmitter coil to receiver coil. The above case works under the principle of electromagnetic induction is suitable for small scale electricity consuming gadgets. When comes for charging the electric car the transferring speed and efficiency must be greater in the above case the maximum distance between the two coils are 1.2 inches is not possible for car because the ground clearance height is more so the above case is not suitable. The wireless vehicle charging system works under two principles.

1. Electromagnetic induction
2. Resonance
3. Highly coupled electromagnetic induction

➤ **ELECTROMAGNETIC INDUCTION**

The electromotive force around a closed path is equal to the negative of the time rate of change of the magnetic flux enclosed by the path. The closed path here is, in fact, conductive.

➤ **Resonance:**

Electrical resonance occurs in electrical circuit at a particular resonant frequency when the impedance of the circuit is at a minimum in a series circuit or at maximum in a parallel circuit (usually when the transfer function peaks in absolute value). Resonance in circuits are used for both transmitting and receiving wireless communications such as television, cell phones and radio.

➤ **RESONANT INDUCTIVE COUPLING:**

There are two coils the secondary coil observes the state from the primary coil. The primary and secondary coil will get coupled when the resonating frequency of both the coil matches. Most of the wireless electricity transfer technology uses this principle

➤ **APPLICATIONS:**

- The car battery charges automatically when the car moves on the lane where the transmitting coils are placed.
- The battery is recharged by electromagnetic waves, so that no need for any wired medium to charge the battery.
- It takes less time to charge the battery and the driver can continue in his path in the charging lane, no need to wait for the battery gets charged.
- This system overcomes the major drawback of plug-in type charging of electric cars and their limited driving capacity.

➤ **FEATURES:**

- The transmitting coil generates the EM waves and it is received by the receiving coil placed on the base of the car.
- Running all vehicles using electricity reduces greenhouse pollution.

➤ **ADVANTAGES:**

- Battery is charged by EM waves.
- No need of wire to charge the battery.
- No need to wait until the battery get charged.
- Consumption of charging time is less.
- Transmission and reception of EM waves are fully automatic.
- There is no limited range to travel in the car.

## VII. RESULT

Figure 12 and 13 shows the snap shot of transmitting coil and receiving coil.



Fig 12:- Transmitting Coil

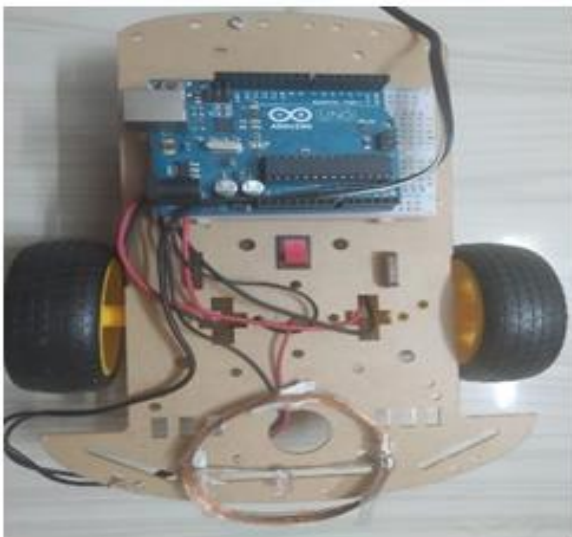


Fig 13:- Receiving Coil

## VIII. CONCLUSIONS AND FUTURE WORK

In this system completely discuss about the smart city automation and the technologies used, the first chapter explains about the working and monitoring of wireless smart dustbin and its merits. Second chapter deals about the wireless power transmission in running vehicles.

Adding hazardous sensors and giving visual facilities to the dustbin avoids the dropping of wastes outside the dustbin. By increasing the power transmission rate of the coil can make the system more efficient.

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