IOT BASED WASTE MONITORING SYSTEM USING RASPBERRY PI KIT

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ABSTRACT –
In the present scenario, many times we see that the garbage bins or Dust bin are placed at public places in the cities are overflowing due to increase in the waste every day. It creates unhygienic condition for the people and creates bad smell around the surroundings this leads in spreading some deadly diseases & human illness, to avoid such a situation we are planning to design "Waste Monitoring System using IOT". In this proposed System there are multiple dustbins located throughout the City.When the level reaches the threshold limit, then waste collection can be done at right time before it overflows.

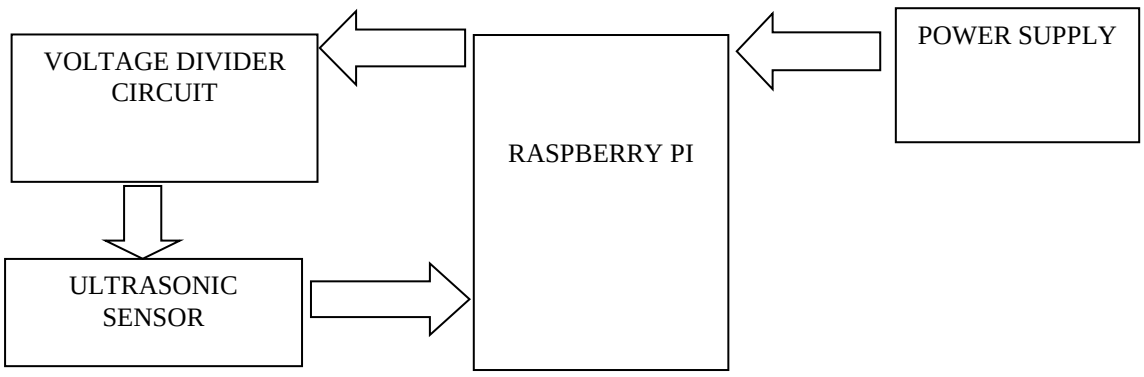
KEYWORDS- Waste Monitoring, Raspberry Pi Kit, InternetofThings (IOT), Ultrasonic Sensor, Voltage divider circuit, Node Red.

INTRODUCTION-
Things that are connected to Internet and sometimes these devices can be controlled from the internet is commonly called as Internet of Things. In our system, the dustbins are connected to the internet to get the real time information of the dustbins. Managing the bins by monitoring the status of it and accordingly taking decision. These dustbins are interfaced with raspberry pi-based system with ultrasonic sensors. Where the ultrasonic sensor detects the level of the dust in dustbin and sends the signals to raspberry pi the same signal is encoded and send to the application and it is received. The data has been received, analyzed and processed in the database, which displays the status of the Garbage in the dustbin on the application of authorized person system. The concerned authority get alert about dustbin is full and informs person whoever is responsible for collecting garbage from the particular areas.

LITERATURE REVIEW:
Seven reports were reviewed in detail for the literature review, with the majority of these providing some evidence to support the theory that the introduction of waste collections is associated with a reduction in waste arisings.
Internet of Things (IoT) has attracted widespread applicability not only limited to smart cities and communities but also in water, waste management and so on. In the perspective of waste management, several different IoT-enable solutions have been proffered with each having its own strengths and weaknesses that requires improvements.
Folianto, et al. [1] proposed a system that identifies the when a litter bin is completely full. In this system, data is collected and transmitted via a wireless mesh network. Moreover, to reduce the amount of power consume and maximize the time efficiency of the operations, the system employs duty cycle technique.

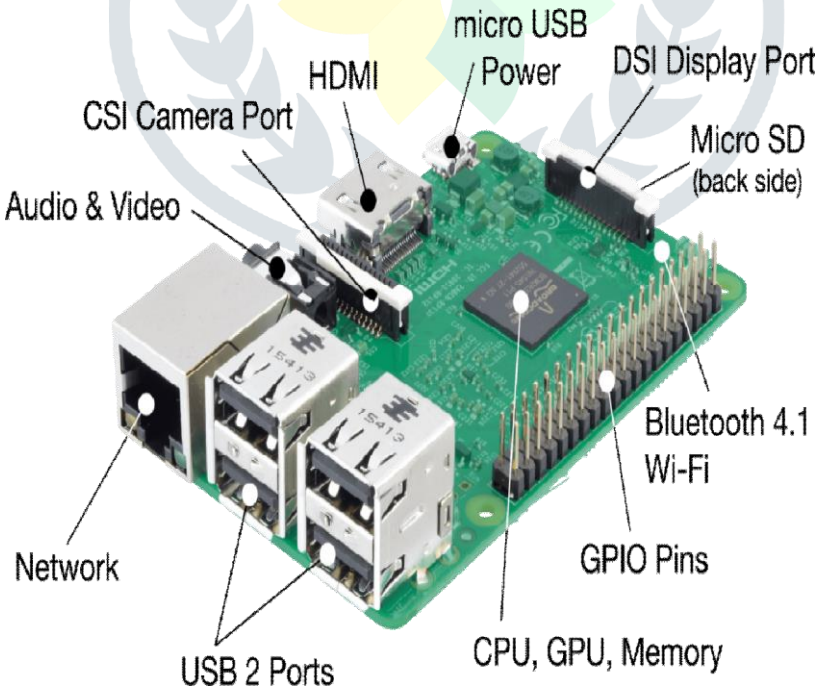
The technology has achieved a widespread application in which cities waste management is not an exception. In this paper, we have discussed several works on smart waste collecting systems as IoT-enabled solutions for smart cities waste management.
Navghane [2] also proposed a smart waste collection bin using the combination of sensors such as weight and infrared (IR) sensors. These sensors are equipped with the capability of sensing the weight and different levels of garbage respectively. In this case, the IR sensors will show the various levels of garbage in the dustbins and activate the weight sensor to transmit the results ahead when its threshold level is reached. Chaware, [3] proposed a waste collection system considered innovative to assist in keeping cities clean. The system operates by monitoring garbage bins and notify the authorities and the garbage collection vehicles about the level of garbage stored or contained in the garbage bin through a web application.

BLOCK DIAGRAM



FEATURES OF THE USED COMPONENTS

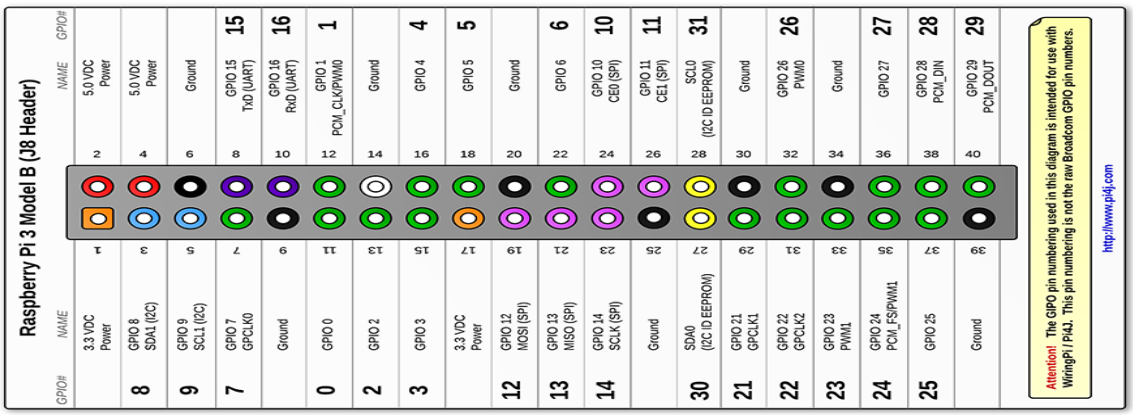
RASPBERRY PI- The Raspberry-Pi is series of credit card-sized single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and developing countries. Several generations of Raspberry Pi have been released. The first-generation Raspberry Pi 1 Model B was released in February 2012. It was followed by a simpler and inexpensive model A. In 2014 the foundation released a board with an improved design in Raspberry Pi 1 Model B+. The model laid the current "mainline" form-factor. Improved A+ and B+ models were released a year later. A cut down "compute" model was relased2014, and a raspberry zero with smaller size and limited input/output (I/O), general- purpose input/output (GPIO), abilities released in November 2015 for US$5. The Raspberry Pi 2 which added more RAM was released in February 2015. Raspberry Pi 3 Model B released in February 2016 is bundled with on-board Wi-Fi and Bluetooth. As of 2016, Raspberry Pi 3 Model B is the newest mainline Raspberry Pi. These boards are priced between US $20-35. All models feature Broadcom system on chip, which includes an ARM compatible central processing unit (CPU) and an on-chip graphics processing unit (GPU, a Video Core IV). CPU speed ranges from 700 MHz to 1.2 GHz for the Pi 3 and on-board memory range from 256 MB to 1 GB RAM. Secure Digital (SD) cards are used to store the operating system and program memory in either the SDHC or MicroSD sizes. Most boards have between one and four USB slots, HDMI and composite video output, and a 3.5 mm phone jack for audio. Lower level output is provided by a number of GPIO pins which support common protocols like I²C. The B-models have an 8P8C Ethernet port and the Pi 3 has on board Wi-Fi 802.11n and Bluetooth. The Foundation provides Raspbian, a Debian-based Linux distribution for download, as well as third party Ubuntu, Windows 10 IOT Core, RISC OS, and specialized media center distributions. It promotes Python and Scratch as the main programming language, with support for many other languages.



Features diagram of raspberry pi 3B model fig.1

Board	Raspberry Pi 3 Model B
Processor	Broadcom BCM2837
CPU Core	Quad core ARM Cortex-a53,64Bit
Clock Speed	1.2Ghz (Roughly 50% faster than P12)
RAM	1 GB
Network Connectivity	1 x 10 / 100 Ethernet (RJ45 Port)

PIN DIAGRAM:



Pin Diagram of Raspberry Pi 3B model Fig.2

The Raspberry Pi 3 features the same 40-pin general-purpose input-output (GPIO) header as all the Pi is going back to the Model B+ and Model A+. Any existing GPIO hardware will work without modification; the only change is a switch to which UART is exposed on the GPIO's pins, but that's handled internally by the operating system

ULTRASONIC SENSOR:

Pin Number	Pin Name	Description
1	VCC	The VCC pin powers the sensor, typically with +5V
2	Trigger	Trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave.
3	Echo	Echo pin is an Output pin. This pin goes high for a period of time which will be equal to the time taken for the US wave to return back to the sensor.
4	Ground	This pin is connected to the Ground of the system.

Ultrasonic sensor fig.3

METHODOLOGY:

This project Waste Monitoring System using IOT is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins over mobile or computer. For this, the system uses ultrasonic sensors placed over the bins to detect the garbage level and compare it with the garbage bins depth. The system makes use of Raspberry Pi for sending data over Node-RED cloud. Node-RED is a visual tool for wiring the Internet of Things (IOT) that can be run on a Raspberry Pi and allows for rapid prototyping of this project.

RESULT:

In this project we are monitoring the level of garbage in dustbin as describe below. We used Node-Red for creating and accessing servers to send and receive data.

Fig.4

In the fig.4 , we observed that when our dustbin is empty the reading value of gauge on mobile is also showing zero .

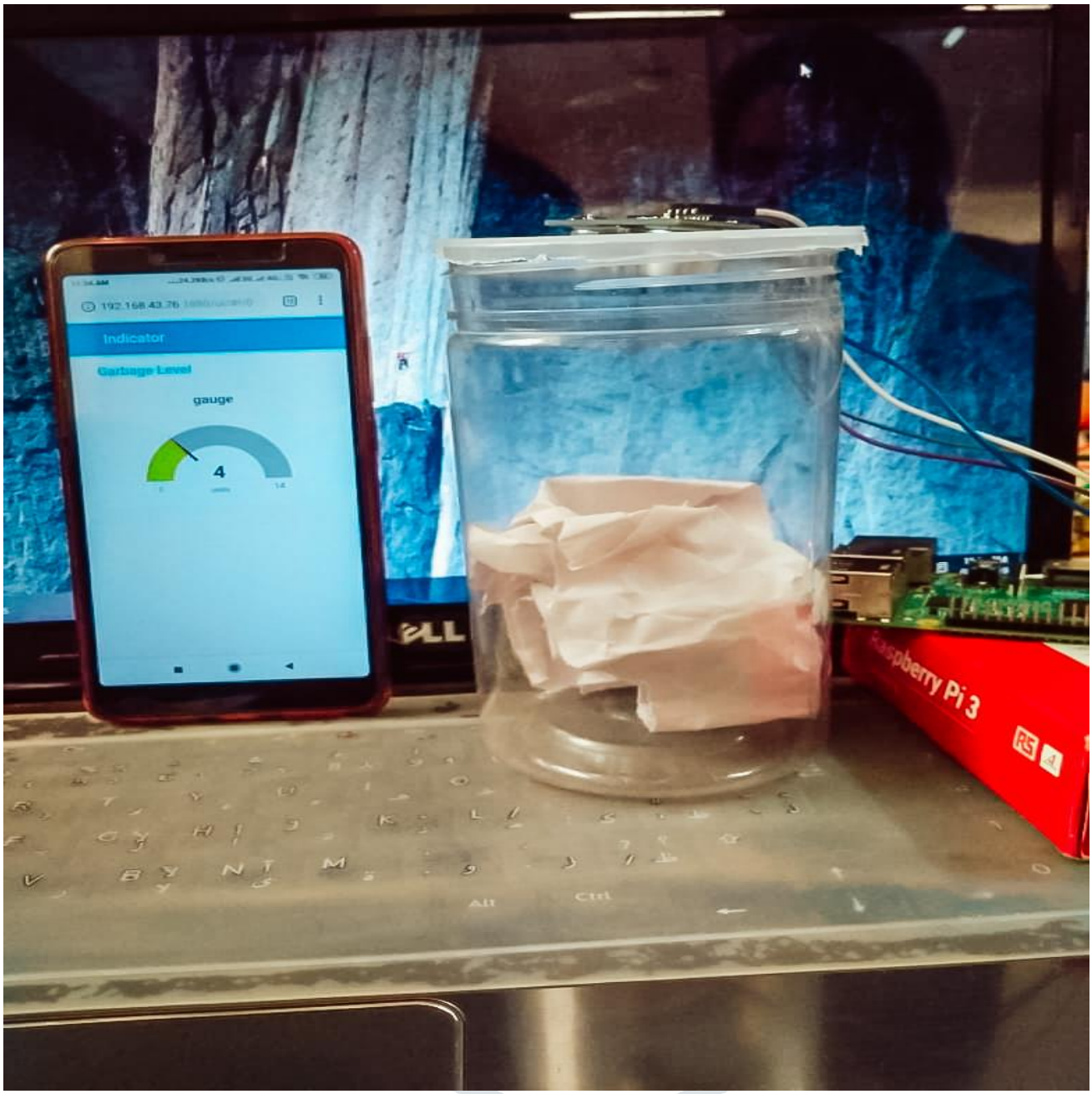


Fig.5

In the fir.5 we observed that when we added some garbage into our dustbin, then then the value of gauge changes from zero to 4 cm with color green.

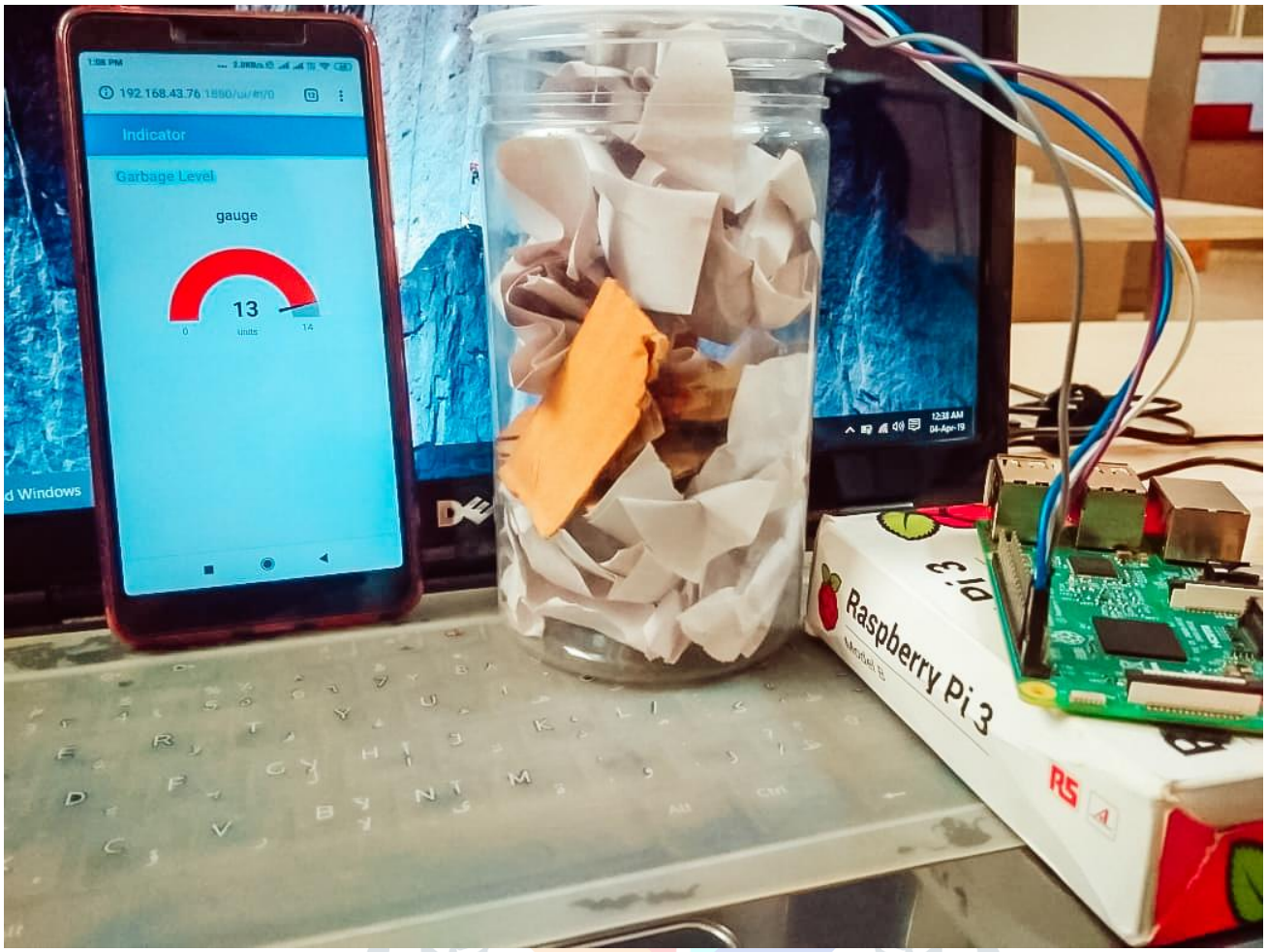


Fig.6

In the fig.6 we observed that when our dustbin gets almost full with garbage, then the value of gauge changes from 4cm to 13 cm with color red.

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