Interlinking of IoT, Big data, Smart Mobile app with Smart Garbage Monitoring

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Abstract - Interlinking of IOT, Big Data and Android, Now arises a question, what's link between these technologies? As, IoT is a technology where world is stepping towards future development, Internet of Things (IoT). Internet is interconnecting of networks, Things means Devices or Objects (Interaction between Objects). IoT is not mainly creating smart gadgets or connecting more things to the internet, machine-to-machine (M2M) technologies can be seen as the first phase, in the next phase the connectivity of physical objects together connected in support of intelligent decision making operated with Sensors and Actuators. A Sensor is used for grasping the input from any object and an Actuator is used for activating the device based on the input taken from a Sensor, here comes the need of Big data Analytics, Data was getting seriously big even before IoT entered the picture. If Big data is "Heart" of advancement, IoT is the "Soul". Where sensors sense objects continuously time to time and forward in every bit of second, processing which in cause memory load that should be maintained, so the huge amounts of data should be collected and maintained with Big data. Data Analytics for extracting actual information from huge amounts of data. Now comes Smart App which has more scope with introducing of smart gadgets where maximum people are aware the applications in them. So for user interaction purpose we introduce mobile apps by directly giving access to the users. In this paper I have given brief introduction of Interlinking of IoT, Big Data and Smart mobiles focusing on one of major problem in society i.e., Garbage Monitoring replacing with Smart Garbage Monitoring.

Keywords- IoT, Big Data, Android, Sensor, Actuator, Smart Gadgets, Data Analytics

I. Introduction

Garbage is a word which in term used for waste. Still in many cities we are using manual Garbage Monitoring, collecting and maintaining with manpower. In the traditional system, there is no proper management of garbage time to time, which causes different problems for both to the government and also to the people in the form of health issues, maintenance and so on. Now I want to introduce a new System for eliminating all the issues caused by the Manual System, Replacing with a Smart Garbage Monitoring. With this system I want to introduce a method of detecting the waste levels and also the type of wastage and segregating automatically without any human interaction. Next to it, providing a new interface between the Government and the user with an android app. As smart mobile is daily use for the society, so that the levels of particular wastage of a certain user is shown to the user and a certain amount is collected depending on the level of waste and type. So here the

user will also get awareness of the problems. Maintaining the data collected for every second from the IoT devices is difficult, So Big data is used for collecting huge amounts of data and different tools of Data Analytics are used for extracting the particular information of a particular user and forwarding to the next phase.

II. IoT (Internet of Things)

Here things are devices or Objects where the communication goes between the objects time to time so the actual output can be given without the major need of the man power, coming to in our Smart Garbage monitoring system the previous waste collection bins are replaced with smart bins, where each bin is attached with a sensor which is going to the sense the data for every fraction time and passes to the further processing system, where the central processor process the and forwards to the actuator for

actuating(taking further action), So what is a Sensor and Actuator and interaction between them[4].

A Sensor is a device that detects the changes in a physical object with different properties based that may either using the light waves, humidifies, touch based, patterns and so on, based on their these sensors are divided in to different types as of humidity sensors, ultrasonic sensors and so on[6]. A sensor is the one which takes the input in different methodology and forwards to the further processing on their properties

In this application we use Ultrasonic sensor, these "are based method of measuring the properties of acoustic-waves with their frequencies that are above the level human audible range," often it may range roughly 40 kHz. They work typically by generating a frequency of high pulse of sound waves, and the echo pulse properties are received and evaluated.

For different sensing purposes. 3 different properties are developed based on their need those are:

- For sensing distance **Time of flight**

- For sensing velocity **Doppler shift** is used

- for sensing distance, directionality, or attenuation coefficient **Amplitude attenuation**
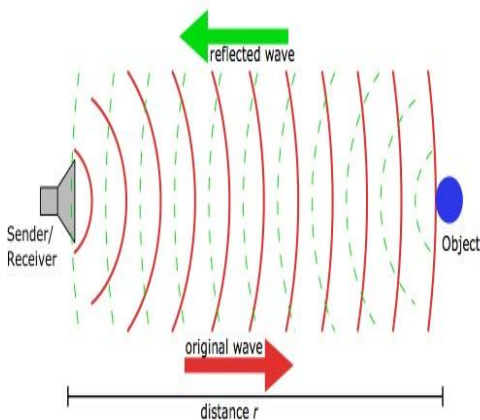

Figure.1

So here I am using the ultra-sonic sensor for finding the level of bin filled with a Time of Flight technical where is light wave is released and after it is reflected back here we will calculate the distance of the light with its time, as we save the properties before only for the bins, so I can accurately calculate and evaluate the level if bin whether it filled to what level

and still ho level is remained , these all information is calculated for bit of second , evaluated and forwarded to the central server for time to time and further proceeding are done at the central server

An **actuator** is a main part of a machine which is responsible for the movement or control of a mechanism or any system **[6]**. It requires a controlled signal along with some source of energy for working. A control signal may be relatively low which requires an electrical signal of strength of some ohms, either pneumatic or may hydraulic pressure, or it may even take human power. The main energy source may be hydraulic   fluid pressure,   or pneumatic pressure, electric current, the actuator responds by converting the energy into mechanical motions when it receives a control signal. It is a mechanism by which is a system that controls which acts upon an environment. The controlled system may be simple (electronic system or fixed mechanical), which is software-based it may be a printer driver, robot controlled system a human, or it may base on any other input given

SO here the sensor and Actuator plays a major role in IoT right from sensing (taking input) actuating (showing the output with response based upon the necessary that should be performed.

III. Big Data in Smart Garbage

Here coming to our Smart Garbage Monitoring as were are moving to the automatic detection of the input from sensors , so the sensors will detect the level of waste along with type of wastage and so on, If one sensor detect and send data for a second it is low if there is an increase in sensors and also the data should be collected for every fraction of second so here there will be different sensors which will send data for every second and all the data should at every time slot should be processed and maintained at the central server should be forwarded to the further proceedings, here if the data is from few sensors and for some time slots its ok to maintain, but if the sensors sense for every second and it increases to minutes and hours and days and so on increase in no of sensors , so here the data is growing rapidly and rigorously , here the difficulty arises for the storing those data as for every storage there is a limit of storage capacity , and also from huge volume of data it is difficult to maintain, segregate and

pick the necessary data what it requires, for receiving the required data also it takes long time as it decreases the performance of the application, fore successful running of any application there should be increase in throughput along with proper maintenance and it should be reliable if any failure causes also, if we store data at a single storage here the limit may arise as of memory load cause and also if that single storage disk crashes, we lost all information and it falls in the failure of the system[6].

So that's here the Big data entered into our application where we will receive the data for every fraction of second and also from many sensors(bins), all this data is collected which is huge can be maintained and processed with the Big data analytics, Big data and its history and need is given below.

Big Data

It is a term which describes with a large-volume of data i.e. may be in a structured or unstructured – that increases the complexity of need for business on a day today basis. But it's not all the amount of data that is important. It is that what the organizations may do with the data that matters. So it should be analyzed for the insights that may lead for better decisions and major strategic business trends [5].

History and Current Considerations

Of course the word "big data" is almost relatively new, the method of gathering the information and storing and analysis is earlier. The term is defined in terms of [5]

Volume. Here this is term where the general meaning it self gives that is a collection of huge amounts of data that is increased day to day even for minute to minute in this generation, so this all data should be collected and stored in a more reliable way

Velocity. Here this velocity denoted the speed how the data transfers based on different technologies as here we are using the sensing technologies, so the speed should be accurate and with more performance as the data is collected for every bit of second

Variety. It represents the types of data for storing or receiving here when we talk about data the data may or may not be represented in a format, so here it

discussed in structures and unstructured data, depending how the data is collected and processed

Variability. Already we got of verity and velocity with volume now if triggered clocks operations should be done on unstructured data, so there is variability here.

Complexity. Last but not the least the complexity is increasing daily with data formats, memory operations and further processing of information with using the large volumes of data and performing different analytical methods.

Need of Big Data

- **Reduction in cost.** Big data works with technology such as Hadoop and cloud-represented analytics which results in cost effective for storing and processing the analytical operations.
- **Higher performance.** With the implementation Hadoop methodology here the performance is rapidly increased with analyzing data from memory in a more accurate manner
- **Later products and services.** As the technology is improved in more efficient manner so there is a need for producing new latest products with high performance which work in a more efficient way
- **Faster growing with technology.** As the technology in more advance manner so the implementations should be taken in a more accurate for moving along with growth of technology with showing major methods for better performance[8]

Figure.2

- Showcasing the root causes for failures, with issues and defects in very near-real time.
- Once again calculating risk portfolios in minutes for entire
- fraudulent behavior's detection should be done before it affects our organization or system

IV. Mobile Application in Smart Garbage

Here comes the last but the latest technology we use in our application i.e., is the introducing a mobile app for easy interacting with the users with their smart mobiles, Smart mobile it the name which is introduced in the last few years which is now ruling all the world, as of now a human can survival without food or relations and so but he is not able to be idle for a minute or second without a smart mobile , that much impact has been factored with these invention smart devices , these smart devices are increasing day to day with new improvements for every minute a new mobile is coming into market with most advancements.

There are different companies with different mobiles following different architectures for inventing the mobiles with different Mobile Operating systems, some of most popular smart operating system are IOS (apple), Android (Google), Microsoft (Nokia Lumia), Black berry these are most popular once which release their mobiles with different architecture and technologies which is different from others, but their ultimate goal is to reach and create an interactive friendly nature with the user.

These provide services by introducing different applications for providing different services to their use, there are many applications and also is huge number of increase rate in the invention of new applications into the market from different mobile operating systems.

Here in this Smart Garbage Monitoring we are introducing a new application for providing the services for every user, so that the use can directly interact and also get aware of what is going and also he can pay the cost required for garbage maintenance through that app, now he can be more transparent and he will also get knowledge how to be aware for the next steps for providing his service to the society

V. Implementation

So now coming to the implementation part, here we introduce smart bins in part of previous waste collection units, these bins collect the data with the use of ultra-sonic sensors, it is the one which the operation is based on reflection of light a light wave released from the sensor passes in a straight line whenever an object is interrupted, it reflects back to the receiver in the sensor device, here it will calculate the distance by using the light propagated and reflected back by its time, so that we can detect whether a bin is filled at what quantity, so there are other sensors which are used for detecting type of material in the bin which are used for segregating purpose as for separating the wastage into wet, dry and metal, so these information is collected and processed at the local server and then this is forwarded to the central server where the collection of information, maintenance and then processed for further sections as for sending the vehicles for particular area to collect the wastage depending on type of material it is segregated, So here we have replaced the manual system by introducing he automatic model , which provides more benefit and accurate information on time to time..

There are many disadvantages of manual system which are rectified with the introduction of this system,

1. In previous system there is no proper retrieval of data and maintenance, Accurate maintenance of the waste management, with better retrieving of information on time to time is done with this system
2. Now it is costlier for implementation ,but in future if the complete architecture is implemented it is gives a more need with a low cost as there no further maintenance as of manual system
3. In previous manual system there are problems such as diseases caused due to poor maintenance of the waste and collection at a particular time, so these type of inconvenience are rectified with proper maintenance on time
4. In previous manual system there is manual separation is done with human interaction, so this is reduced automatically when it is collected, so that these waste can be further

used for industries for implementing some other item from it which is useful in next part.

5. Here the user or the wastage disposal person on that particular area can get the accurate information with the introduction of the mobile app using his smart mobile

VI. Conclusion & Future work

Here in this paper I have given brief introduction of interlinking of IoT, Big data and Smart Mobile app by providing more interactive usage for the user with his interaction and also for proper maintenance of the waste management with their segregation and further process to the industries for their need, so coming to further implementation, I will show the outputs with their actual implementation with using the complete architecture.

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