THE NEXT STEP TOWARDS SMART CITY BASED ON BIG DATA AND INTERNET OF THINGS

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Abstract—The future of Smart Cities depend on the foundation of Big Data Analytics with its implementation to support the enhancements of the city with the technology, Internet of Things (IOT). The purpose of this paper is to modernize and enhance the technological development of the transportation with smarter, convenient and user friendly approaches. Many systems are working but here we bring some new ways and equipment to make life easier and healthier. With the help of bulk data storage the system do not get overflow any time, our proposed models have been designed keeping in mind the daily requirements and also how this helps to maintain growth and economy with the help of technology. The Smart Card for travelling costs payment, Smart Roads for safer and congestion free traffic roads and highways all build with sensors to detect the cautions which will make a difference in the present situation and will benefit in many aspects, smart waste management deals with the proper classification and filtering of expired goods with good products . These models will be implied and tested after all calculations are done. With proper calculations and minute implementation of our proposed model will not have any drawbacks apart from better alternatives in the future.

Index Terms—Internet of Things(IOT), Smart engineering Techniques, Sustainable city, congestion, Urban network.

I. INTRODUCTION

'Smart Cities' aims to decrease the challenges that the cities face, such as scarcity of energy resource ,healthcare, housing, water and deteriorating infrastructure(roads, schools and transportation).They also suffer from price instability, climate change, and the demand of better economic opportunities and social benefits. Recent advancements in Information and Communication Technologies (ICT) such as Internet of Things (IOT), aligned with technology cost reduction, such as cheap mobile apps, social media, cloud computing and cost effective ways to handle high volume data (i.e. Big Data), provides cities with better opportunities and tools to understand , predict, communicate with urban facilities. The challenges discussed above can be addressed effectively and efficiently through smart city technology. Nevertheless,this approach requires a multi-pronged approach because the problems are diverse. To start with, data scientists will have to use their skills to analyze the huge amounts of data generated by cities annually. Big data analytics will produce insights that city authorities could use to improve road and rail transport, reduce crime, improve healthcare, improve public service delivery, and reduce wastage of financial resources. Another technology that will make smart cities more efficient is the Internet of Things (IoT). This computing term refers to appliances and devices connected to the Internet. Many household appliances including fridges, washing machines, vacuum cleaners, locks, lights, and HVAC units can be tweaked to become IoT compliant. In turn, they could be used to monitor and provide surrounding environment feedback or perform certain tasks.In addition; cities can deploy this technology to improve service delivery. A good example would be water supply systems fitted with IoT sensors to measure water pressure, chemical composition, and flow. When undesirable changes occur, relevant authorities can take corrective measures immediately aided by real-time data.

II. RELATED WORK

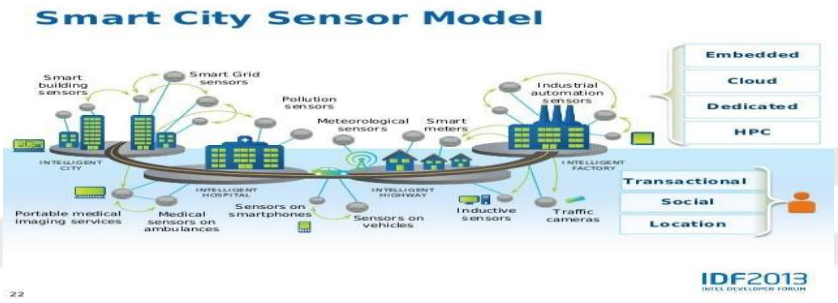


Fig.1: Smart City Sensor Model

The Core Infrastructure that was proposed that the Smart Cityincludes:

1. Adequate Water Supply
2. Assured Electric Supply,
3. Sanitation, including solid wastemanagement,
4. Efficient urban mobility and publictransport,
5. Affordable housing, especially for thepoor,
6. Sustainableenvironment
7. Safety and security of citizens, particularly women, children and the elderly,and
8. Health andeducation.

The Government is not prescribing any particular model to be adopted by the Smart Cities. The approach is not 'one-size- fits-all'; each city has to formulate its own concept, vision, mission and plan (proposal) for a Smart City that is appropriate to its local context,

resources and levels of ambition. cities will prepare their Smart City Proposal (SCP) containing the vision, plan for mobilization of resources and intended outcomes in terms of infrastructure up-gradation and smart applications.

III. PROPOSED WORK

A. Purpose of ProposedApproach

Purpose of this approach is mainly to include more smart features to the list which has already been proposed in the past. With the inclusion of new ,smarter techniques people will get the benefits of technology at a different level. With this proposition we want to highlight how Big Data along with IOT contributes a major part in building the foundation of Smart Cities and to provide the people with better and a Smarter City thanbefore.

B. Proposed Modules:

I. Smart Card–

Fig. 2: Smart Card

II. Smart Roads:

Fig.3: Smart Road

III. Smart Waste Management

Fig 4: Smart Waste

IV. MODULE DESCRIPTION

i. SMARTCARDS

A **smart card**, **chip card**, or **integrated circuit card** (**ICC**) is any pocket-sized card that has embedded integrated circuitsSmart cards are made of plastic, generally polyvinyl chloride, but sometimespolyethyleneterephthalate basedpolyesters, acrylonitrile butadiene styrene or polycarbonate. Since April 2009, a Japanese company has manufactured reusable financial smart cards made from paper.Smart cards can be either contact or contactless smart card. Smart cards can provide personal identification, authentication, data storage, and application processing. Apart from the previous work this new proposed Smart Card is used for Transportation purpose. Transportation include Bus, Trains, Metro, Private Cabs, Public Cabs and any means of transportation where we need to pay thecharges.

a. Work Definition

The Smart card can be used to pay the charges of travelling from one place to another. Rather than standing in a big queue, having a smart card saves time as well as smooth functioning of the system. With one swipe you can pay the money. The card will have a unique number for every individual. Same as the other cards this has to be recharged with an amount and after every travel the amount is deducted and the transaction history is stored in the database of the card. Since the database will store a bulk data, the concept and implementation of Big Data comes into picture. The Reader machine will store the Individuals information will increment the amount as deducted from the individual and can collect cash from the controlling authority. Based on the sensor it will detect whether the person is travelling from which type of vehicle and with the help of cloud it stored the transaction to the main database where all travel transactions are stored that helps the country to keep record of the travelling economy.

b. Benefits

With this Proposed Smart Card , the work labour of the managing officials are reduced, the execution and work pace is increased, and the users can travel with just one card in the pocket, which makes the city more advanced leading to a developed and a “SmarterCity”.

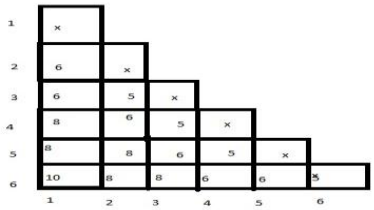
c. Algorithm

ALGORITHM OF SMART CARD:

STEP 1: Scan the Smart Card to enter.
STEP 2: Read N i.e. the UNIQUE CARD NUMBER of the Smart Card.
STEP 3: Check for CARD VALIDATION.
STEP 4:SOURCE gets initialized to the specified unique ID; Say X.
STEP 5: DESTINATION Y reached.
STEP 6: Scan the Card.
STEP 7: Calculates distance between X and Y
STEP 8: Already a stipulated amount for per km distance is provided; so calculation of the Price for travelling from X -----> Y is done.
STEP 9: A slip is provided to the customer C.
STEP 10: END

ALGORITHM OF CALCULATION OF DISTANCE AND COSTING:

STEP 1: The Amount present in the Smart CARD -->Card_BAL.
STEP 2: Read Source --> X.
STEP 3: Read Destination -->Y.
STEP 4: A Marker is assigned to every location i.e.
DumDum -> 1
Sodepur -> 2
Nagerbazar ->3
STEP 5: The Stipulated amount is stored in a matrix format as given



STEP 6: The Stipulated amount is stored in AMT by fetching the matrix through (Source * Destination).
STEP 7: If (X=Y) then ERROR
ELSE
The amount is deducted from the CARD of the customer and the
CARD_BAL := (CARD_BAL- AMT).
STEP 8: ST: =START_TIME.
ET: =END_TIME.
TT: =TOTAL_TIME.
TT: = (ST - ET).
IF (TT > 24 HOURS) THEN WARING SEND TO THE USERs PHONE_NUMBER.
AND FINE:= (Rs.M) DEDUCTED From CARD_BAL. CARD_BAL:= (CARD_BAL - FINE).
STEP 9: UPDATE the DATABASE after the FINE .
STEP 10: END.

ALGORITHM FOR DATA_STORAGE AND DATABASE:
STEP 1: The Fields in the DATABSE OF BOTH ADMIN AND USER.
i) UniqueCARD_ID.
ii) NAME_OF_USER.
iii) SOURCE_NAME.
iv) DESTINATION_NAME.
v) COST.
vi) TYPE_OF_VEHICLE.
vii) VEHICLE_NO.
viii) DATE_OF_TRAVELLING.
ix) BALANCE.
x) START_TIME.
xi) END_TIME.
xii) FINE.
STEP 2: AUTOMATICALLY Updates the DATABASE after every tour.
STEP 3: END

ALGORITHM FOR CARD VALIDATION:
STEP 1:CHECK for the VALID Unique CARD_NUMBER from the AUTHENTIC LIST OF REGISTERED USERS.
STEP 2:IF STEP 1 is TRUE THEN GOTO **STEP 3** else GOTO **Step 6.**
STEP 3:IF CARD_BAL != NULL THEN GOTO **STEP 4** else GOTO **Step 7.**
STEP 4: IF CARD_VALID= TRUE THEN GOTO **STEP 5** else GOTO **STEP 8.**

STEP 5:ACCESS GRANTED.
STEP 6:INAVLID USER.
STEP 7:MESSAGE TOKEN --> NOT ENOUGH BALANCE TO TRAVEL.
STEP 8:MESSAGE TOKEN --> CARD OUT OF DATE.
STEP 9:END

ii. SMARTROADS:

The idea behind Smart Roads include Intelligent Highways with warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams. The road will have digital boards which will direct them to proper directions if there are casualties ahead.The road lighting will be connected to light, weight or motion based sensors that will only illuminate the lighting in that area whenthere is passing traffic. Apart from this the alternative route will be shown with directions along with it.

a. WorkDefinition:

Sensors will be installed at particular places on the highways which will connected over the internet to the display board. Proper GPS systems and Maps pre fed in the system automatically shows the best alternative route to the destination. Weather sensors will predict the weather forecast to avoid accidents and warning is any accidents took place ahead. Since data are being displayed and stored Big Data and IOT helps in implementation of the model.

b. Benefits:

Helps people not to get stuck in the traffic or do not have to face any kind of accidents. Saving of energy as street lights get dimmer when there is no traffic. This reduces the power consumption leading to low expenditure. Smart Roads will add to great importance under the Smart Cities initiative.

c. Algorithm

SMART ROAD ALGORITHM

STEP 1: INITIALIZE d[s] = 0 for all v ϵ V {s}, where s as source, V as set of all vertices. Do d[v] =∞. //set all node's distances to ∞ excepts.

STEP 2: Get the current position (x1, y1) of source node fromGPS.
Source_x = x1;
Source_y = y1;
Dist = 0;

STEP 3:S is the set of visited vertices.
Set S = φ //S is initially empty.
Q = V //Queue initially contain all the vertices. While Q ≠ φ //while Q is not initially empty.
Do u = mindistance(Q,d) //select element of Q with min. distance.
S = S U {u} //add u to the list of visited vertices.

STEP 4: Get the position (x2, y2) of the visited nodes from GPS
Current_x = x2; Current_y = y2;
Distance = √(x2-source_x)^2+ (y2- source_y)^2.
Dist = distance + distPrevious_x = x2; Previous_y = y2;

STEP 5: For all v ϵ neighbours[u]
Do if d[v] > d[u] + w [u,v] //if new shortest path found.
Then d[v]=d[u] + w [u,v] //see new value of shortest path if desired then trackback.
Return dis.

STEP 6: If Collision takes place Make the last visited node the new starting node and find the shortest path to the destination node.
Get the current position (x1, y1) of source node from GPS. Source_x=x1;
Source_y=y1;
Dist = 0;
Q = V //Queue initially contain all the vertices. While Q ≠ φ //while Q is not initially empty.
Do u = mindistance(Q,d) //select element of Q with min. distance.
S = S U {u} //add u to the list of visited vertices. For all v ϵ neighbors[u]
Do if d[v] > d[u] + w [u,v] //if new shortest path found.
Then d[v]=d[u] + w [u,v] //see new value of shortest path if desired then trackback.
Return d.

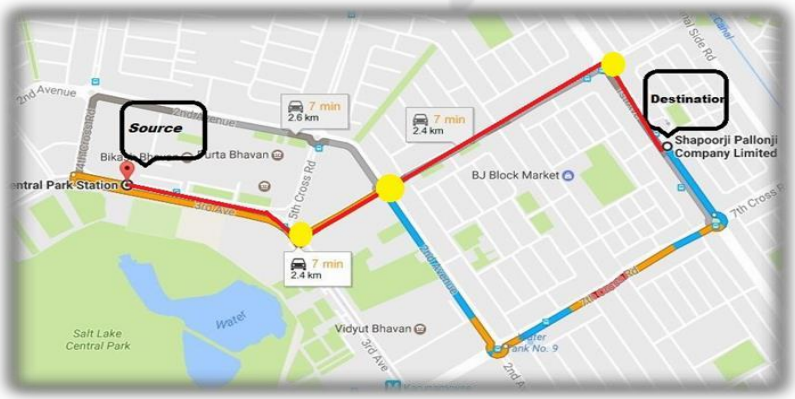


Fig. 5: Shortest Path

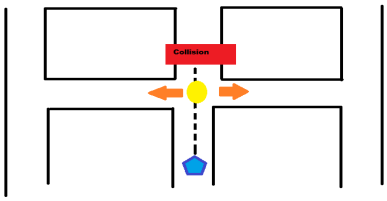


Fig. 6: Collision Detection

iii. SMARTWASTE

1. The software is based on the storage of database of the different products that are in the store.
2. The database consists of the name of the item, manufacturing date, expiry date, current date and status of the item.
3. Check if the Current_date matches with the Expiry_date or exceeds it; then check whether the item is DEGRADABLE or NON-DEGRADABLE.
4. The software separate the degradable and non-degradable in two distinct containers D and ND respectively.
5. The containers D and ND are emptied the next day.

a. Work Definition:

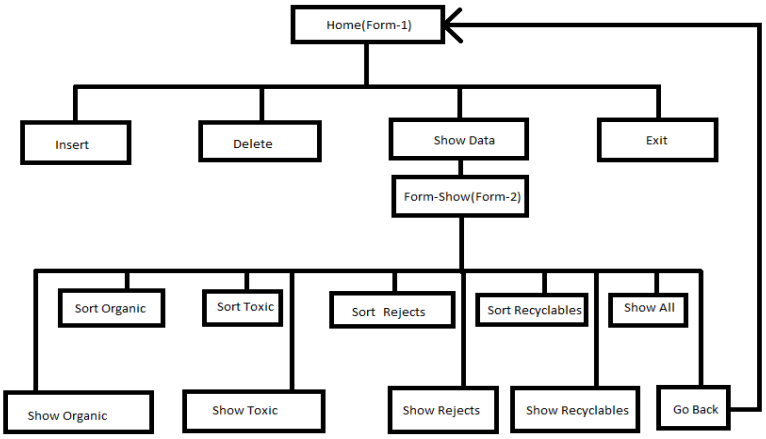
Our objective is to implement Smart City based on the domain Smart Waste Management System, which includes:

- Segregation wastes into respective categories.
- To make it possible to reuse the recyclable wastes.
- To create an eco-friendly waste management system.
- To recover values from wastes and discard harmful items.
- To find an alternative to the expensive and hazardous processes like landfill, incineration.

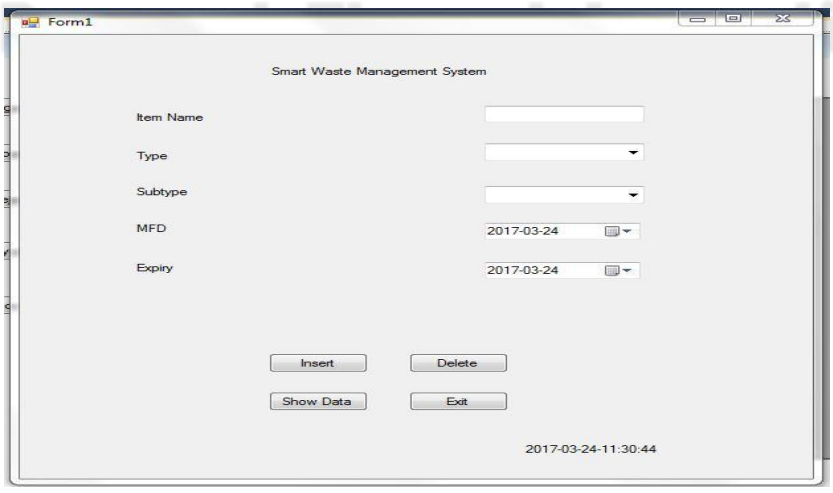
b. Problem Definition:

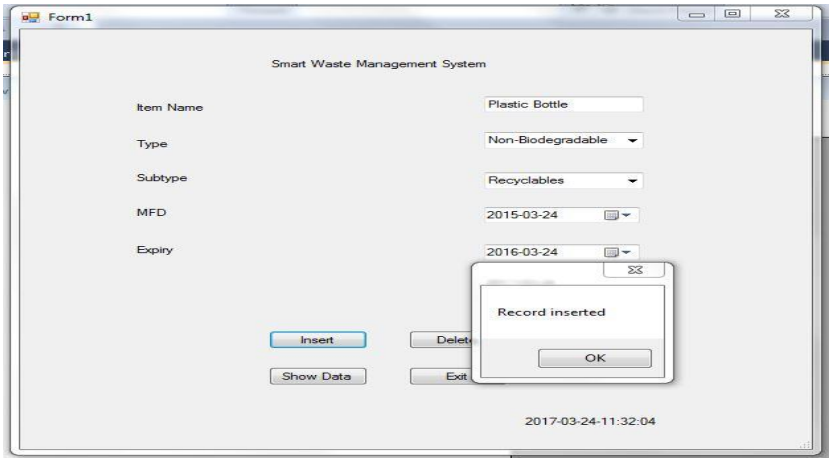
Solid waste is essentially garbage i.e. the wastes produced in our homes, businesses and some industrial sources. All the household wastes are piled up into a container or a bag and they are dumped somewhere, resulting mixing them all to gather. These mixed wastes are hard to segregate, thus making it impossible to recover the re-useable items. Waste production in this country is growing in volume and in toxicity. More and more of our everyday products contain toxic chemicals, such as mercury or PBDEs (flame retardant chemicals), and these toxic products are combined with a plethora of other chemicals, which eventually impact public health and the environment. Most contemporary waste management efforts are focused at local government level and based on high tech / high energy waste disposal by methods such as landfill and incineration. However these methods are becoming increasingly expensive and energy inefficient. In other words waste disposal is not sustainable and will have negative implications for future generations. By our new approach household wastes can be segregated and recorded into databases by marking them into their respective categories like Organic, Toxic, Recyclables, Rejects which will allow provide us an eco-friendly waste management and also enable us to recover economic values from household wastes.

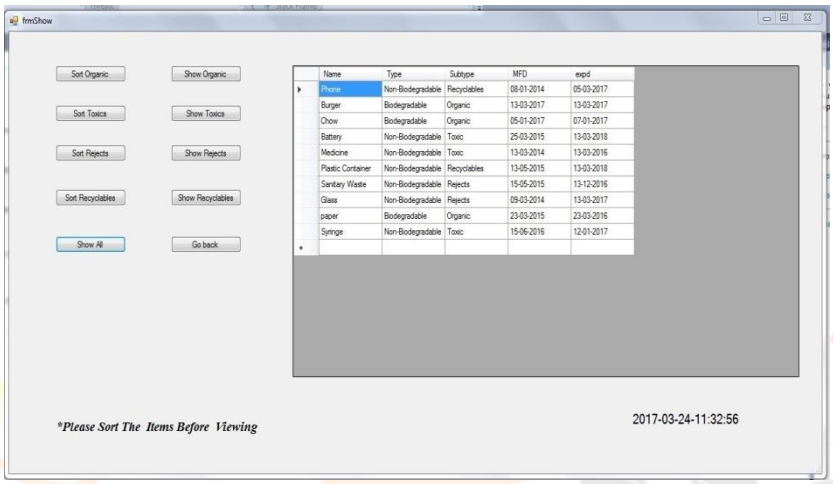
c. Application Workflow:



d. Results:




Form1
Smart Waste Management System
Item Name
Plastic Bottle
Type
Non-Biodegradable
Subtype
Recyclables
MFD
2015-03-24
Expiry
2016-03-24
Record inserted
OK
Insert
Show Data
2017-03-24-11:32:04


frmShow
Sort Organic
Show Organic
Sort Toxics
Show Toxics
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Show Rejects
Sort Recyclables
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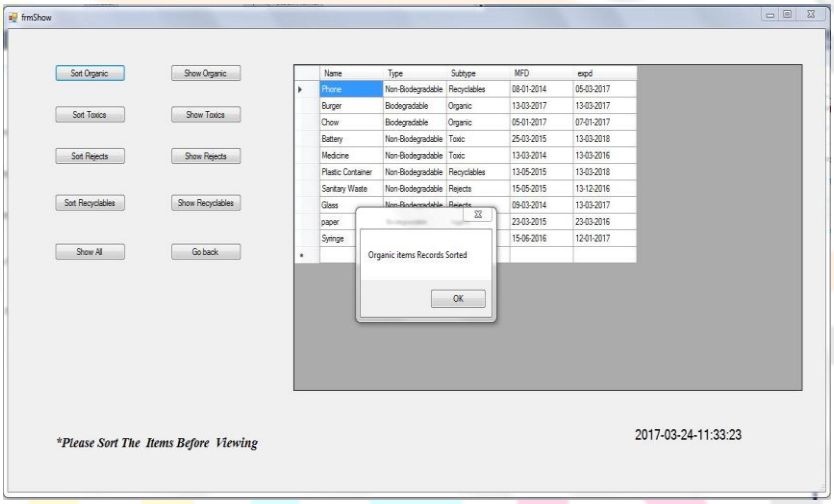
Show All
Go back
*Please Sort The Items Before Viewing
2017-03-24-11:32:56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Organic items Records Sorted
OK
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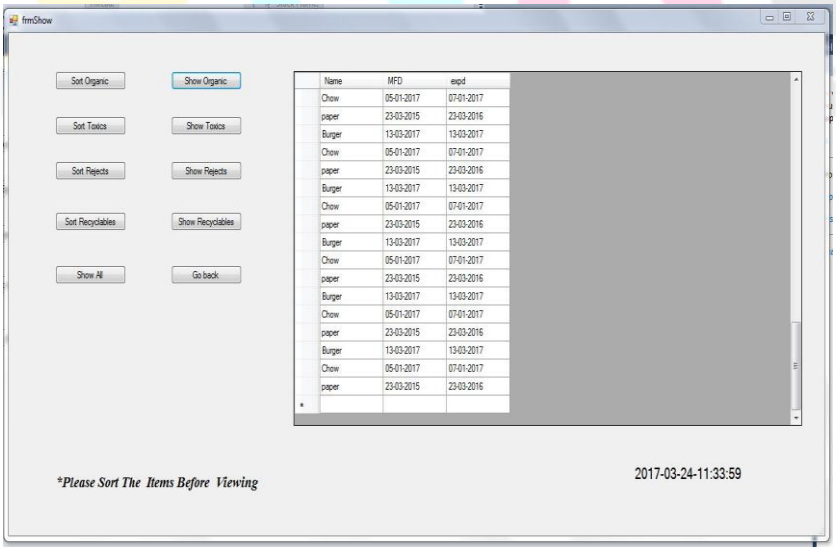
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