Aerial Reconnaisance For Municipal Services Using Gis & Gps Based Target Tracking System

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Abstract *-- The management of municipal services such as Roads, Buildings, Water Supply, Waste Water, Street Light, Recreational areas, etc requires a lot of information related to location, distance and area. But the available information on the above fields are not very easy to access and not accurate. Recently, due to the internet evolution on the development of Google Earth provides a virtual Globe and gives a real picture of the ground. Using this we can fly anywhere in the earth and view the satellite imagery, maps terrain, 3D buildings etc. Hence, in order to do the management of urban infrastructure especially solid waste management, requires a lot of spatial information such as to locate the solid waste collection point /bins housing density, Optimal routing of vehicles, open land details, monitoring the movement of vehicles, etc. The objective of this paper is to study the usefulness of Google Earth for Municipal Application and propose the methodology for the GPS based tracking of the vehicle.*

Keywords *-- Municipal services, GIS, GPS, Tracking, Execution status*

I. INTRODUCTION

The e-Governance places a vital role in urban local bodies to manage and administer their area. Since the management of urban local authorities requires to manage the data such as Water Supply, Sewage, Street light, Roads, Water Bodies, Recreational areas and their asserts in day to day activities among the above field. Nearly, 70% to 80% of information which we are handling in day to day works is based on the location/point, distance and area. For that we are depending on the map and data i.e., spatial data or maps. At present, the available information's are not easy to access and accurate.

In order to understand and provide accurate and timely data and to take better discussion, we are in need of map based information. As per mandatory reforms of JnNURM advocates for the implementation of geographic information system in JnNURM implementing cities and advice for the all other towns. In similar way, cities are started to create GIS for their ULBs, but none of the city has reported the completion of the task in a full-fledged manner.

In a mean time, the local authorities are sharing and managing their town data information to the public as well as professional through expressing it electrically, primarily over the interact through email and web portals.

In recent days Google earth, virtual globe as a visualization tool is widely known and has a high potential to display the satellite image, maps,3D information, historical image, distance measurement tools, etc. throughout the world.

Google earth is highly used for not only to display the detailed district plan of the urban design guidelines or related document but can also offer a possible method for stakeholders to experience the planning site from anywhere via internet. Stakeholder to experience the planning site from anywhere via the Internet. Hence the urban design guidelines is more initiative and dramatic to both professional planners and stakeholders (Zhenjiang shen, etal 2013)

For the success in plan preparation requires effective Stakeholder participation. The conventional way of sharing information's are through paper based drawings and read only digital format (pdf) made accessible over the internet. Some of the planning tools computer aided design (CAD) and Geographic Information System (GIS) allowed the planning authorities to design and publish the electric maps, searchable drawings and other auxiliary documents. The conventional methods of the above cannot offer sufficient ways for users to experience all of the aspects of the planning sites. Virtual Reality (VR) can also be used to represent planning sites on the internet as reference material for stakeholders. With the latest developments in virtual globe technology, it is now possible to develop a seamless and continuous multi-scale 3D visualization platform to share urban planning information in the public participation process.[1] Both professionals and general public are used to visual approaches (wu.et.al.2010) In the planning design process, users can exchange their ideas more easily and accurately by using a virtual environment on the internet with effective communication process. It is possible to enhance public participation as well. As discussed

above, the virtual model is effective at improving the information flow and helps disseminate technical knowledge to the public. The implementation of a hydraulic design project in some public hearings resulted in increased interactivity between stakeholders and improved communication efficiency for public participation by the VR system (jianget al, 2003).[1] On the one hand, stakeholders without a professional background in planning and design can learn the urban plans and share the opinions. On the other hand, designers and planners can improve their design works based on feedback from the stakeholders.

Although Google Earths Virtual Reality has a high potential for the management of urban local bodies, only few reports are available. Hence, this paper proposes to study "the Google earth and its products. And also the tools and other information's are available in this software for utilization.

And other objectives are to study about of Google earth for mapping and measurement of road, building and municipal assets. And also to study on the usage of Google earth for mapping the solid waste collection points, GPS enabled vehicular tracking system and to study on advanced level of GPS solid waste collection monitoring system.

II. OBJECTIVES

The Objective of this paper is

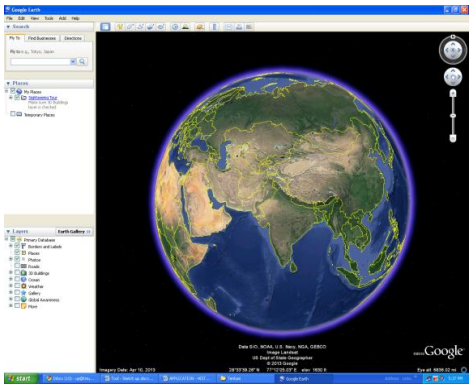
1. To study about the usefulness of Google Earth software for municipal application
2. To study about the GPS based vehicle tracking system and its usefulness for municipal management.

III. MATERIALS AND METHODS

a) About Google Earth

Google earth is a virtual globe, map and geodata created by keyhole .lnk ,a central intelligence agency (CIA) funded company acquired by Google in 2004, which is shown in fig.1

Figure 1: Virtual Globe, Google Earth



The Frame work of Google Earth provides an information on search option , Finding the optimal direction option and handling of layers etc. And also provide tools for zoom in and out, Co-ordinate and satellite image details etc.

It has two products namely

1.Google Earth (a free version with limited function)

2.Google Earth Pro ($399 per year), which is intended for commercial use.[2]

The features of Google earth are as follows:

1.Wikipedia and Panoramic integration, 2.Flight simulator, 3.Featured planes, 4.Sky mode, 5.Street View, 6.Water and ocean, 7.Historical Imagery, 8.Mars, 9.Moon, 10.Liquid Galaxy.

Among the above feature the Street View and Historical Imagery is used for the urban management.

Street View[2] On April 15, 2008 with version 4.3, Google fully integrated its Street View into Google Earth. In version 6.0, the photo zooming function has been removed because it is incompatible with the new 'seamless' navigation.

Google Street View provides 360° panoramic street-level views and allows users to view parts of selected cities and their surrounding metropolitan areas at ground level. When it was launched on May 25, 2007 for Google Maps, only five cities were included. It has since expanded to more than 40 U.S. cities, and includes the suburbs of many, and in some cases, other nearby cities. Recent updates have now implemented Street View in most of the major cities of Canada, Mexico, Denmark, South Africa, Japan, Spain, Norway, Finland, Sweden, France, the UK, Republic of Ireland, the Netherlands, Italy, Switzerland, Portugal, Taiwan, and Singapore.

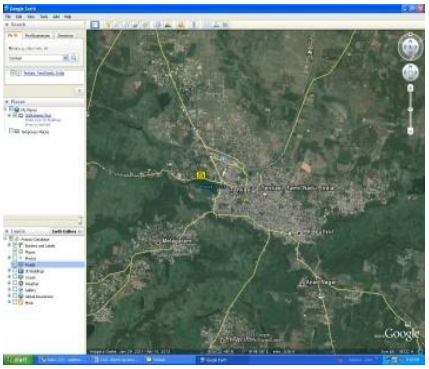
Google Street View, when operated, displays photos that were previously taken by a camera mounted on an automobile, and can be navigated by using the mouse to click on photograph icons displayed on the screen in the user's direction of travel. Using these devices, the photos can be viewed in different sizes, from any direction, and from a variety of angles.

Historical Imagery[2] Introduced in version 5.0, Historical Imagery allows users to traverse back in time and study earlier stages of any place. This feature allows research that requires analysis of past records of various places.

b) Search Tool in Google Earth

Using search tool in Google earth, we can zoom it in to the specified place on the Google earth. For example, searching for the location Tenkasi [one of the town panchayat of state of Tamilnadu], Google earth zoom in to the tenkasi town panchayat area.

Figure 2: shows the output of search tool.



The above tool will be highly useful to locate the concerned municipal or Town Panchayat area among the entire global data. And also the satellite imagery of this level gives overall picture of the town. Hence We can infer municipal area development, land use types, density, vegetation details etc.

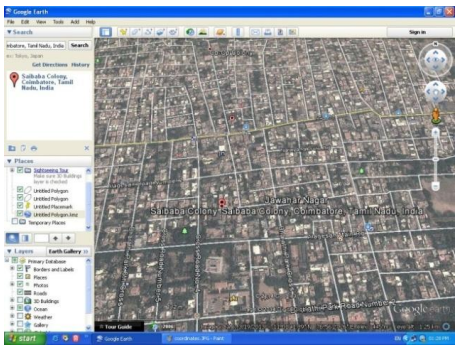
And also by clicking the primary data bases in the layer tools such as border and labels, place, photo [panoramic/360° cities], roads, 3D buildings, etc. Displaces concerned geographic details which is computed on the imagery and displayed.

The above layer information gives more map information for better understanding the areas such as street names, boundaries, photos etc., which was added by Google earth organisation as well as different user communities of Google earth.

c) Geographic Tools

The co-ordinates of the particular location can be known, by moving the curser on the particular location which also gives elevation and viewing altitude [eye alt]. The co-ordinate will be highly useful to locate the point on the ground using the GPS device/Android phones.

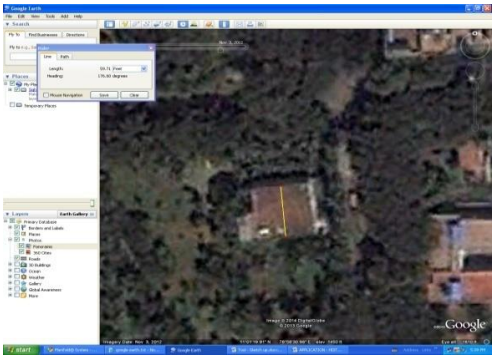
Figure 3: Geographic Tool



d) Measurement Tool

Line tool The measurement tools in Google Earths are line, path and area. The distance and area can be measured from the imagery.

Figure 4: Line Tool

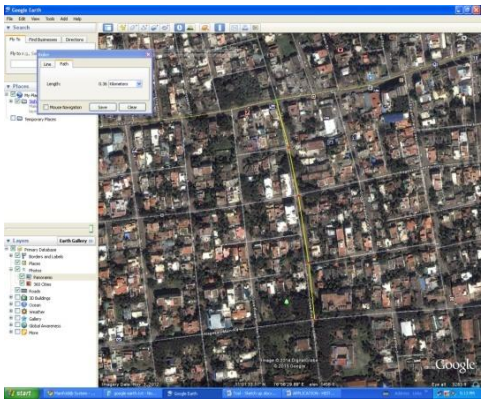


For example, the length measurement of the building which is shown in figure gives 59.71 feet and as per the field measure on the ground is 60 feet. Hence, accuracy of the measurement is 99.5%.

Hence an above tool will be useful to take out the length measurement of either side of the building as well as roads.

Path tool If the road is not a straight line either curved/bend in nature, the path tool provides a node in between the two points.

Figure 5: Path Tool



e) Historical Imagery

This feature is introduced in version 5.0, allows traversing back in time and studying either stages of place. This allows to analyse the past records of various place, growth of the town, development of infrastructure mushrooming of unauthorised development on the municipal land etc. The following figure shows the development of the building on the site at various stages can be found out in the figure.

Figure 6: Imagery as on March 17th, 2010

Figure 7: Imagery as on June 09th, 2010

Figure 8: Imagery as on January 21st, 2012

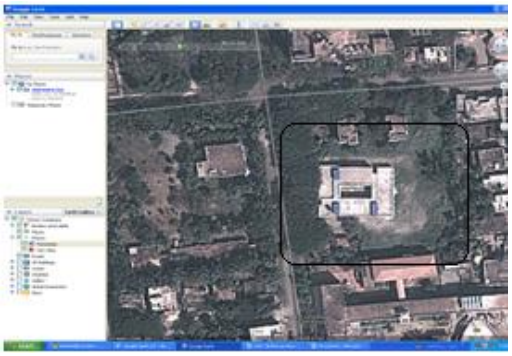
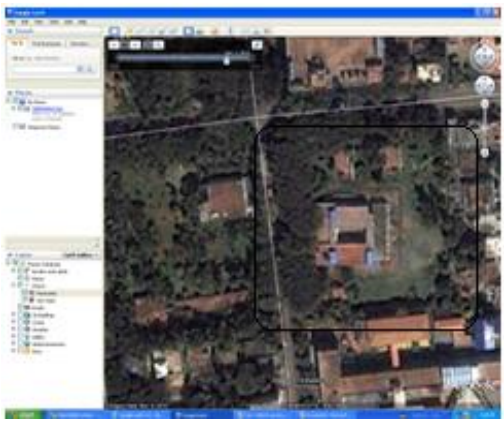


Figure 9: Imagery as on November 03rd, 2012



From the above figures, it is observed that, Google Earth provides the development in the particular site at different stages. This information can be useful to the planning authorities to study the land use changes and the development of the buildings.

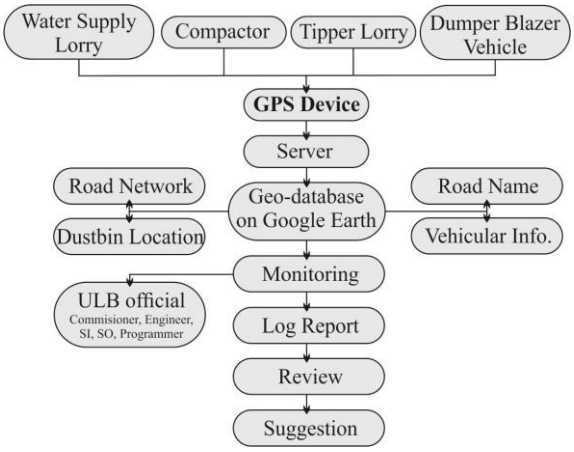
IV. VEHICLE/TARGET TRACKING SYSTEM

GPS based vehicle tracking system is one of an efficient and effective tool to monitor the routing of the vehicle and to take out the 108 report of the vehicle. Google earth provides an interface to publish the map information and can be viewed through online. From which we can able to know where the vehicle position, the previous route of the vehicle, trip distance, vehicle information such as diesel consumption, and RC information etc.

The data will be stored into the database and can be viewed and printout can be taken out .

As per the following methods the GPS based vehicle information can be achieved for the urban local bodies. The proposed methodology for the GPS based vehicle information are as below,

Chart 1: Flow Chart for tracking system



a) GPS Device

The GPS device can be fixed in the water supply lorries, tipper lorry, compacter, dumper blazer vehicle and JCB etc. The figure shows the model GPS device which can be fixed on the suitable place of the vehicle**.**

Figure 10: GPS Device

Source: Primary Data, Image clicked by author.

b) Geo-Database

The dash board and data base can be developed to receive the GPS data from the device and also the road network can be mapped such as road name, land mark etc. from the satellite imagery. Other information can be inputted into the Geo-database are Municipal Boundary, Ward Boundary. Road Network and Road Name Solid Waste Collection Point and Bin Location, Vehicle information : Type of Vehicle, Purchasing date, Purchasing value, RC book number and Expire date, Engine Number, FC Date, License details, Usage (water Supply / Solid Waste), Insurance, Tax, etc.

ULB Land assets : Municipal Office (Main and zonal), Solid Waste Dumping Yard, Park, Water Tanks, Schools, Hospitals, Burial Ground, Bus Stop, Municipal Commercial Shop, Markets (Vegetable, Fish), Slaughter House, Treatment Plants, Bus Stand. Other information's – Banks, Temples, Hospitals, Schools, Government Offices (EB, Telephone, Fire Service, etc,), Tourist Places if any, Cinema Theatres, Kalyanamandabam, Hotels, ATMs, Community Centre, Reservoirs, Lakes, ponds, rivers, Recreational Centres, Church, Mosque, etc.

c) Monitoring

The administrator and executive authorities can view and access the data in map format as well as report format through dash board developed over the Google earth. Separate login and password may be given to them to access the information in a secured manner.

Figure 11: Monitoring the route & vehicles

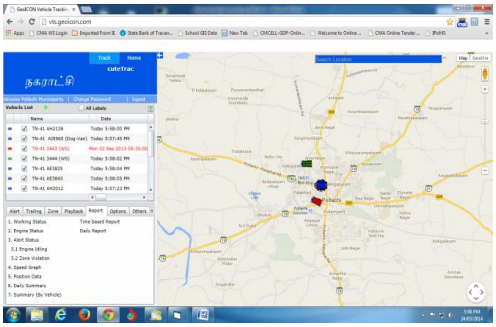
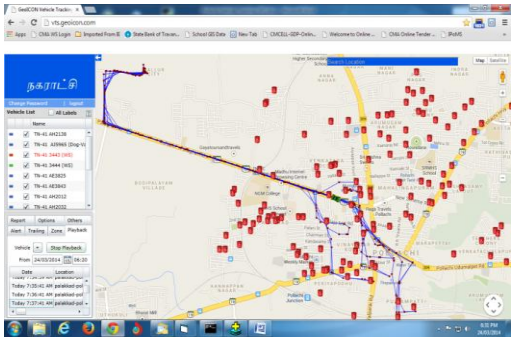


Figure 12: Monitoring the targeted locations



d) Real-Time monitoring using Geo-Tagged photos

Due to advancement in the GPS devices, the camera/cell phone /tablet have a GPS receivers. So that the photos taken on the field is tagged with the Geo-data. Hence the status of the project/work may be photographed and using the convertor tool it convert and displays the photos on the exact of place over the imagery. So that the status of the project / bottle necks can be given to the higher authorities now and then so that the projects may be completed in an effective and efficient manner.

For converting the geo-tagged photos to the Google acceptable format, the photo GPS extractor can be used. This is small utility tool to visualize the GPS co-ordinates of photo on a map.

V. CONCLUSION

"Google earth" application is very easy to handle and to monitor. Hence this may be used for day to day working activities of ULBs. And it may be used to make a rough measurement on road, buildings, site etc. And it may useful access the asset of ULBs, location of facilities such as dustbin locations in Solid waste management division.

By deploying GPS based real time vehicle tracking system can able to *Monitor the actual movement* and real time position of the vehicle. And the system *Analyse the bin pick up status* such as bins picked up/served on not picked up/served in real time. It *Improve service delivery mechanism* and achieve better information management and *Ensures citizens' participation* in governance and arrive at the performance level of each waste collecting vehicle. *Reducing the unwanted trips/detours/stoppages* and enhance the productivity/utilization of the fleet. Improve public image and also offered a tool for RTI. *Timely completion of job* with greater efficiency, Greater transparency in the civic administration. GPRS enabled mobile device for officers to track the service from anywhere & anytime. Greater accountability on field level staff.

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He obtained his Under Graduation in Civil Engineering from Government College of Engineering, Coimbatore in the year 1998. He completed his Masters in Urban Engineering from Anna University, Chennai. Later worked as a Research Associate for the Traffic Operational Management Plan (TOMP) project sponsored by DTCP, GoTN for the four selected Urban settlements of Tamil Nadu. Then moved for a year time at DSM Software Pvt, Ltd as a Spatial Data Executive & Photogrammetrist.

Then he joined at Institute of Remote Sensing, Anna University, Chennai as a Teaching Research Associate. During the time handled subjects such as Remote Sensing and GIS for Urban and Regional Planning, Advanced Surveying, Digital Photogrammety, Interpretation Labs, etc. Also guided several Mini and Masters Students Projects for the Civil Engineering and Master of Geoinformatices students. Also completed his research work on "Urban Feature Extraction from High Resolution Remote Sensing Data" and Published papers at the National and International Journal.

In the year 2007, he joined at TamilNadu Institute of Urban Studies, Coimbatore as an Assistant Professor (Urban Planner / Environmental Engineer) and continuing his service till now. During his service he is coordinating and organizing the In-service and Sponsored training programmes such as TNUDP III, TNSUDP, SJSRY, BRGF, JnNURM, AMRUT and Smart City the area of Urban Governance, Urban Planning, Municipal Engineering, GIS, etc for the working officials as well as Elected Representatives of Urban Local Bodies of TamilNadu. During his time involved in preparing / editing half dozen volume of training handbooks for the above said programmes as Joint authors. Also Handling classes for the above training programmes. And guiding students from the Madras University, Anna University, etc for their projects. Also coordinating to make MoU with related institutions at the State level, National level and International level.

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He is an Physical Planner and specialized in GIS, Spatial analysis and other advanced analytical tools in mapping and design. He serves many professionals and students with his skills and opinions in aid of non physical firm. He also authored few research papers and presented in national conference wisely. Now, he is researching on various sectors with the guidance of affluent professionals of core research team. His focus and interests are in Cyber Design, GIS, MIS, Poverty Alleviation etc. A strong believer in the ability of planning and research combined with Spatial thinking for strengthening our societies and having a positive effect on the world. His prime objective is to achieve the original status of planners among all other profession throughout India.