International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622
NATIONAL CONFERENCE on Developments, Advances & Trends in Engineering Sciences
(NCDATES- 09th & 10th January 2015)

RESEARCH ARTICLE OPEN ACCESS

3D Analysis Tool Using Google Sketchup and NASA World Wind

*Ponkam Ujawala, **Mr.M.Omkar Sharma,
M.Tech Student,CMR Engineering College
Asst.Prof, CMR Engineering College

ABSTRACT
3D city models are basically a computerized or digital model of a city contains the graphic representation of buildings and other objects in 2.5 or 3D. The needs for 3D city models are growing and expanding rapidly in various fields include urban planning and design, architecture, environmental visualization and many more. The efficient generations of the 3D city models are improving the practice of urban environmental planning and design. SketchUp is an excellent tool used by architects and civil engineers for creating, editing and sharing 3D models. With this program we not only model objects and city furniture but also see it in virtual form and three dimensions, change the texture, the style, whatever we want until it reflects our required style. Google Earth being widely used by the general public and professionals, Virtual Globes are revolutionizing the way in which scientists conduct their research and the general public uses geospatial-related data and information. World Wind is an open-source virtual globe first developed by NASA in 2003. World Wind provides customable analysis to huge volumes of two-dimensional and three-dimensional scientific data. In this Project, Google Sketch up is used to prepare 3D City Models and then to unlock their full potential, models are interfaced with COLLADA (Collaborative Design Activity), the XML-based scripting language of Google SketchUp and other 3D modeling applications. The imported model finally visualized on World Wind. We further develop geoprocessing tools to perform analysis with 3D city models, and interactive tools (such as the 3D Measure tool) in 3D World Wind to solve problems that can't be solved in

INTRODUCTION

BACKGROUND

The advancement in computer graphics, high computational capacities and web technologies have entirely revolutionized visualization techniques. The involvement of latest trends such as 3D visualization and animation has completely changed the way the information is revealed. With the help of three dimensional and dynamic contents, the objects can be visualized and interpreted in a way much better than before.

3D city model is a digital representation of the Earth's surface and it's related objects such as Building, Tree, Vegetation, and some manmade feature belonging to urban area. There are various terms used for 3D city models such as "Cyber town", "Cyber city", "Virtual City", or "Digital City". These been widely used to assist urban management related applications such as urban planning, traffic control, mobile telecommunication designing, etc. Therefore, many countries and cities are creating and releasing their official 3D model.Public administration agencies need 3D city models to regulate land useentitlement or administer local taxation policy in three dimensions. For example,the local taxes that are paid in Singapore are partly determined by the availability of sunlight in the occupied space and the impact of sunlight availability on the surrounding area (Rich, 2009). Also, the facilities, energy or public health management agencies will do a better job with the help of 3D city models. 3D city model is also wildly used in disaster control, location marketing, tourism etc (Schulze-Horsel, 2007). Visualisation is a complex and important issue in 3D city environment. In most of 3D city model related applications; visualization is always a critical aspect, e.g.in urban planning and disaster mapping.

The main aim is to find out what kind of digital city model is the most suitable, to define which view is the most understandable for lay public and to define the role of the 3D city model in the whole process of public participation

3D MODELLING TECHNIQUES

The implementation of 3d city models is based on many techniques:

1. Terrestrial, such as

- Active 3D or range captures using laser scanners.
- Photogrammetric method provides exact and definite interpretation results.
- Geometric modelling by a CAD modeler based on surveying data, existing engineering diagrams and drawings such as floor plans.

2. Aerial, such as:

- Aerial photogrammetry (automatic extraction of buildings).

- Aerial laser scanning (extract buildings from discontinuities in height model).

- **Laser scanning** provides highly and accurate representations of most shapes. Combined with colour information, either from scanner itself or from digital camera, a realistic model can be created. For all scanners, the accuracy depends not only on the technology used but also on the range, angle of incidence and surface characteristics. For the generation of 3D city models, a density of more than 2 points/square meter is required. The method is fast and accurate but requires expensive hardware and software plus highly trained staff as well.

- **Photogrammetric method** is not as fast as laser scanning but is more accurate. The images are measured to an accuracy corresponding to camera quality, usually by precision comparator or by sub pixel operators for digital images. 3D object coordinates are calculated by bundle adjustment with simultaneous camera calibration and the inclusion of any additional geodetic measurements. To generate 3D city models we don't need high resolution and expensive cameras but we need professional photogrammetric software and highly trained staff.

- **Geometric modeling** based on surveying data is the classical approach where we use surveying techniques to acquire terrain details, digital cameras to get colour information and a 3D modelling software. To generate 3D city models we already have the surveying equipment and software to process raw data, we have digital cameras so the only investment is a professional 3D modelling software.

- **Aerial Imagery** is well suited for the economic acquisition of 3D city models, making possible to recover structures as well as dimensions. In this case, for capturing a 3D point cloud, stereo pair of images are needed with forward and side overlaps of 30% and 60% respectively. To increase the accuracy in position we need to have buildings footprint measured by total station; the height accuracy is claimed to be about 0.2 to 0.5metres.

GOOGLE SKETCHUP

Sketch Up is an excellent tool used by architects and civil engineers for creating, editing and sharing 3D models. With this program we not only model objects and city furniture but also see it in virtual form and three dimensions, change the texture, the style, whatever we want until it reflects our required style. In recently, its latest commercial version is SketchUp Pro 2013, (earlier it was SketchUp Pro 8), a free version is also available with name as SketchUp make, and that integrates with Google Earth. The model can be exported to Google's "3D Warehouse", to share these 3D models to anybody. These models are useful for the various ranges of applications such as Architectural, Civil Engineering, Mechanical, and Film & Game industry. The SketchUp (free version) have the capability to export the models in .kmz, while the SketchUp Pro version can export these models to .3ds, .wrl, .xsi, .dwg, .dwf, .fbx, and .obj file formats.

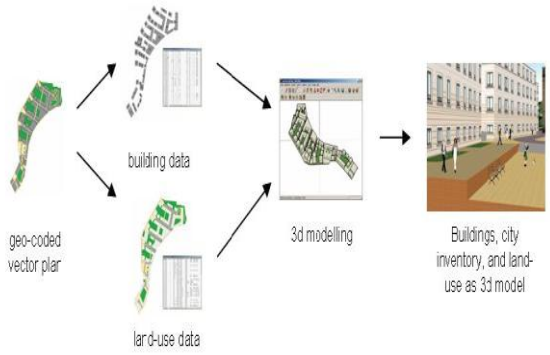

FIG 1: 3D modeling approach used for the creation of

LASER SCANNING USING FARO SCANNER

Terrestrial Light Detection and Ranging (LiDAR) is a land-based laser scanner which, combined with a highly accurate differential GPS, enables us to produce 3D computer models of landslides at the coast (The LIDAR). Terrestrial laser scanners provide detailed and highly accurate time of flight 3D data rapidly and efficiently. Applications are wide ranging including Topography, Mining, As-Built Surveying, Architecture, Archaeology, Monitoring, Civil Engineering, Façade Measurement and City Modeling.

In this framework, FARO FOCUS 3D is used to scan the college building. As-built surveys using 3D laser scanning technology, such as the FARO Laser Scanner, provide users with detailed point clouds which enable 3D modelling for diverse tasks including building reconstruction, plant layout and enhanced data presentation with augmented reality.

With fast turnaround times on scans of buildings and entire environment, FARO's 3D laser scanner can deliver fully surfaced CAD models for a variety of industries. Architectural design, civil engineering and construction, facility management, and cultural heritage have all benefited from this 3D FARO solution. It can scan large and distant objects upto 330m away with a scan rate of 976000 points\sec and in direct sunlight. It is integrated with a GPS receiver

and camera of 3MP which gives quality more than 70MP. The functioning of the 3D laser scanner can be controlled by providing wifi address in the laptop; the user can adjust the settings according to the requirements. After scanning, it produces a 360 degrees panoramic image which is optimized for quick visualization of large amounts of points in the 3D view of the workspace. A panoramic image is a function on some digital cameras that enables to take multiple photos in a sequence according to the shoot taken. These images can later be stitched together to create one large panoramic image. This laser scanner produces 84 images in a scan and internally combines all the images to give an appropriate image .The FARO scanner combines with 3D modelling for visualization and drawing production

VISUALIZATION PROGRAMMABLE PLATFORM

World Wind is both a system for highly interactive geographic data browsing utilizing the Internet, as well as a standalone computer application. It has been used as thick client to deliver 3D content and to provide interoperable access to geographical information together with geospatial processing services. The most important thing about NASA World Wind is its unique potential to aggregate a huge number of public and private geographic data sets, providing access not only to NASA data but also to data from other government agencies, industries and the general public.
NASA World Wind has been developed in two versions:

- **WorldWind.NET**: WorldWind.NET is NASA World Wind software that relies on .NET Framework and is restricted to Windows operating system. Besides displaying the Earth, there are also several other planets available: Moon, Mars, Venus, Jupiter etc. It provides the ability to browse maps and geospatial information using the WMS servers, import ESRI Shape files and KML/KMZ files.

- **World Wind Java**: World Wind Java SDK is, on the other hand, a set of development tools that can be used to create hundreds of different applications. It is cross-platform, being able to be run on Windows, MAC OS X as well as on GNU/Linux. It has API-centric architecture, which puts World Wind itself in a role of plug-in. That means World Wind SDK can be used in a numerous number of applications, relying on different technologies. It gives a developer much more flexibility to extend and adjust SDK in a way the user finds it suitable.

Figure: WORLDWIND .NET

This technology includes two key parts: Data Collection and Visual Display. With the help of java API, 3D models of KMZ format can be loaded into World Wind. Visual Display (real-time interaction and simulation) based on the obtained data can be conducted in this 3D virtual city. The models can be designed using some 3D modelling software such as 3DSMAX, AutoCAD, Google Sketch Up and so on which must be converted into collada file format and then packed into KMZ file based on kml codes. KMZ file can be imported into World Wind successfully by the jaxb-collada API. Google 3D Warehouse has provided large amounts of3D models available formatted in KMZ, therefore clients can conveniently download and import them into World Wind.

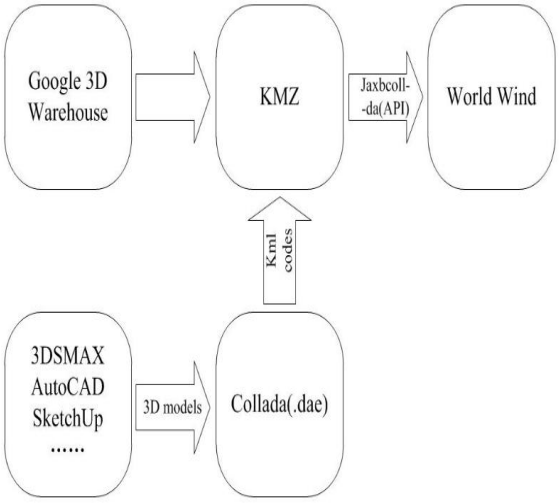

FIGURE : IMPORT 3D MODELS PROCESS

Kml is a file format used to display geographic data in an Earth Browser, for instance Google Earth, Google Maps and World Wind. Kmz file packing 3D models is based on kml standard. It is very important that the models imported in this way are attached detailed geographic information such as geographic coordinates. World Wind Java SDK provides a 3D model class KMLViewer, which parses the relevant kml files to load 3D models and apply to the geographic information platform.

PROBLEM FORMULATION

Our world is increasingly confronted by globalised and immensely complex technological problems. Organisations and authorities are in urgent need of better ways of communication and of overcoming common problems. With new terms for the sustainable development of cities, educational institutions, globalisation and governance, the need for improved ways of taking decisions has appeared at all governmental and non- governmental levels locally, regionally and nationally.

Following these trends, new terms of standardising processes have been formulated and defined at different levels and different scopes. Most of the educational institutes cannot afford a high cost tools to design a 3D model. Here, cost and time are the key factors. To overcome these problems, we used simple digital images and very cost effective SketchUp software.

APPLICATIONS OF 3D CITY MODEL

3D city models have already been widely employed to assist different applications such as urban planning, traffic control, mobile telecommunication design, etc.

- Disaster management: Public safety agencies such as fire department and emergency medical services need 3D city models to help them locate the available fire response equipment, manage the local transportation infrastructure in the case of an emergency, and settle down the evacuated peoples, etc.
- Urban planning: Landscape planners need 3D city models to visualise the impact of newly proposed projects on the city environment. Some factors that contribute in improving the quality of planning are transportation system, energy, water and waste management, green structure, etc.
- Public affairs*:* Public administration agencies need 3D city models to regulate land use entitlement or to administer local taxation policy. The facilities, energy and public health management agencies will be able to do a better job with the help of 3D city models.
- Emergency services: such as applications to problems of policing, security, fire access, and ambulance access. These kinds of applications largely dwell on the intricate geometry of the urban fabric and the need to understand how different locations can be accessed quickly.
- Telecommunications: in particular the sitting of towers for mobile and fixed communications is problematic in environments dominated by high buildings.
- Architecture: as in urban planning, site location and design review, in particular aesthetic issues and massing, are important factors as well as issues involving conservation and disruption to the urban environment.
- Facilities and utilities management: water, sewerage, and electricity provision as well as road and rail infrastructure all require detailed 2d and 3d data for their maintenance and improvement.
- Marketing and economic development: 2d and 3d models provide extremely rapid ways of visualizing the environment of the city, the locations of cognate uses, and the availability of space for development.
- Property analysis: related to economic development but also to the general development of the city. Methods for visualizing cities enable detailed data to be computed concerning floor space and land availability as well as land values and costs of development.
- Tourism and entertainment: 3d models provide methods for displaying the tourist attractions of cities as well as ways in which tourists and other newcomers might learn about the geography of the city.
- E-commerce: virtual city models in 2d and 3d provide portals to virtual commerce in that they provide the user with semi-realistic entries to new and remote trading and other commercial domains.

In future, 3D city models will play an increasingly important role in our daily lives and become an essential part of the modern city information infrastructure (Spatial Data Infrastructure). Similar to the 2D cartographic maps, the 3D city models will be used to integrate various data from different sources for public accessible visualization and many other applications.

CONCLUSION AND FUTURE SCOPE

By developing these 3d city models one can have an exact view of a particular area which is helpful in developing smart cities**.** The 3d models developed using sketchup are viewed on worldwind

with certain longitude and latitude values**.** 3d models are also developed using terrestrial lidar which is a round based laser scanning technique to produce 3d point cloud data. Many of the spatial problems can be solved due to which urban areas can be developed.

REFERENCES

[1]. Bogdahn, J 2012, *Multifaceted facade textures for 3D city models*, PhD thesis, Salford : University of Salford.
[2]. Coors, V. and Zipf, A., 2007. Mona 3D-Mobile Navigation using 3D City Models. LBS and Telecartography 2007 Hongkong.
[3]. 3DCityDB, (2011): http://opportunity.bv.tu-berlin.de/software/projects/3dcitydb (accessed 2011-08-10).
[4]. Ching-yin Law Simon So : QR Codes in Education.
[5] Kamon Homkajorn, Mahasak Ketcham, and Sartid Vongpradhip : A Technique to Remove Scratches from QR Code Images
[6] Grün, A., Wang, X., 1998. CC-Modeller: A topology generator For 3-D city models, ISPRS Journal, Vol.53, No.5, pp. 286-295.
[7] Emem O., 2002b: 3-D Modelling: Design and Application. MSc Thesis, Yildiz Technological University, Istanbul.
[8] Fabio Remondino and Alessandro Rizzi. Reality-based 3D Documentation of Natural and Cultural
[9] Delaney, B. (2000) Visualization in Urban Planning: They Didn't Build LA in a Day, IEEE Computer Graphics and Applications, May/June 2000, 10-16.Doyle, S., Dodge, M., and Smith, A. (1998) The Potential of Web Based Mapping and Virtual
[10] Reality Technologies for Modeling Urban Environments, Computers, Environments and Urban Systems, 22, 137 – 155.
[11] Benner, J., Geiger, A. and Leinemann, K. (2005), Flexible Generation of Semantic 3D Building Models. In: Gröger, G. et al. (Eds.): Proceedings of the 1st International Workshop on Next Generation 3D City Models, Bonn, Germany.

****Mr.M.OmkarSharma**, working as a Assistant Professor in CMR Engineering College, Hyderabad, Telangana, india. I am having 4 years of teaching experience and 2 years of industrial experience and I was completed my M.Tech and B.Tech in Computer Science and Engineering in 2012 and 2008 respectively from JNTUH , Hyderabad, Telangana, India. I presented many papers in international and national conferences held at various places. I am interested in doing research in computer networking and also interested to study in various upcoming technologies cloud computing, mobile computing etc.

*****Ms.Ponkam Ujwala ,M (Tech) pursuing M.Tech(CSE) in CMR College of Engineering, Hydrabad, India. . I am interested in doing research in computer networking and also interested to study in various upcoming technologies