Mobile based Tools and Techniques for 3D Visualization

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ABSTRACT
To view a large amount of textual or graphical data in 3D form on mobile device several tools and techniques are used. Most of the tools are readily available in market for 3D visualization on mobile devices but these tools may be of specific purpose therefore various tools and techniques are developed for 3D visualization of different types of data in different situation. These tools and techniques are used in remote or local visualization on mobile device. This paper gives the focus on commonly constructive tools and techniques for 3D visualization on mobile devices in remote and local visualization.

Keywords
Remote visualization, local visualization, mobile device

1. INTRODUCTION
3D visualization plays an important role in many desktop and mobile applications. But for mobile application 3D visualization is a challenging task due to mobiles small screen, low computation power and less memory. Complex image based or textual data can be used for 3D visualization on mobile devices. Such complex data can be spatial, temporal, 3D video, audio, multi resolution images, web based information etc [14, 17, 19, 12].

Visualization can be remote or local for mobile devices. Both ways of visualization uses various tools or techniques for 3D visualization on mobile device those are discussed in this paper.

2. REMOTE AND LOCAL CONCEPT FOR VISUALIZATION ON MOBILE DEVICES:

Large and complex data visualization on mobile device can performed by means of two approaches i.e. local and remote visualization approach.

2.1 Local visualization
When the whole data is store on mobile device and then such data is visualized on mobile screen by means of some techniques, such kind of visualization is a local visualization.

2.2 Remote visualization
In some situations data may come from remote side i.e. form server side and then it views on mobile devices, it is remote visualization.
For local visualization mobile devices must have large storage capacity while in remote visualization mobile devices can considered with given capability [2].

3. COMMONLY CONSTRUCTIVE TOOLS AND TECHNIQUES FOR 3D VISUALIZATION ON MOBILE DEVICES

3.1 Overview, zoom and rotation
Overview with details gives the detail view and overview of information space. It includes various issues i.e. scrollbar, embellished scrollbar and thumbnail. Scrollbar increases information on screen. Thumbnail provides the navigation. Google map, games etc. are the applications of detail overview [14].

Zooming and rotation is performed at client side to navigate through 3D video [17]. Zooming technique is also used by visualizer of ABMS [18].

Tile images visualized at client side with the help of view operations like zoom, rotations etc. Client also supports multi threaded pull model for multiple tiles [19].

3.2 Focus plus Context
For the visualization of large information on mobile devices, author produced focus plus context visualization technique. In this focus is given on context to visualize information. It also discuss focus and users center of attention, differentiable context, multiple views of context, homogeneous and heterogeneous context which create structure presentation by using inherent structure of information [15].

3.2.1 Fisheye view
Hee Yong Yoo et al. [12] proposed fish eye view algorithm for sequential and radial layout by considering the mobile limitations. Degree of Interest (DOI) shows the font size of text for both layouts. In sequential layout font size is fixed but in radial layout font size is small for center distant information and large for near information. Even though the radial layout gives the effective visualization but it is limited to PDA applications only while sequential visualization is for both cellular and PDA**.**

3.2.2 Magic eye-view
Magic eye view is used for hierarchical layout on hemisphere. But there is a problem with magic eye view visualization for hierarchy because it displays lot of unused space on mobile screen and the node labels gives the parts of the presentation. Therefore magic eye technique has been improved which specify half ellipsoid or half spheroid with different coordinates. For the navigation through keypad it is necessary to solve ellipse formula for the x and y coordinates. Gheorghita Ghinea et al. [11] executes magic eye view algorithm using JAVA MIDP2.0 API with the CLDC 1.1

configuration on Nokia platform with different series. Work is done on Nokia mobile of series 60 having the resolution of 280 x 176 pixels and the resolution of 320 x 460 pixels is used for Nokia 7710.

This approach is applicable for all resources because it is resource friendly and reduces transmission complexity. Shows presentation improvement for screen limited devices**.**

3.2.3 Lens based focus plus context

Emmanuel Pietriga et al. [1] propose a new interaction visualization technique for independent data. Focus plus context is also one interaction technique, which allow visualization and navigation of information in large space without using zoom. Author proposed new focus plus context interaction technique based on lenses which provides navigation in large workspaces but it applicable to the large screen resolution devices.

3.2.4 Pinhole camera based focus plus context

Voicu Popescu et al. [3] proposes a pin hole camera concept which plays an important role in remote visualization because it allows zoom in at client side without moving more data from remote side i.e. server. Pinhole camera is also useful in focus plus context visualization. Different types of data like iso-surface geometry, volumetric, and image data etc moreover supports by pinhole camera.

Focus plus context perform the location selection sampling, then rendering which is of different type including ray tracing, feed forward rendering, nonlinear rastarization and subdivision. Display is a vital part of focus plus context. Finally it is found that pinhole gives a good rendering performance on high resolution, provides detail about image data. Also gives the good communication performance.

3.2.5 Visual lens toolkit

In focus plus context visualization technique focus area has highly global information but the context area only provides focus on global overview of things. So this technique is useful to display focus and context area on small display devices. Visual lens toolkit is inspired from focus plus context technique and it is based on elastic presentation framework (EPF) [4].

3.2.6 SpiraList uses a Focus+Context visualization mechanism which provides a global view of large lists. To interact with large list on mobile device SpiraList is used; SpiraList is a new interaction and visualization method for displaying large lists (100 items or more) in an efficient way on small tactile screens [6].

3.2.7 Focus plus context route zooming

To zoom a road and its connected landmark Huamin Qu et al. [5] proposed a focus plus context zooming technique. It allows the user to view road in 3D urban environment from 45 degree bird's eye view. Seam carving technique is used in rout zooming which consist of distance field calculation, seam segment selection, importance value computing, dynamic seam carving and translation of blocks. Grid based scaling technique is used for blocks to uniformly scale the building size. To provide the occlusion free route visualization, non landmark buildings occluding the selected route can remove. For the interactive routing routes are divided into different segment those are retargeted by user for detail view.

3.3 VRML

A new technology i.e. virtual reality modeling language (VRML) used for displaying 3D model. The Virtual Reality Modeling Language is a file format for describing interactive 3D objects. VRML is designed to be used on the Internet, intranets, and local client systems. VRML is also intended to be a universal interchange format for integrated 3D graphics and multimedia [7, 8].

3.4 Flash lite

The technology iVISiCE is transport on mobile device using flash lite which compact file size, due to the use of vector based graphics, for fast access via the Web. Thus iVISiCE on mobile improves learning due to the features of mobile devices and Macromedia Flash Lite. This technique is also useful for constructor of different site [9].

3.5 Web Browser, 3D viewer

At the client side of this application uses compact 3D viewer in JAVA and web browser to browse and rate 3D model. Viewer performs zooming function [16].

3.6 Hierarchical Visualization:

3.6.1 Radial edgeless tree (RELT)

Jie Hao et al. proposed hierarchical visualization in radial layout for music data on mobile devices. This radial layout is edgeless. Generally edges are used to represent relationship between data but it consumes lot of space. Radial edgeless tree (RELT) uses adjacency and direction to show relationship. RELT is also understood as seignior partition problem having some rules like root of tree is located at upper left corner called monarch, seignior's are in decreasing order in this higher rank have more space. Root partition his area in number of seignior, seignior also partition their space for seignior under them [10].

3.6.2 Hierarchical Aggregation Visualization

Aggregation is a set of data items i.e. aggregate data items and hierarchical aggregation is iterative building of tree in top-down or bottom-up manner. Hierarchically aggregated visualization also supports the common information visualization technique like overview, zooming, filtering and details on demand. Other than these techniques hierarchical aggregation also supports rendering to traverse through hierarchical aggregation. Aggregate data includes some statistical terms like sum, average, mode, median, extents, percentile and distribution [13].

4. CONCLUSION

In remote visualization most of the visualization techniques are used at server side but many tools and techniques are also applicable to mobile devices for 3D visualization. Mobile based tools and techniques are applied on both local and remote 3D visualization of large complex data. Most of the tools and techniques are responsible to manage and view complex data on small screen effectively such as focus plus context only get focus on useful context on available screen space, zooming navigates through image or textual data. Interaction is also support by some technique to get and view large amount of data. Focus plus context is commonly utilized mobile based technique for 3D visualization.

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