Towards an Integrated Web-based Visualization Tool

A Comparative Survey of Visualization Techniques for Enhancing Stakeholders’ Participation in Planning

P. Parsanezhad, U. Ranhagen and Y. Ban
17th. November 2011
INDEX

- Visualization as a means for participatory planning
- Contemporary visualization tools
- Digital visualization and modelling tools

- Aims, objectives and scope of the research
- Background activities and institutional frameworks
- Methodology
- Evaluation cube

- Case studies
- Evaluation
- Conclusion

- Proposal for the Integrated Web-Based Visualization Tool
- Discussion
Visualization as a means for participatory planning

Communicative planning, collaborative planning and participatory planning [Hea03]

**Planning tools:** Search for more comprehensive, informative and interactive tools to enhance planer’s facilitating role [CR04]

**Visualization tools:** A shift in planning paradigms to more visual approaches for a better inclusion [Sie06] [Sim01].

**Digital visualization tools for planning:** Maximum participation regardless of temporal or spatial distance [BCW08].
Contemporary visualization tools

Visualization environment for a participatory planning procedure:

- **Available** and **workable** for different groups of users
- Fairly **integrated** so as to bring all diverse planning issues together within a **simplified and unified planning tool** [Sta00].
Efficient
Integrated
Resource-Demanding
Expensive
Stand-alone
Environments
Virtual Landscape
Theatre (VLT)
VR-cube
Simulators
Labs

CAD
GIS applications
Rendering Tools

Ubiquitous
User-friendly
Specific
Limited
Online GIS
GoogleSketchUp
Digital visualization and modelling tools

Analytic comparison of capabilities and limitations of **CAD** and **GIS** applications

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>CAD</th>
<th>GIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Use in Planning and Design</td>
<td>Architecture, Urban Design</td>
<td>Urban Planning, Community Planning, Regional Planning</td>
</tr>
<tr>
<td>Scaling to Needs</td>
<td>Scales Not (Too Geometric)</td>
<td>Scales Well (Geography to Geometry)</td>
</tr>
<tr>
<td>Planning And Design Capabilities</td>
<td>Limited Flexibility And Possibility For Design</td>
<td>Suitable Instruments For Planning</td>
</tr>
<tr>
<td>Dominant Visualization Mode</td>
<td>High Realistic Visualizing Capabilities</td>
<td>Schematic Visualizing Capabilities</td>
</tr>
<tr>
<td>Analytic Strengths</td>
<td>Few Analytic Capabilities</td>
<td>Analytic Functions for Modelling Systems</td>
</tr>
<tr>
<td>Dominant Content</td>
<td>Physical Form</td>
<td>Natural and Socio-Economic Phenomena</td>
</tr>
<tr>
<td>Dominant Presentation Capabilities</td>
<td>High Virtual Reality Capabilities</td>
<td>Thematic Representation Capabilities</td>
</tr>
<tr>
<td>Number of Alternatives</td>
<td>Increase in Number of Alternatives</td>
<td>Increase in Number of Alternatives/Scenarios</td>
</tr>
<tr>
<td>Automated Modelling</td>
<td>Operator-Demanding Modelling</td>
<td>Semi-Automated Modelling</td>
</tr>
<tr>
<td>Accuracy</td>
<td>High Accuracy Due to Geometric Base</td>
<td>Limited Accuracy</td>
</tr>
<tr>
<td>3D Visualization</td>
<td>Workable 3D Environment</td>
<td>Mainly 2D, limited 3D</td>
</tr>
</tbody>
</table>
Aims, objectives and scope of the research

• a search for a conceptual framework for an integrated web-based participatory planning tool

• What are the main characteristics of an integrated web-based visualization tool for enhancing stakeholders’ participation in planning procedures?

• solutions at urban scale
Background activities and institutional frameworks

KTH Classroom Search Engine & 3D KTH Virtual Campus

- Division of Geo-informatics in School of Architecture and the Built Environment of KTH – 2009

- Footprint extrusion and enhanced with photorealistic mapping of the façades

ViSuCity (Visual Sustainable City)
Methodology

• Bibliographical resources on visualization in planning and relevant disciplines
  e.g. collaborative planning, city modelling, virtual reality, augmented reality, Geographic Information Systems, Public Participatory GIS, Web 2.0, neogeography, e-government and decision support systems

• Interviews and discussions

• Online search: websites, weblogs and web-catalogues of companies active in visualization and planning authorities + Google Alerts
Methodology

- Evaluation cube
- Evaluation and analysis of case studies
  A number of prominent visualization applications were then selected, studied, categorized and examined contacts with developers and marketing agents through e-mail, phone call, net-meeting and meeting sessions
- Introduction of a back-casted visualization interface
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BASIC INITIATIVE</td>
<td>PROBLRM FORMULATION</td>
<td>INTERVIEWS/TALKS</td>
<td>LITERATURE REVIEW</td>
<td>DATA ANALYSIS (1ST ROUND)</td>
<td>RECHECK AND SYNCHRONIZATION WITH VISUCITY</td>
<td>RADICAL ONLINE SEARCH (2ND ROUND)</td>
<td>DATA ANALYSIS (2ND ROUND)</td>
<td>FINAL PRESENTATIONS</td>
</tr>
<tr>
<td>Experimental student project (KTH Classroom Search Engine &amp; 3D KTH Virtual Campus)</td>
<td>Optimal 3D presentation environment: - GoogleSketchUp - HyperCub - 3D PDF</td>
<td>An inquiry into Optimal Web-Based Visualization Techniques for Enhancing Stakeholder Participation in Planning</td>
<td>- Experts from Participating groups and related firms/organizations: KTH, SBK, SWECO - Technical issues - Delphi method</td>
<td>- Areas of concern - Visualization - City modeling - Virtual Reality - Collaborative planning - GIS - PPGIS - Web 2.0 - SIA</td>
<td>- Meetings - cooperation</td>
<td>- Search for participatory web-based visualization and planning tools</td>
<td>- Evaluation of existing environments including Nero 4 - Extraction of principles</td>
<td>- Presentation at KTH - Presentation at SWECO</td>
</tr>
<tr>
<td>RADICAL ONLINE SEARCH (1ST ROUND)</td>
<td></td>
<td></td>
<td></td>
<td>REPORT COMPOSITION</td>
<td></td>
<td></td>
<td></td>
<td>CONCLUSION - OUTCOMES</td>
</tr>
<tr>
<td>- Existing visualization environments - Websites and weblogs of regional planning authorities,...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Conceptual framework for the optimal web-based visualization tool - Proposal for an integrated web-based tool for participatory planning - Proposal for a comprehensive framework for evaluation of visual tools</td>
</tr>
</tbody>
</table>
Evaluation cube

- **Efficiency** and **workability**

- SWOT analysis (strengths, weaknesses, opportunities and threats)

- The three factors of *user groups, planning aspects and planning scales*
Case studies

City Maker™

- a multidisciplinary 3D visualization platform
- urban planning, management, administration, surveying, architecture, transportation, emergency, power and utilities

- Operates with GIS applications
- exchanges a DXF, DWG with planning
- Mass data processing, delicate visual effects and interoperability

- expert-oriented
- not workable and user-friendly enough for users.
- by Digital City Research Center of Beijing Tsinghua Urban Planning & Design Institute and Gvitech Technologies.
Case studies

City Engine

- an interactive interface
- Using **procedural** methods for rapid creation of urban fabric ruled by generic geometry-creation grammars
- real-time creation of photorealistic representations of a fictive city or district

- primarily focused on physical body of built environment
- should also be linked to dynamics of the city
- a stand-alone and not web-based application.

By *Procedural Inc.*
Case studies

City Planner

- user-friendly, web-based
- for creating, sharing and communicating urban plans.
- Inputs: 3D models from SketchUp, Maya or 3D Studio Max.
- Digital models available online for being observed, visually analyzed and evaluated by stakeholders.
- Adding geo-referenced feedback to a developing urban plan
- Mainly for visualization of planning alternatives rather than actual urban planning practice
- not generally includes analytic functions.
- by Agency 9 AB
Case studies

**Neo4 Urban Planning**

- **realistic, static and animated** outputs which includes analytic planning tools.
- supports a variety file formats such as COLLADA, CityGML and those of ESRI ArcGIS.
- By Sightline Vision AB
Case studies

**Symbiocity**

- is not basically a planning product but a trademark for sustainable planning products and services
- by *Swedish Trade Council*
- Symbiocity Scenarios: an online game within Symbiocity website
- visualizes consequences of a set of **planning strategies** on a virtual city **in real-time**.
- realistic representation of urban features and dynamisms
- availability through the Internet
- facilitates collaboration
- interactive and workable interface
Case studies

Urban Circus

- realistic details in real-time and within a **four-dimensional environment**.
- a variety of planning issues in different phases
- highly interoperable
- not very participatory
- its interactivity is mostly limited to navigation tools and presentation modes rather than decision-making and alteration possibilities.
- Takes input from 3DSMax, Maya and ArchiCAD among all.
- Outputs range from 2D rendered scenes, 3D panoramic view, 3D videos, 4D planning environments and interactive web pages.
- By Urban Circus Company
Conclusion

- **Three-dimensional** visual interfaces

- **Realistic visualizations** plus **schematic representations**

- **Fairly interoperable** and **interactive**, exchanging inputs and outputs

- **User-friendly**

- **Information-rich**, required for an integrated visualization media

- **Workability** is the quality that a few examples possess.
Proposal for the Integrated Web-Based Visualization Tool
“All users are thus free to compose their own planning alternatives through an intelligent and fully customized visualization/planning tool instead of choosing among a limited set of planning alternatives.”
Discussion

• The perpetual risk of using outdated data, literature, reports, software tutorials, technical recommendations, etc

• Differentiating between visualization, planning, presentation, drafting and enhancement tools:

  According to definitions of the term visualization the concept is closely intertwined with data representation and thus goes far beyond the mechanical act of virtual construction of an urban element in a schematic or realistic manner [BAS00][SDD98][OHD99].

• Avoiding contradictions when defining criteria for an efficient visualization tool: eg. Integrated + user-friendly