Usability testing of a web-based 3D Cadastral visualization system

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(Some of the) challenges for 3D cadastre visualization

- Linking 3D parcels (‘spatial units’) to legal information (RRR, parties)
  - Can be stored in different databases
  - Must be combined somehow in the visualization software

- Placing cadastral parcels in their context
  - Topographic / image base layers

- Occlusion (spatial units are hidden or not well visible)
  - Apartment buildings, complexes
  - Subsurface situations (tunnels, parking lots, pipelines)

- ...
How to see it clearly ..?

Occlusion, for example

- Apartment units within a building
- Impossibility to ‘see' legal boundaries ..

Combination of reference objects and legal boundaries

- Good for orientation and reference purposes 😊
- A further challenge regarding occlusion 😞
Case study

**Brisbane** City centre (Story Bridge and Kangaroo Point area)

The **Queensland Digital Cadastral Database (DCDB)** was abundant source of test data
In addition: manual encoding, based on existing 3D survey plans
3D parcels: building format or volumetric parcels

2D Parcels

Volumetric parcel, from below ground to 200m above

Volumetric parcel below Building Format parcels

Building format Parcels

Volumetric parcel above ground
Data model

light orange = existing tables
red = new
blue = LADM 'views'
Software used: Cesium (open source)
Current version of prototype

http://pakhuis.tudelft.nl:8080/edu/Cesium-1.43/Apps/3dcad/
Usability testing

Four main phases

1. Recruiting users
2. Define goals and tasks to be performed
3. Create a questionnaire
4. Process results and obtain feedback
Usability test: Tasks performed by users

- Navigate through the viewer, pan, zoom and rotate view to get familiar with the controls
- Change the visibility of layers
- Visualize an underground parcel
- Visualize information about a single parcel, i.e. ownership information, and unit/lot/plan number, etc
- Search for a single owner and visualize all the parcels owned by that person / party
Usability test

Section #1

Please perform the following list of tasks and give us your feedback. Note each question involves a practical task to be carried out on the prototype itself, after that a few questions need to be answered.

Description:
Please make sure you have a working internet connection. Open the following link on your web browser to start up the prototype: http://peekhuis.tudelft.nl:8080/edu/Cesium-1.43/Views/3d/res/. Before testing more advanced functionalities, it is crucial to get familiar with the basic navigation tools and view controls.

Note: it is suggested to use a mouse.

Task: Navigate to the Brisbane Airport and check where it is located with respect to the river. You can do this in two ways, if you know where the airport is approximately located just pan and zoom to the location, otherwise click on the magnifier icon and type "Brisbane Airport, Australia".

- South
- South-East
- Brisbane does not have an airport
- North

Opinion: Can you easily navigate through the viewer? Are the controls intuitive?

Yes, the controls are very similar to other CAD programs, making it intuitive to work with. However, it is difficult/impossible to understand where north is without a compass to indicate.

Please, give a grade on a scale from 1 to 10 to the usability of this functionality.

Extremely low usability: 

1 2 3 4 5 6 7 8 9 10

Extremely high usability:

Average: 3.7 / 5 points
Median: 4 / 5 points
Range: 2 - 5 points

Total points distribution:

No. of respondents: 10

Yes, I am very familiar with Cesium JS.
I am a little familiar with Cesium JS, I have used it a few times.
I have heard about Cesium JS but I have never used it before.
No, I do not know Cesium JS at all.
Results

- From usability test
  - Some bugs ..
  - Visualizing subsurface parcels should be improved
  - Zoom to parcels after search for parcels
  - (Improve loading time)

- In general
  - Linking spatial with legal information using OGC WFS works well
  - Cesium JS is a good platform to continue with
Move parcels up (here 200m)
View below surface
Future work

- Finish prototype, new usability test (November 2018)
- Further look into occlusion in case of tunnels / subsurface
  - Dynamic elevation tool (vertical move)
- Test more complex data model (n:m relations between parcel, RRR and party)
- In stead of KML files (prepared beforehand, can get out-of-sync)
  - On-the-fly: KML or glTF as output of web service