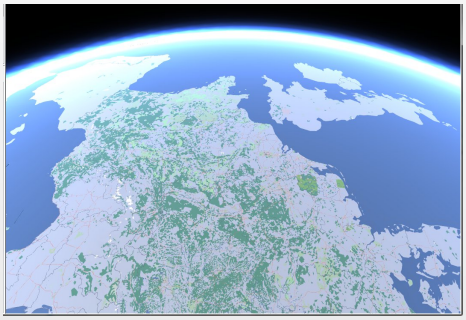
Creating a worldwide 3D globe from user-generated data



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Compiling 3D Cities – a new approach

- How about… Crowdsourcing 3D City Models…?
  → Motivated voluntary mappers have shown their potential to do it!

[OpenStreetMap]

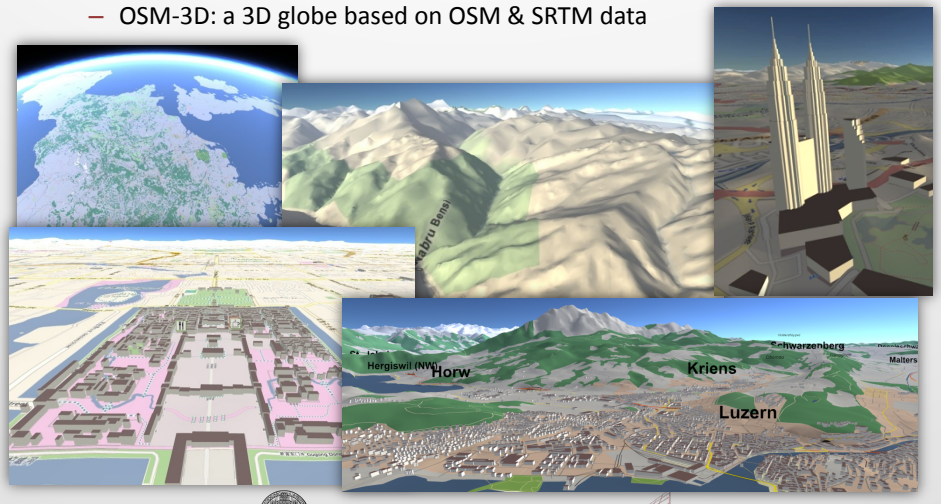
Disneyland, USA

St. Peter's Basilica, Rome

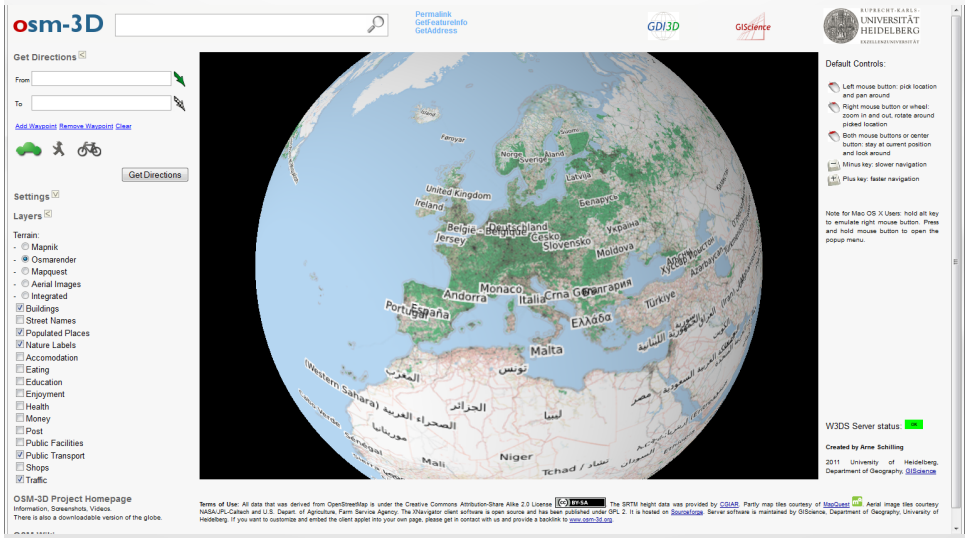
[Google 3D Warehouse]

OSM-3D

- Only few „bottom-up" approaches based on VGI so far
  – OSM-3D: a 3D globe based on OSM & SRTM data



http://osm-3d.org



OSM-3D: Tokyo, Dubai...

3D-VGI
Prerequisites

- Prerequisites for 3D-VGI are better than ever
  - low-cost hardware, service-based photogrammetry

[© Microsoft]


[© Autodesk / genbeta.com]

- Increasing awareness & interest in 3D in our society
  → Collaborative capturing of 3D geo-information becomes possible


[plasticjungle.com]


[areamobile.de]

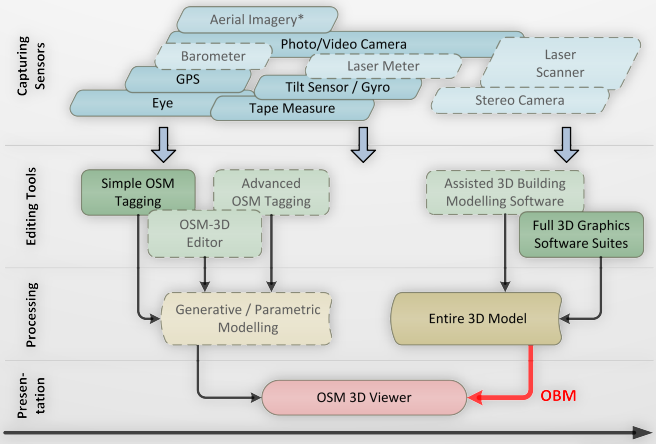
3D-VGI
Current Issues

1. No 3D support in (OSM's) simple data model 
   - Complex 3D modelling is difficult
2. No mature and wide-spread 3D viewer
   - Crucial for people's motivation to do 3D mapping
3. Not enough tools for users to contribute various 3D information in different LoDs
   - Users must be supported/enabled to *directly* map 3D content

3D-VGI

Future Directions

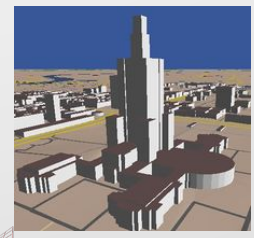
- Broad range of capturing/editing/visualisation tools
- Research about appropriate data structures & workflows



Building Generation

Several OSM keys contain relevant information for the building

- **Direct height:** *height*, *building:height*
- **Indirect height:** *levels*, *building:levels*, *building:levels:aboveground*
- **Elevation:** *building:min_level, building:min_height*
- **Roof Shape:** *building:roof:shape, building:roof:style, building:roof:type*
- **Roof Colour:** *building:roof:colour, building:roof:material*
- **Facade Colour:** *building:colour, building:facade:colour, building:cladding*
- **Additional Roof Attributes:**
  - *building:roof:extent*
  - *building:roof:orientation*



OpenBuildingModels.uni-hd.de

Vision

- What?
  - Free-to-use repository for 3D architectural building models
  - Link models to OSM or use them for other applications
- Why?
  - a) Not each and every building is taggable…

[nicetobook.com] [detaildesignonline.com] [wikipedia.org] [gigalo.de]

  - b) It is feasible! There exists already a huge 3D community
    - → *cf. Google 3D Warehouse, OpenSceneryX.com, Archive3D.net, Free3DModels.org, Shapeways.com …..*

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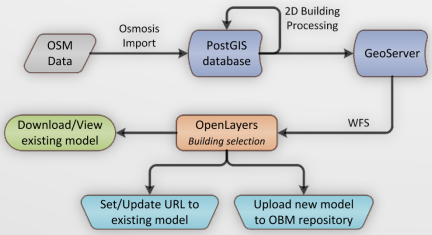
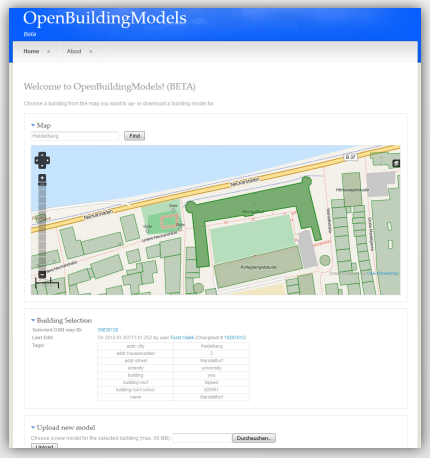
Prototype

- Current state: prototypical web-platform
  - Process building outlines from OSM ways
  - Provide them as a WFS (GeoServer)
  - User can select building
  - Upload 3D model to repository





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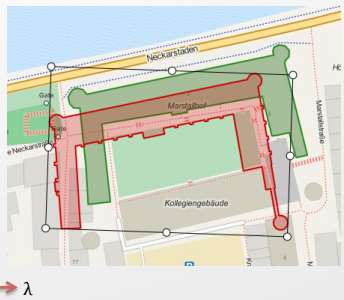
Challenges

- Geo-referencing
  - Match with existing OSM groundplan



- Plus…
  - Interoperability of different 3D data formats
  - Collaborative editing of architectural 3D models
  - Multiple LoDs, quality
  - Performance
  - …

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Benefit

- Integration into OSM-3D
  → great leap forward towards collaborative 3D city models
  - Significant improvement of LoD
  - „Non-taggable“ buildings are particularly important (landmarks)
  - Beneficial for many applications

Conclusion

- Recent VGI projects have shown their potential
- New: 3D-VGI, “citizens as **3D**-sensors”
- Main requirements:
  - Suitable data structures for crowdsourced 3D-modelling
  - Broad range of capturing and editing tools, viewers

- OpenBuildingModels is one effort to advance this field
- It is primarily intended for users with 3D modelling skills

- Collaboratively created 3D city models can be greatly enhanced with such a repository of architectural 3D models

Future Work

- Continue work on OpenBuildingModels platform
- Repository for 3D models of other, prototypical objects
  - e.g. trees, technical facilities, street furniture...

- Further research challenges in ”Crowdsourcing 3D virtual cities”
  - Facade modelling, Roof modelling
  - Research on suitable capturing methods, data structures, modelling/ editing tools etc. for crowdsourced approach

Thank  You