

Mobile Augmented Geo Data Visualization Based on OSM

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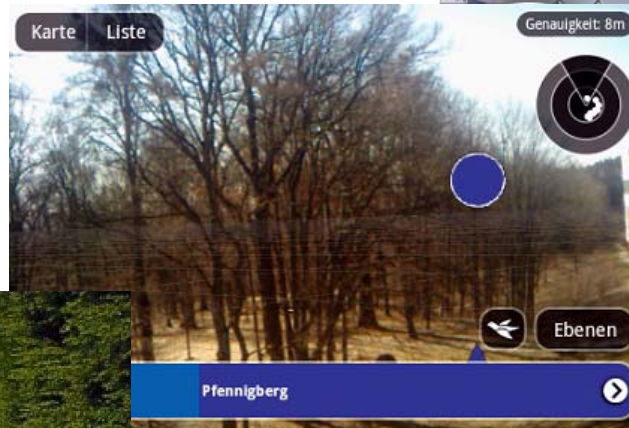
Studium mit Zukunft

Objective

- Augmented Reality („When the real world is enriched with virtual content...“)
 - Navigation-aid for hiking and trekking
 - Rendering POIs and paths into the camera's live-view in 3D
 - Open Street Map data
 - Proof of concept
 - Android

AR-Browser

- Wikitude / PeakAR
- Layar
- INSTAR
- ...



Technology

- Basis: PeakAR Salzburg Research
- Master thesis project
- Android (G1 /HTC Dream)
- OpenGL ES
- Sensor data
 - GPS
 - Compass
 - G-force sensor
 - Camera
- Open Street Map / web services

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Concept

- View vector
 - Position and height from GPS
 - Cardinal direction from compass
 - Tilt from g-force sensor
- OpenGL Models
 - Created from OSM data
 - User is “in the model”
- Correct Perspective!

The data directly influences the accuracy!

Open Street Map

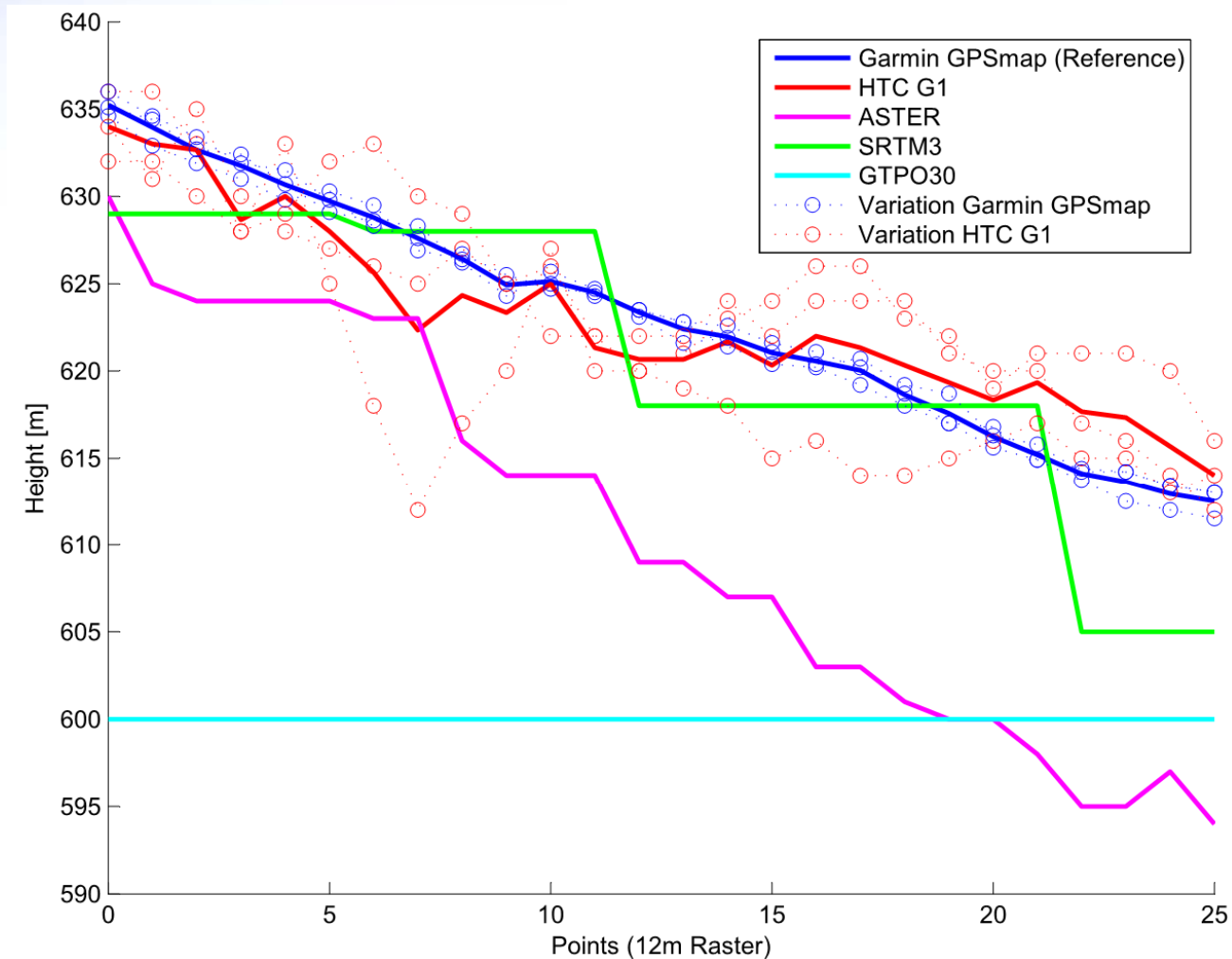
- Open Street Map
 - High degree of detail
 - Metadata
 - „Free“
 - Access to geo-data
 - No (sufficient) height information?



Height?

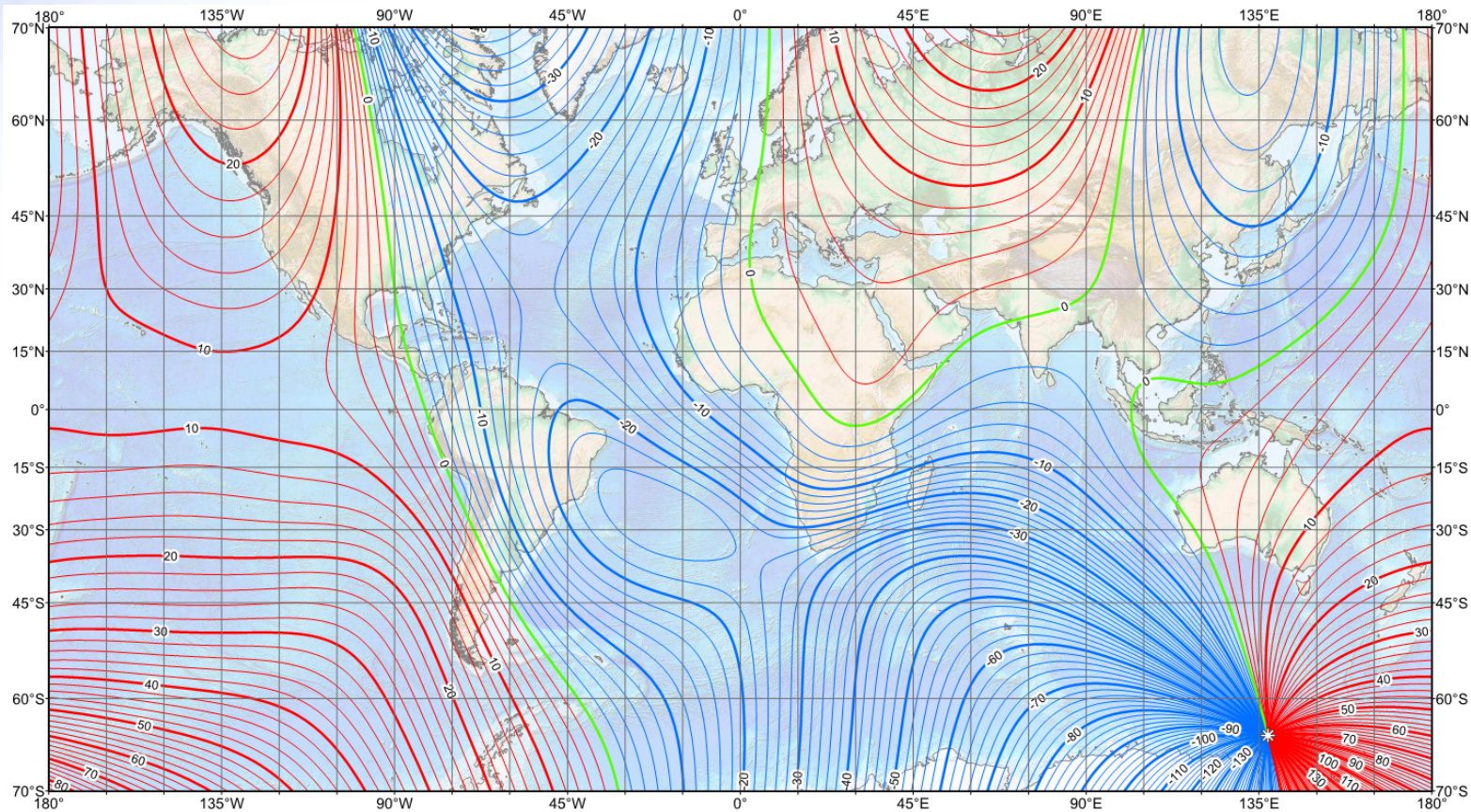
- Height is important for the model!
- „Flat“ visualization is not satisfactory
 - Paths winding up a mountain
 - Mountain peaks / Plateau
 - Webservices
- Height of the device? Use GPS height?
 - Reference system (GPS height vs. national systems)
 - Absolute accuracy not of interest -> consistency!
 - Acquire device height from webservice or use GPS height?

Topography



Heading

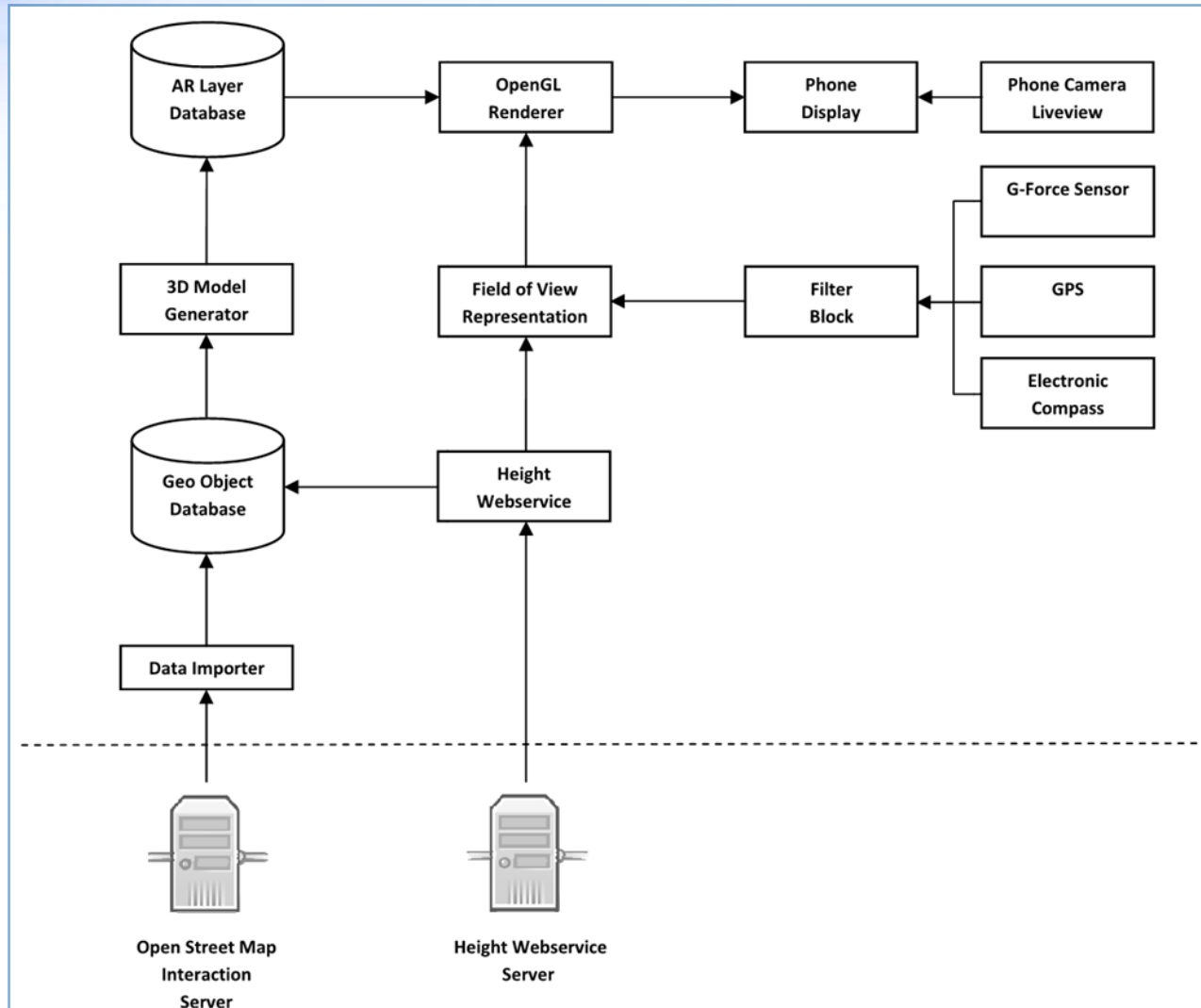
- Compass points to magnetic „north“ (not grid north)



World Magnetic Model Epoch 2010 - Main Field Declination (D). Mercator Map Projection with declination in degrees.

Source: <http://www.ngdc.noaa.gov>

Concept

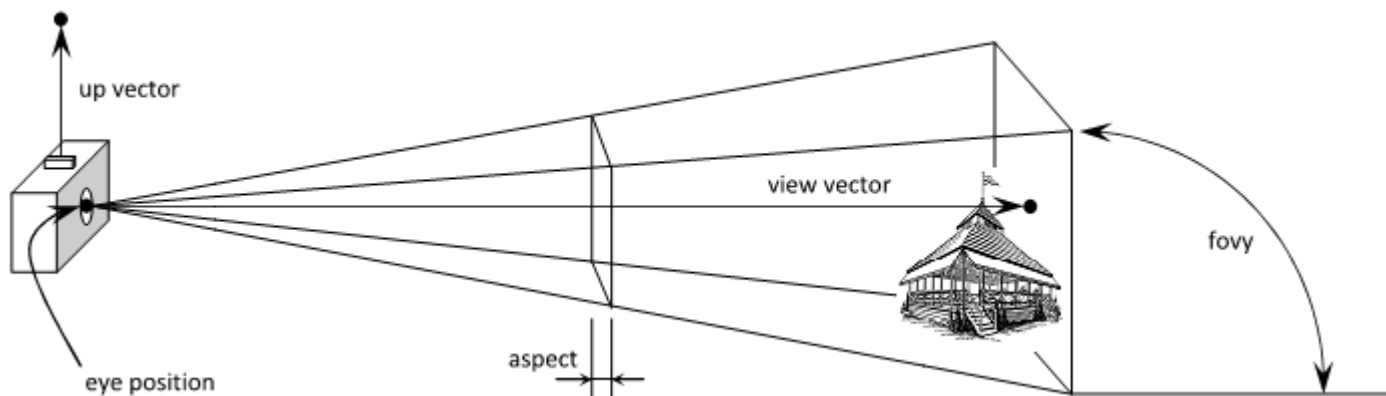


Models

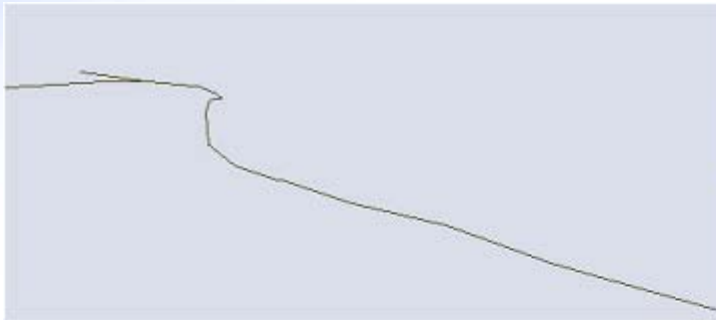
- 3D Model Creator
 - Paths
 - Areas
 - POIs
 - Labels
- Paths and areas consist of points
-> conversion to vertex models (UTM)
- Text and icons

Perspective

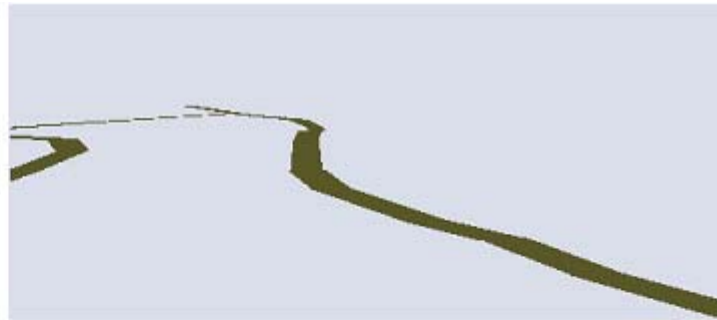
- Perspective Correction
 - Perspective is defined by the camera's focal length
 - Near objects too big – distant disappear (~700m)
 - Text Labels – fixed scaling (counter perspective)
 - POIs – bound scaling (max. and min. size)
 - Paths (2D and 3D mixed model)



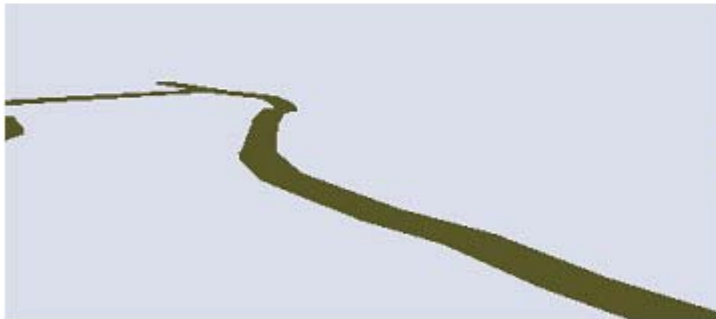
3D Model Creator



(a) A path line without perspective.



(b) A path having a width but no height.



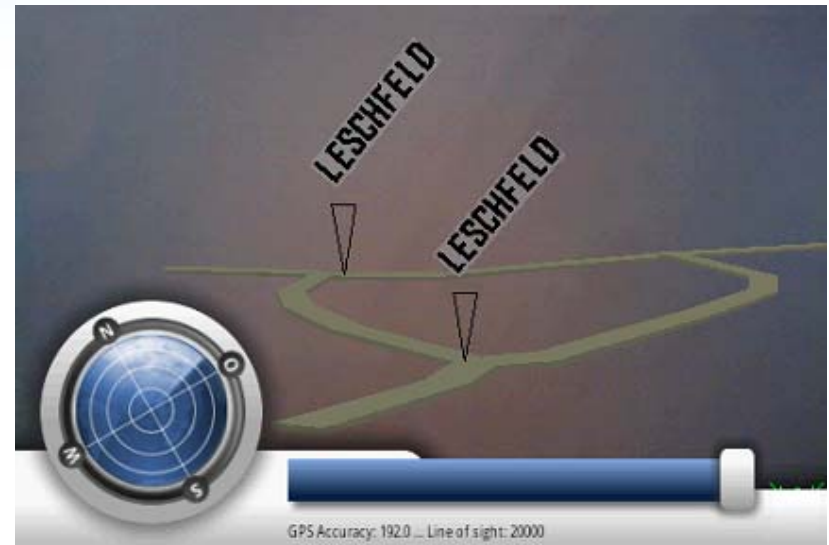
(c) A 3D Path drawn in one color.



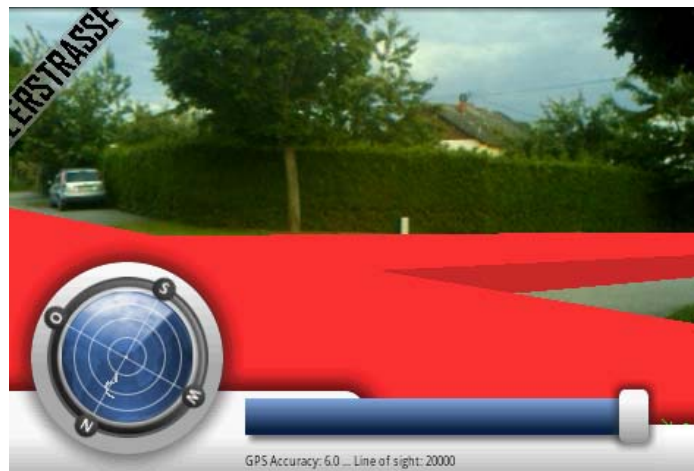
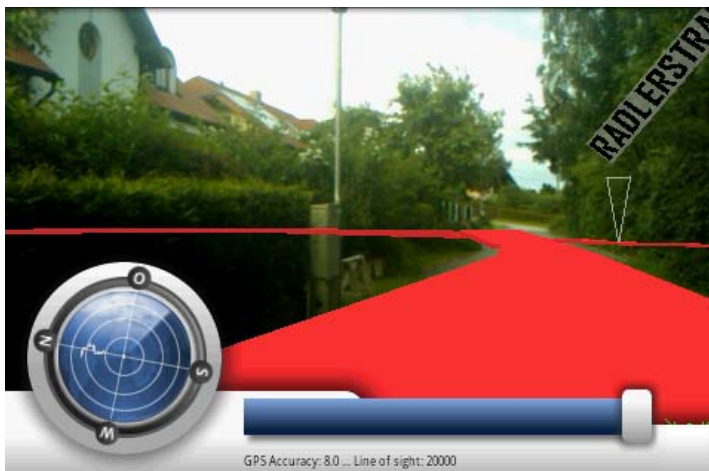
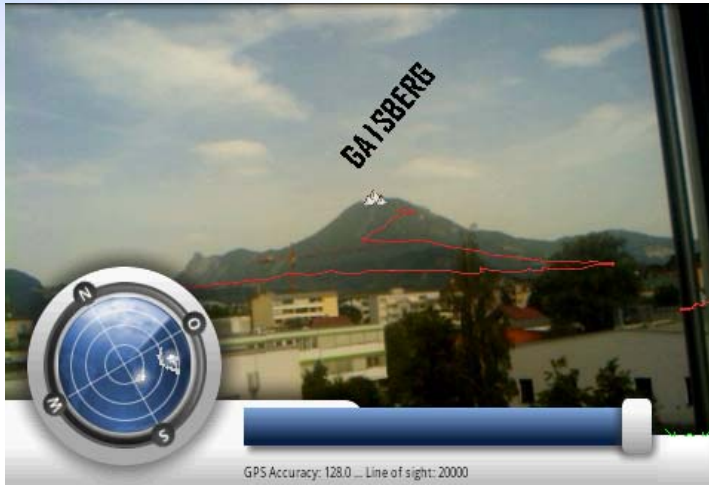
(d) A 3D Path with the sides being drawn in a darker color.

Labels

- Creates 3D labels
- Rotation
- Readability
- Placement (continuous?)



Screenshots



Screenshots



Conclusion

- Scenarios
 - Far (compass, g-force sensor)
 - POI ✓
 - Paths ✓
 - Near (GPS, geo-data, height)
 - POI ✓
 - Paths
 - Accurate data ✓
 - Inaccurate data 
(User moves along a path -> matching)



Remaining Issues

- Topographic data
 - 3D Mesh for topography
- Dependency towards network connection
 - Compass
 - Topography
 - OSM-Data
- Phone sensor inaccuracies
- Solution? Offline database with pre-calculated models

Further information

- www.fh-hagenberg.at
- www.salzburgresearch.at
- SotM Paper:
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