

TERRALOUBE

Automatic Generation & Recognition of Geospecific 3D Information

Large scale 3D geo data analysis

GeoDev-Meetup, 29.06.2016
J. Schindler, Co-Founder & CTO



esri

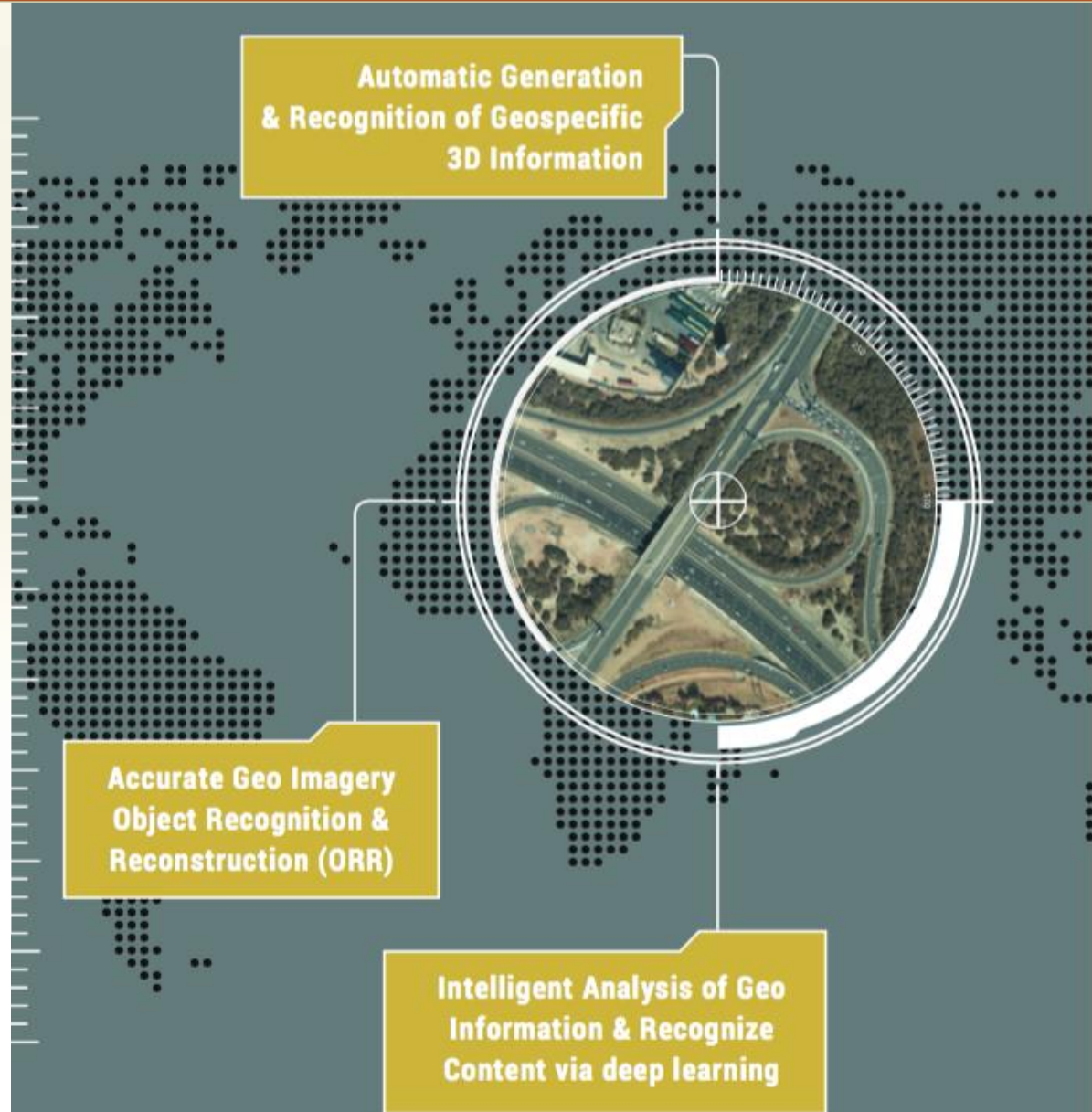
Emerging Business
Partner



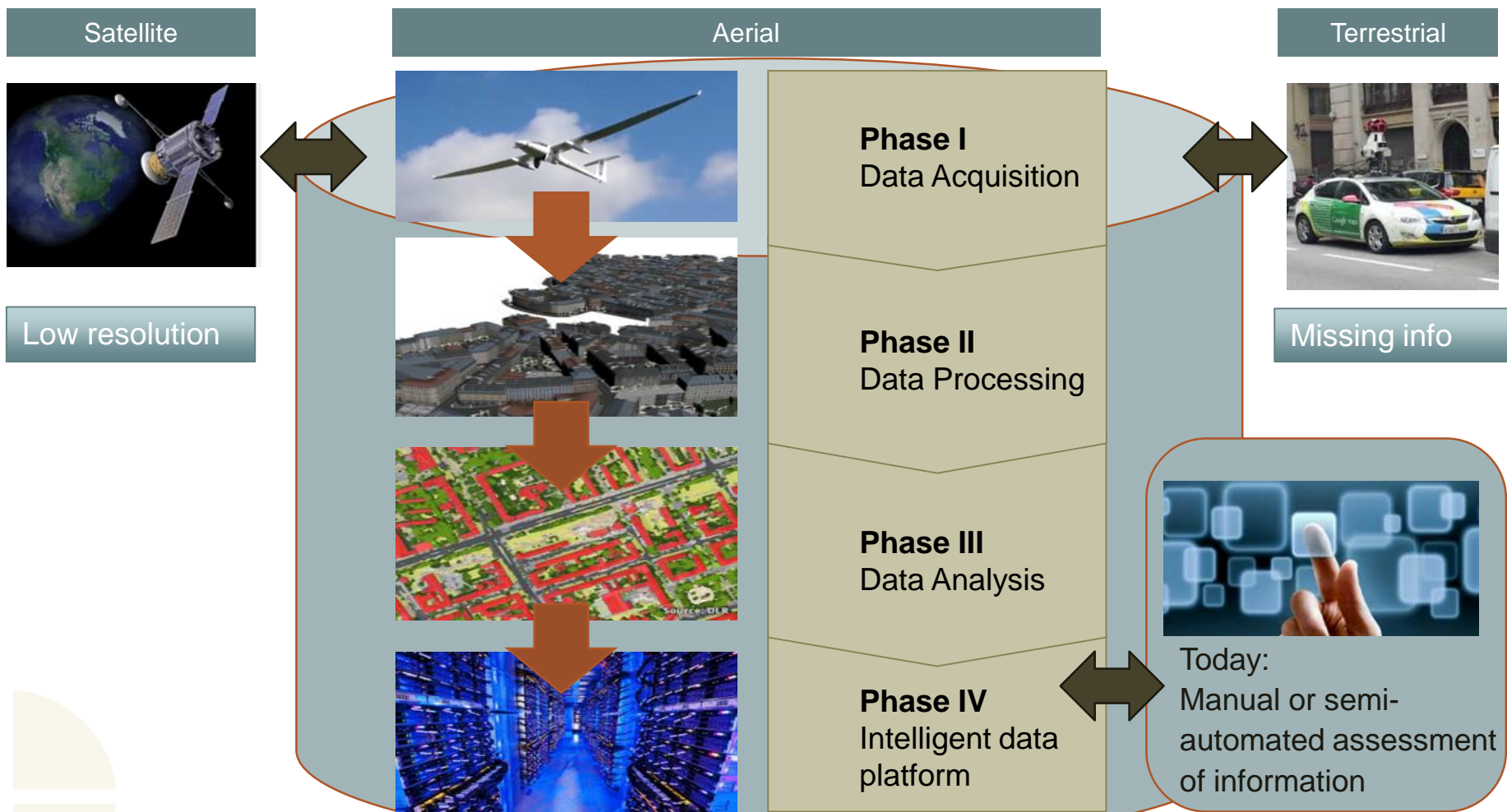
business
incubation
centre

Agenda

1. The business idea
2. The technology
3. One real example
4. Questions & Discussion



TerraLoupe's focus of business on data analysis of 3D aerial imaging data



Increasing demand for geo-data innovation in several industries

Risk Assessment



Autonomous Systems



VR/ Augmented Reality



Construction/ Infrastr.



Energy/Solar Industry



Requirements towards industrial usage of 3D geo data

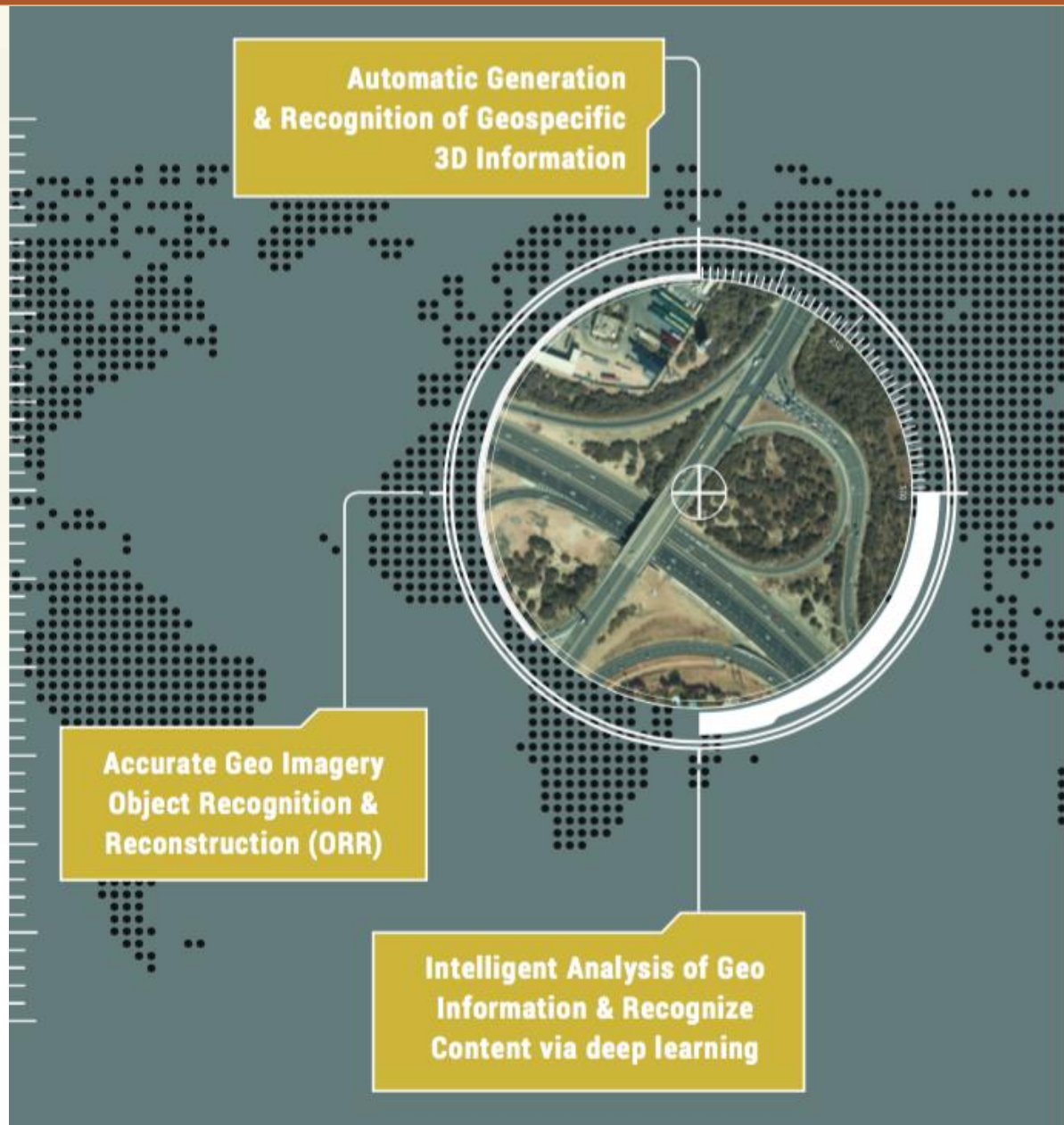
- High accuracy
- Large areas
- Classification of objects
- Up-to-date
- Cost efficient

Security



Agenda

1. The business idea
2. The technology
3. One real example
4. Questions & Discussion



TerraLoupe process – Automation of complete process chain



Detailed process overview – Improved automated process chain (speed-up)

I Data Acquisition

1. Define project targets
2. Data acquisition
3. Geo-registration of images

Images

II Data Processing

4. 3D-Model-reconstruction (point cloud)
5. Develop mesh
6. Put texture on mesh

III Data Analysis

Development

Model development

Recognize objects

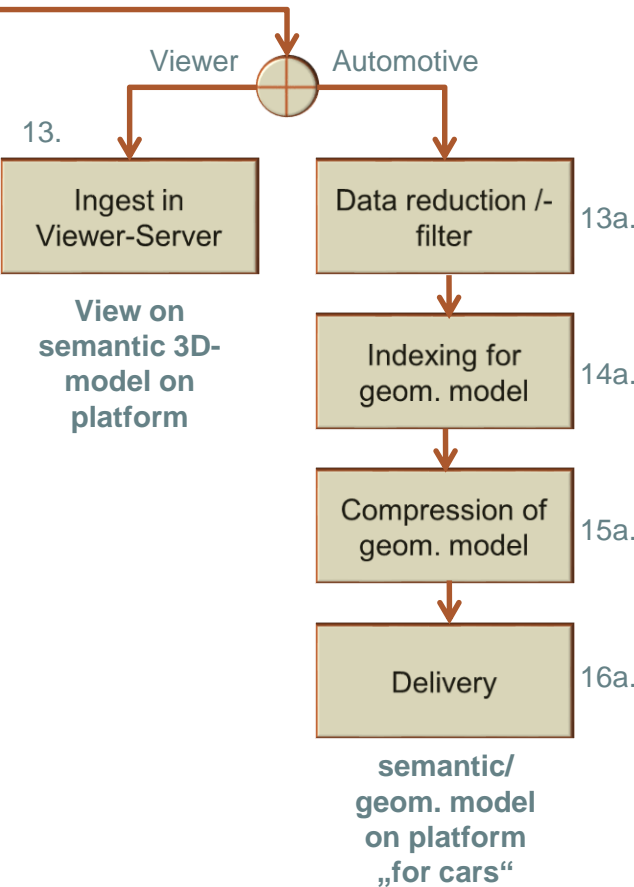
Transfer classifier to 3D-object

Evtl. refinement of objects coordinates

Operations

Semantic 3D-Model

IV Output / Delivery / Platform



Machine learning based object detection

Inputs

- High-resolution, oblique aerial imagery
- 3D reconstruction
- State-of-the-art machine learning



Outputs:

- Recognized objects and
- Localization in real world

From hand-crafted rules to deep learning

Rule-based object detection (from 80s)

- Hand-crafted features (color, size, shape, ...)
- Hand-crafted rules (e.g. rectangular objects of certain size → building)

Classical Machine Learning (From 2000)

- Hand-crafted features (e.g. SIFT**, color histograms, size)
- **learned** classifiers (SVMs*, Random Forests, ...)

Deep Learning (from 2013)

- **Learned** features (convolutional neural networks, auto encoders)
- **Learned** classifiers
- Single process from input data (images, 3D point clouds) to classification results

Algorithms

- Manually engineered
- Human knowledge needed
- Longer development / re-development times
- Less data needed

TerraLoupe 

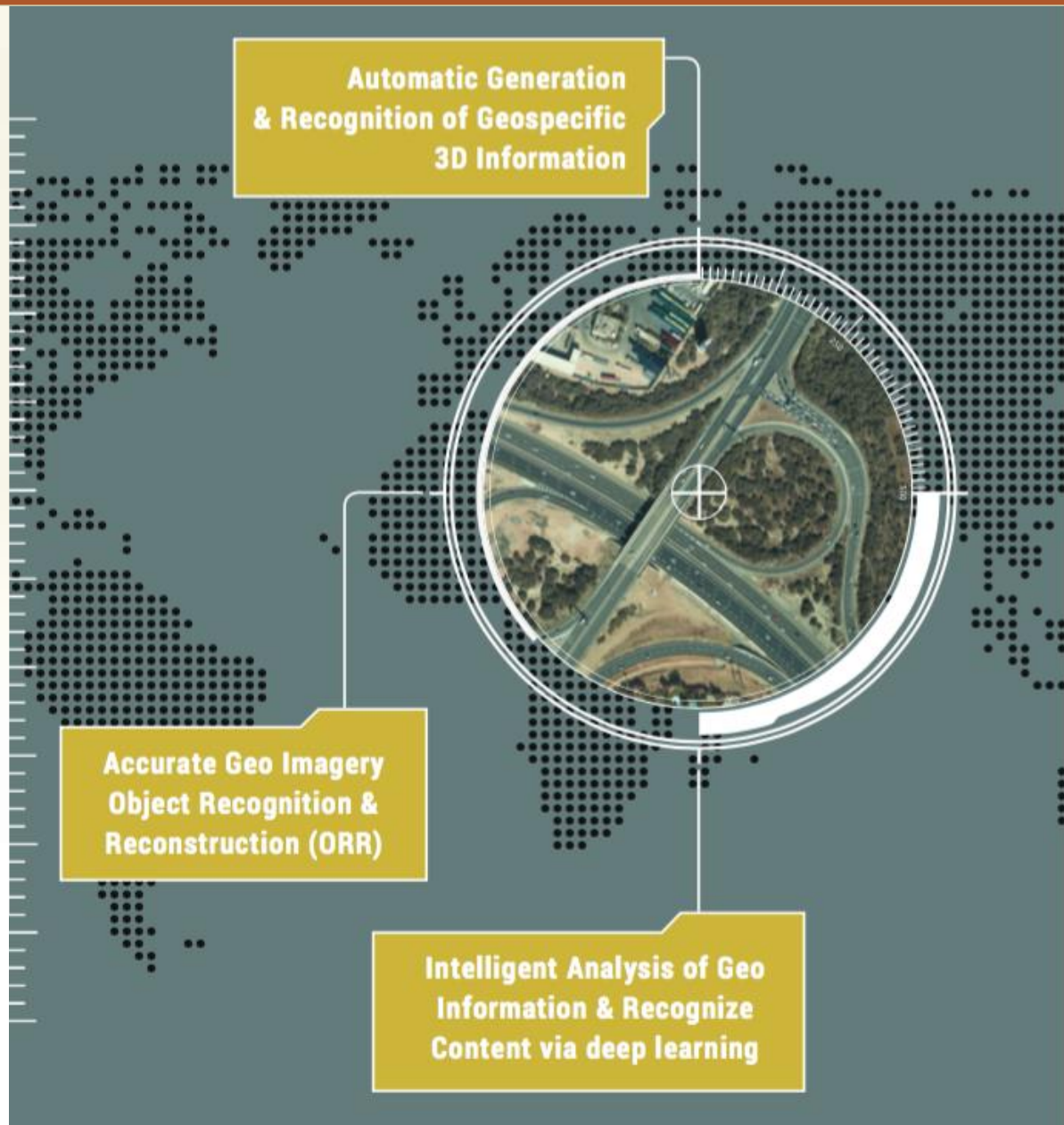
- Learned from data
- Better results
- Faster development / no re-development
- More data, computational power needed

* SVM: Support Vector Machine

** SIFT: Scale Invariant Feature Transform

Agenda

1. The business idea
2. The technology
3. One real example
4. Questions & Discussion

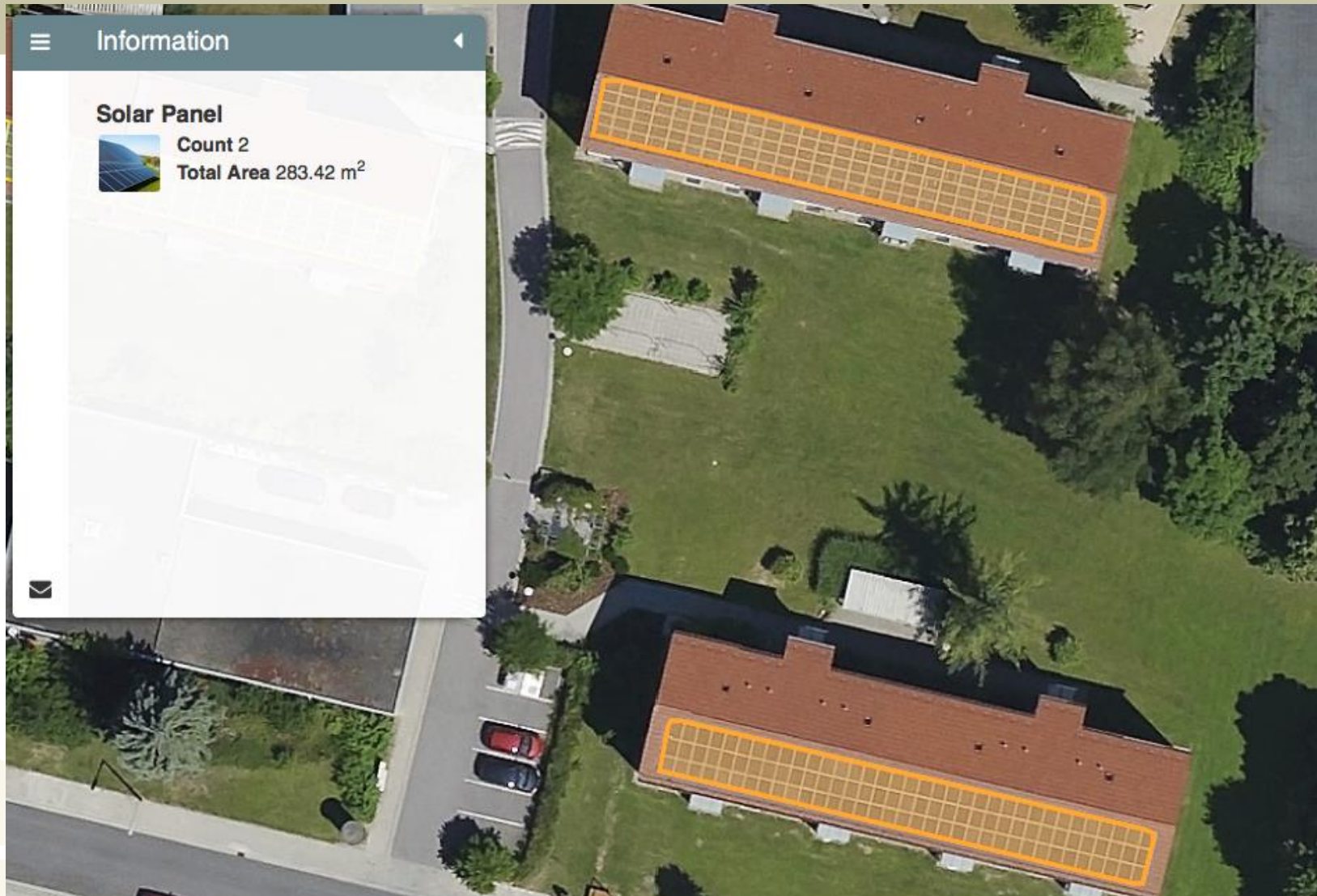


Example project data

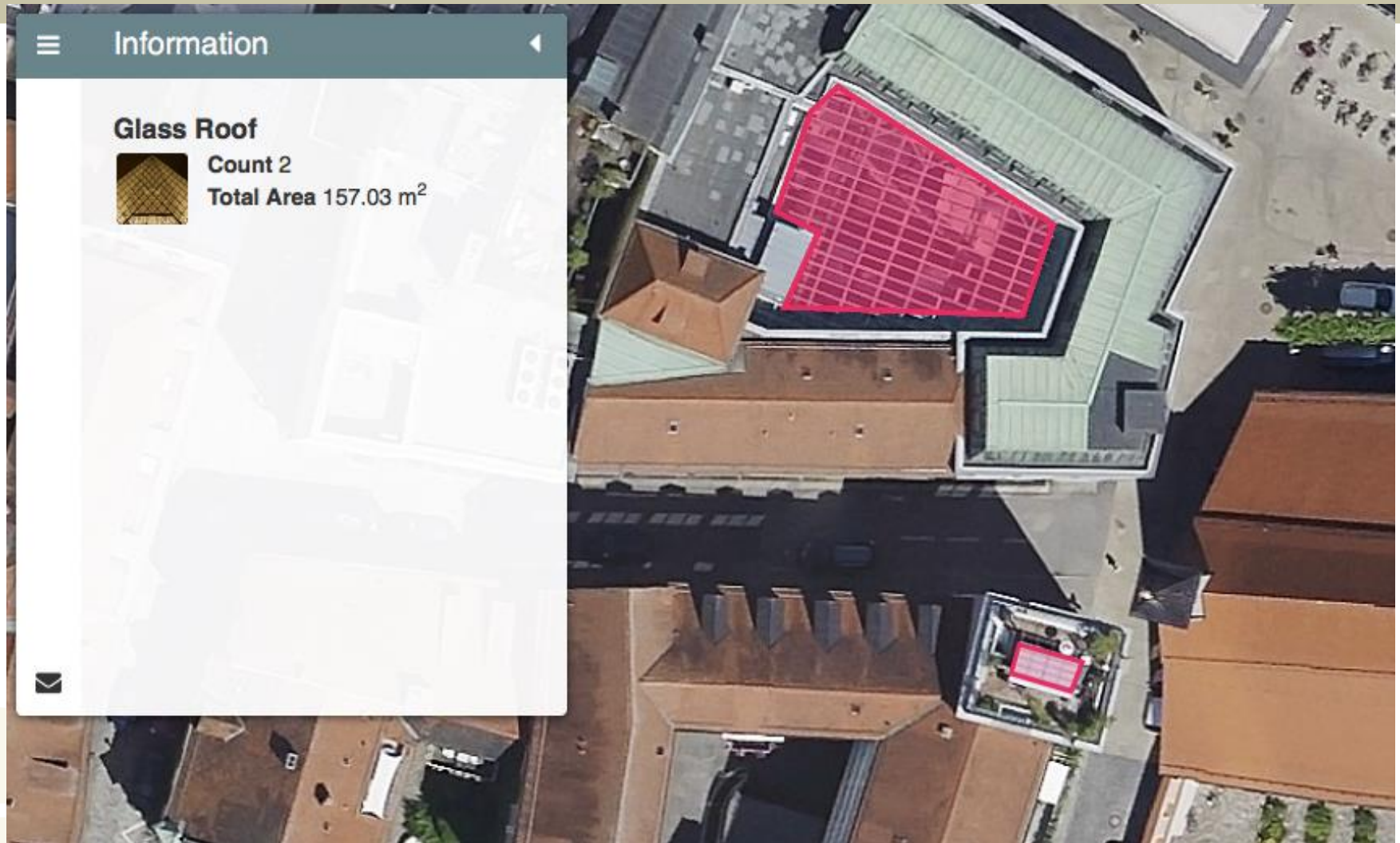
- City of Regensburg
- 81 sqkm
- Ground resolution 10 cm
- Top-view + Side-view
(nadir + oblique)
- Overlap 60:30
- All 5 perspectives



Example detection of solar panels (ortho)



Example detection of glass roofs (ortho)



Example detection of satellite dishes oblique view and corresponding ortho view

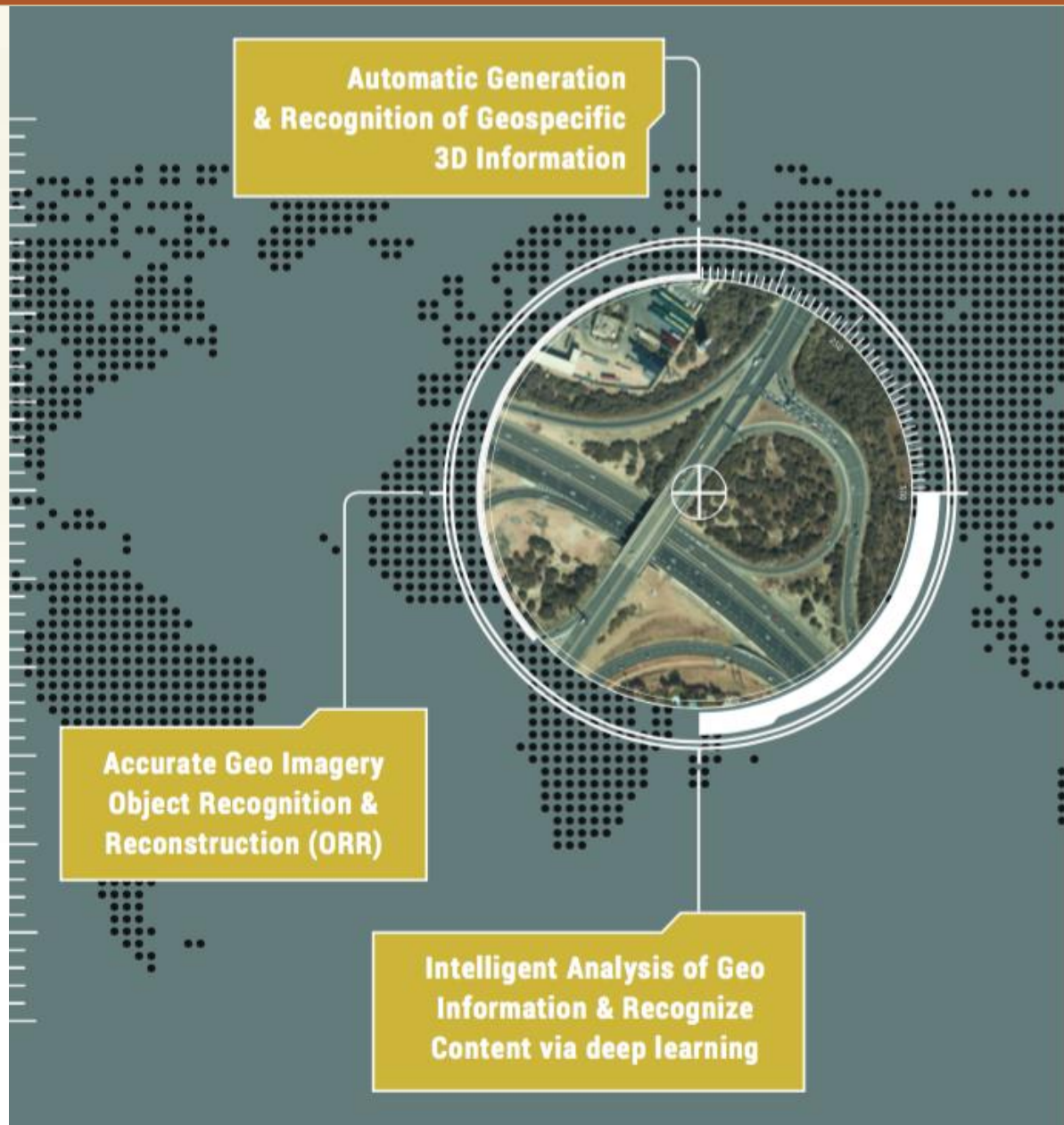


Example detection of satellite dishes oblique view



Agenda

1. The business idea
2. The technology
3. One real example
4. Questions & Discussion



Thank you

TerraLoupe GmbH

Friedrichshafener Str. 1
82205 Gilching (bei
München)
+49 8105 7727780
www.terraloupe.com



Co-Founder & CTO

Josef Schindler

Josef.Schindler@TerraLoupe.com

+49 171 37 888 30