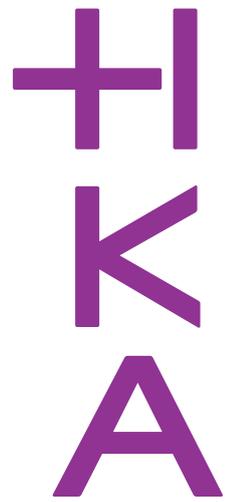# Silos de Burjassot / Valencia

In the 16th century the city of Valencia started to build grain silos in Burjassot 7 kilometers from the city center to store grain in cool and dry subterranean chambers. In the end, a total of 47 silos were built, although only 41 remain. Six of them were connected during the Spanish civil war.

In April 2016 was the first field campaign in Burjassot in Valencia / Spain. The measurement campaign was an opportunity to use several geodetic and geophysical measurement techniques.

Methods

Following Methods are applied:
- Geodetic Network *(see Page 2)*
- Thermography *(see Page 2)*
- Laser Scanning *(see Page 3)*
- Photogrammetry *(see Page 4)*
- GPR Ground Penetration Radar *(see Page 5)*

Student's Reports

Ahmed Hadabay *(downlad)*
Larissa Zucker *(download)*

Press

Radio-Interview with Prof. Dr. Heinz Saler *(downlad)*

Silos of Burjassot – Video and 3D-Modell

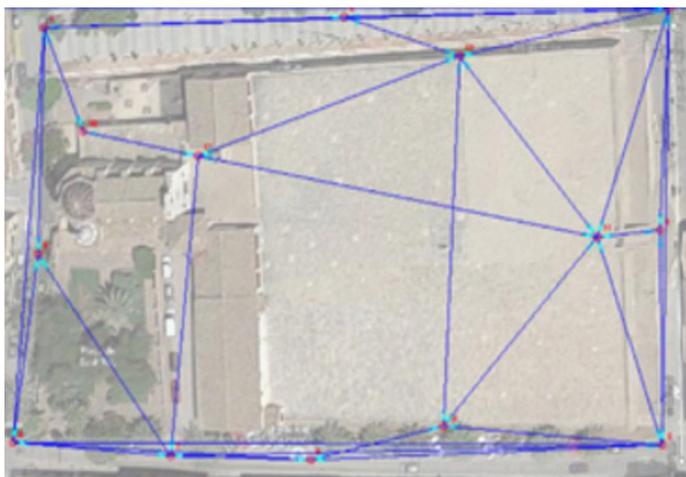*Video Silos of Burjassot*

Silos of Burjassot 3D Modell (unity 3D) – 250 MB!!

Geodetic Network Measurements

The Geodetic network is set of points with reference coordinates as base for all other geometric results of the project. To calculate these coordinates measurements elements like distances and angles, and GPS coordinates are used.
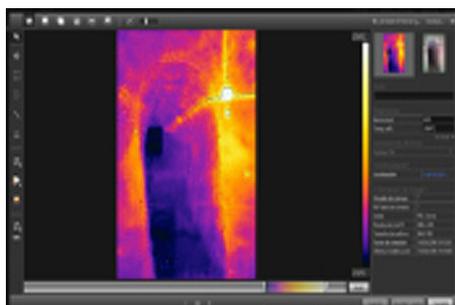

Thermography

Thermographic cameras detect radiation in the infrared range of the electromagnetic spectrum and produce images of that radiation. The amount of radiation depends on the material emitted by an object; therefore, thermography allows one to detect different material.

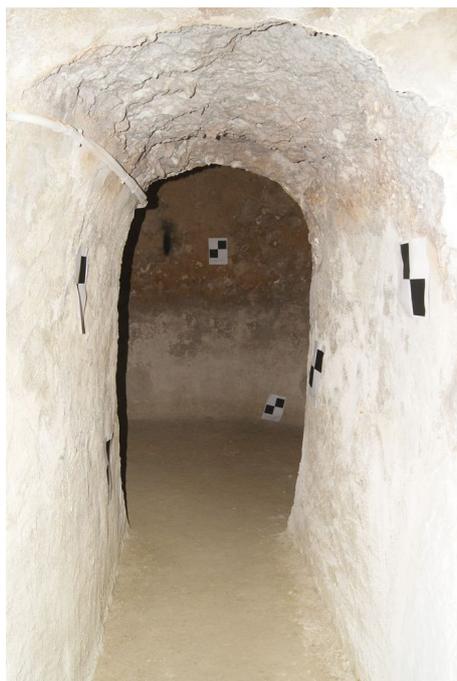*Taking Thermography Images*

Thermo Image of the silo

Visualization of the silos with Unity Game Engine
(for Firefox and Internet Explorer only)

Laser Scanning

Laser scanning produce millions of points representing real objects like walls, trees, buildings etc. within some minutes. Laser scanner can be used interior and exterior of constructions.
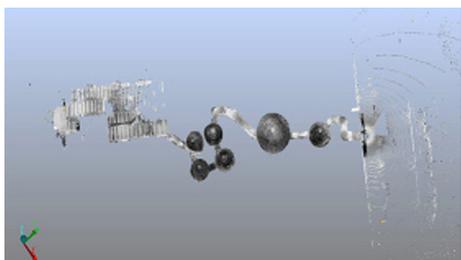

Taking Thermography Images
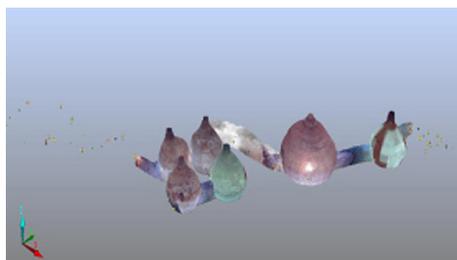

Thermo Image of the silo

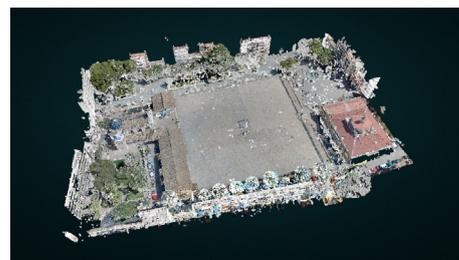*Visualization of the silos with Unity Game Engine (for Firefox and Internet Explorer only)*

Results

Result 1

Result 2

Visualization

Visualization of the 3d point cloud (for Firefox only)

Photogrammetry

Photogrammetry is a measurement technique which use overlapping photographs of an object or a scene for calculate its 3d geometry. The photographs can be taken from a local point or an UAV – Unmanned Aircraft Vehicle.

Terrestrial Photogrammetry
Lightening the silos for taking the
photogrammetric images
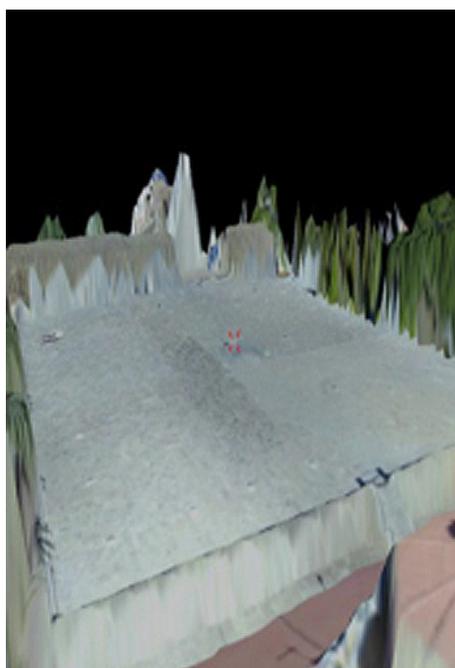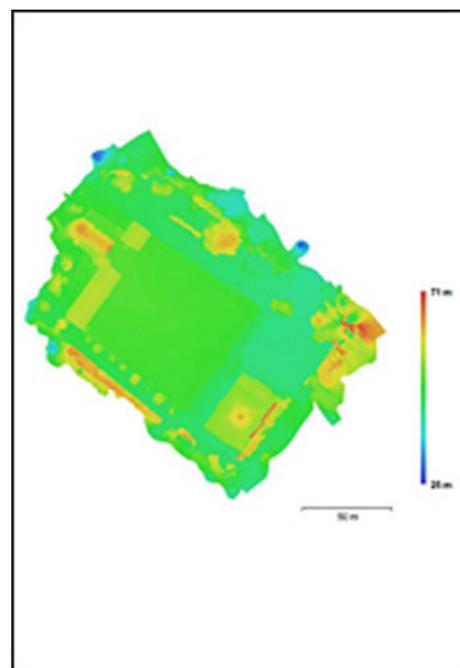

UAV Photogrammetry 1

UAV Photogrammetry 1

Results

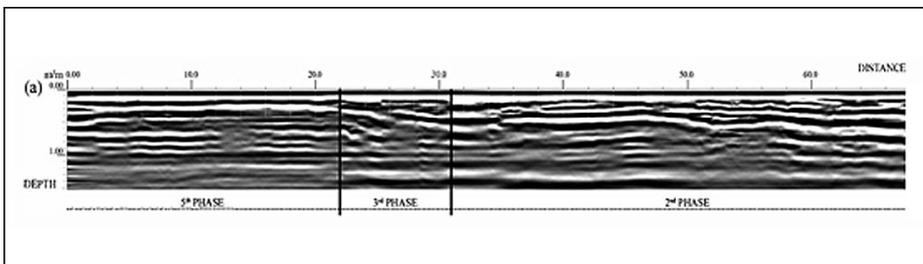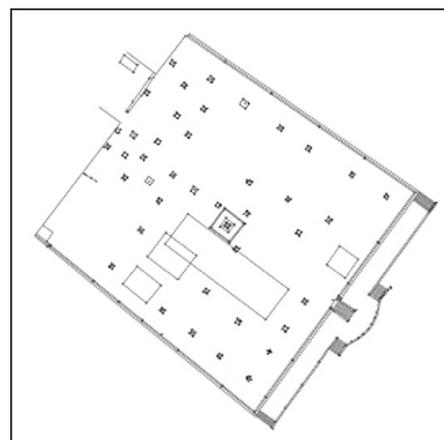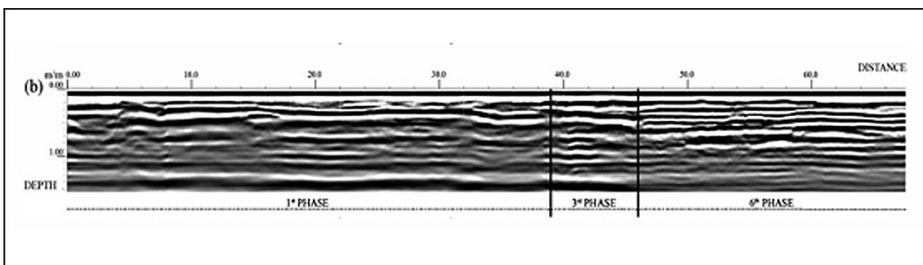*Result 1*

Result 2

Result 3

Ground Penetration Radar (GPR)

GPR is a geophysical method using radar pulses to image the subsurface. This nondestructive method uses electromagnetic microwaves and detects the reflected signals from subsurface structures. GPR can have applications in a variety of media, including rock, soil, ice, fresh water, pavements and structures.
In the field of cultural heritage GPR with high frequency antenna is also used for investigating historical masonry structures (like subterranean silos), detecting cracks and decay patterns of columns and detachment of frescoes.

In Burjassot GPR has been applied at the silo yard to detect more silos and in the silos for investigating the material of the structures.

Reflection profiles obtained witt the 400 MHz center frequency antenna, which show five different constructive phases of the pavement (Valls et al. 2014).

Results
The GPR measurements of 2016 are still not processed, but results of a former campaign in 2014 are already available