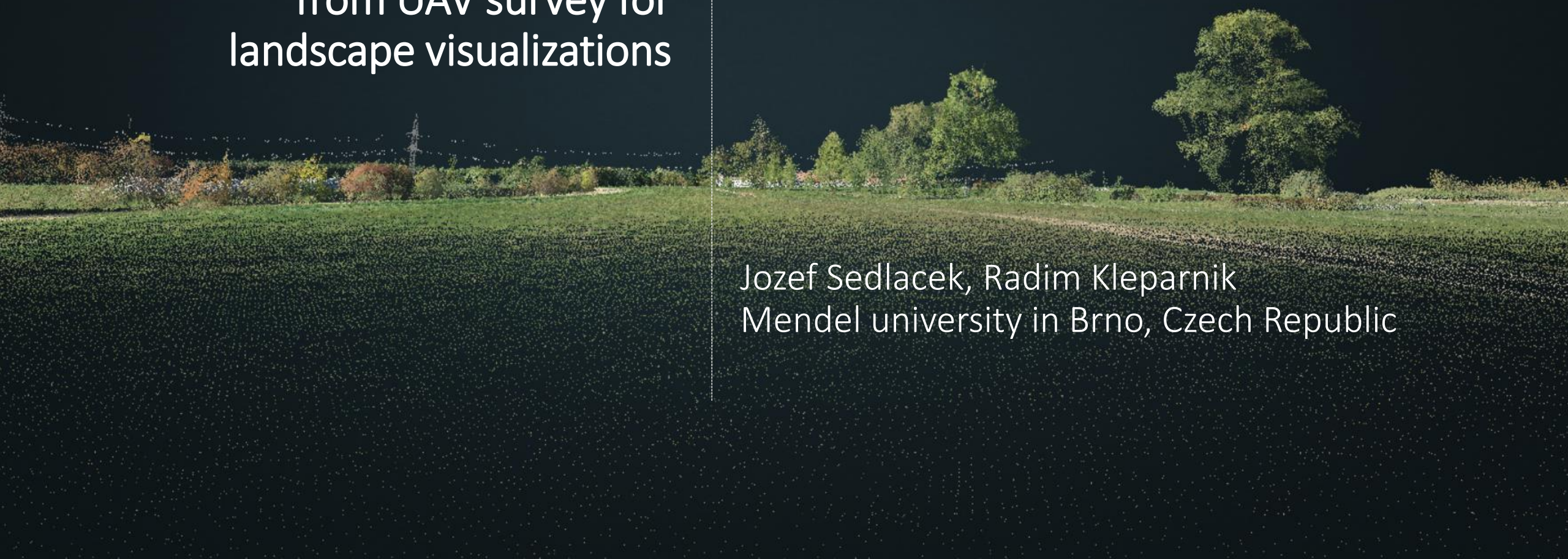
MENDELU
Faculty
of Horticulture

Testing dense point clouds from UAV survey for landscape visualizations



Jozef Sedlacek, Radim Kleparnik
Mendel university in Brno, Czech Republic

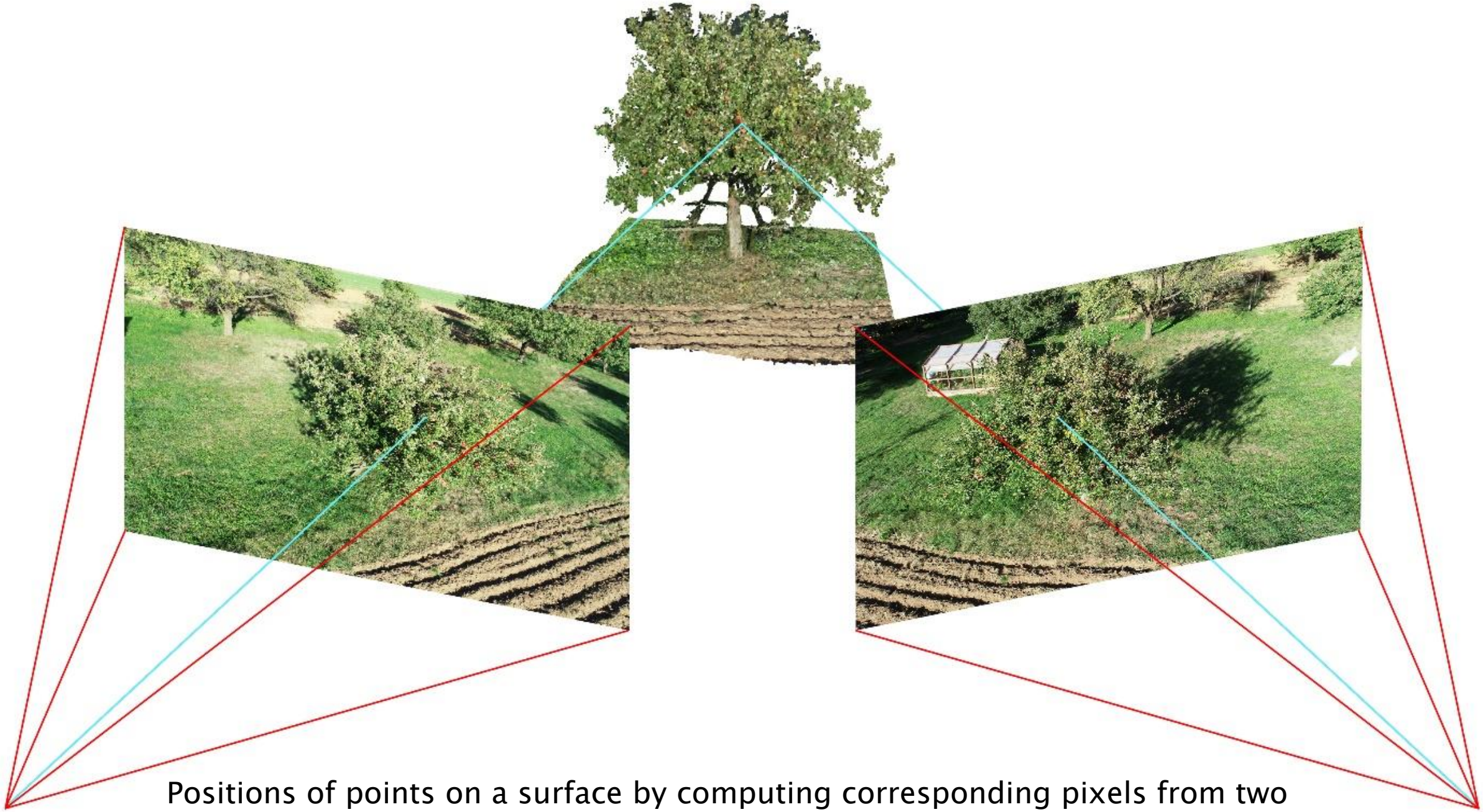
Testing dense point clouds from UAV survey for landscape visualizations

Content

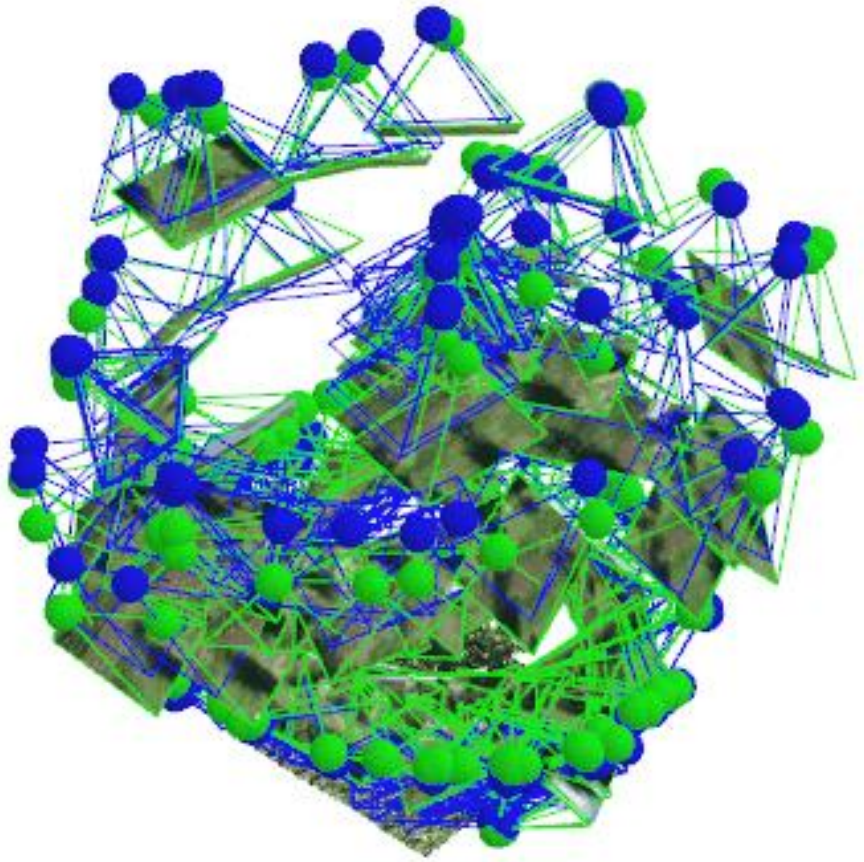
Why point clouds and not a mesh?

Are they an alternative to photo simulations?

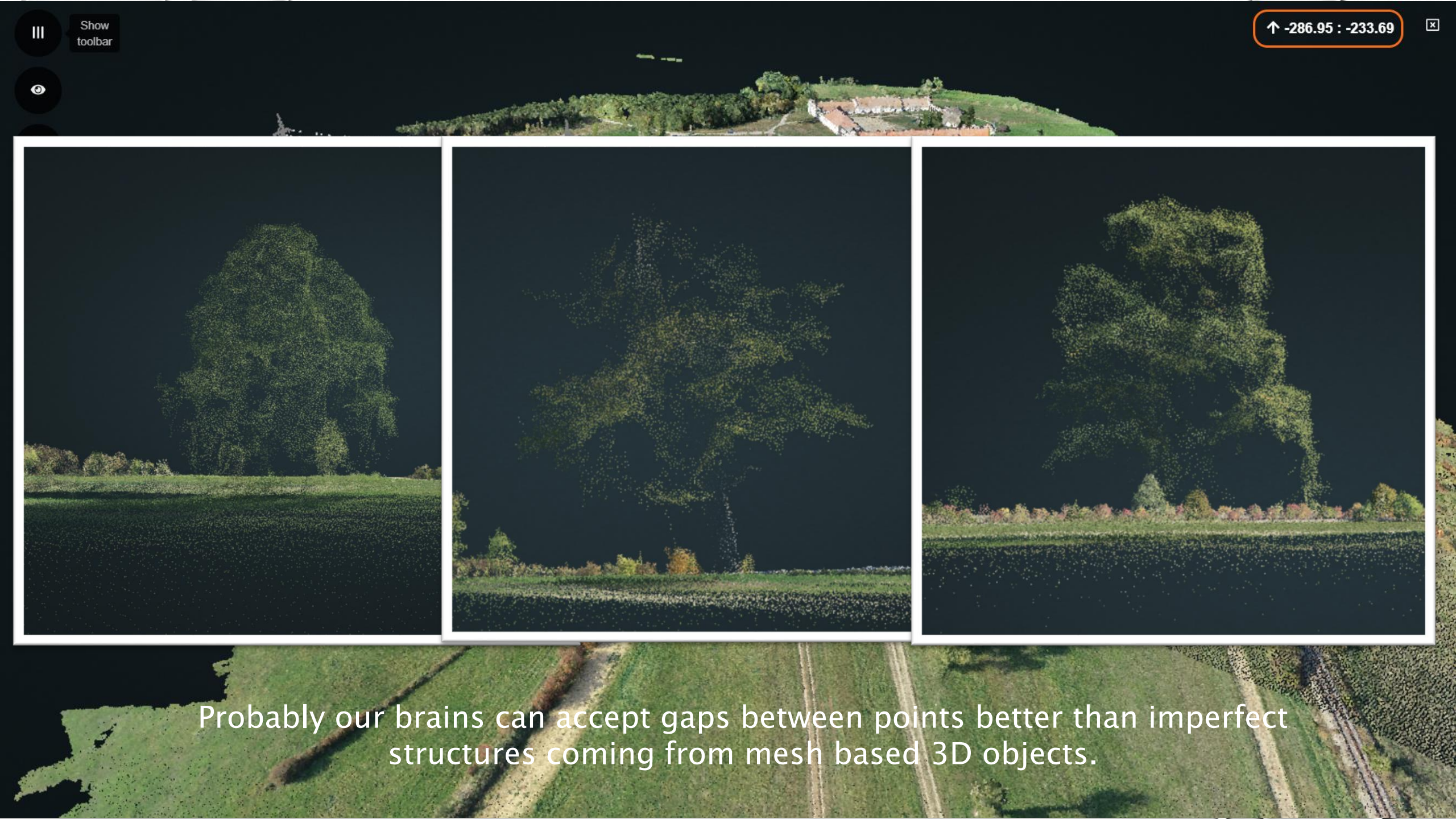
How the point cloud graphic is perceived by the audience?



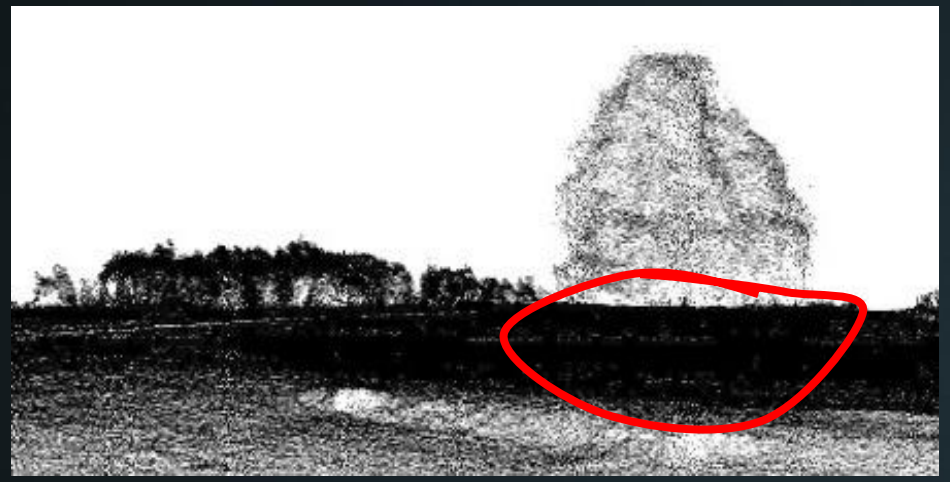
Positions of points on a surface by computing corresponding pixels from two viewpoints (Gross, 2007)

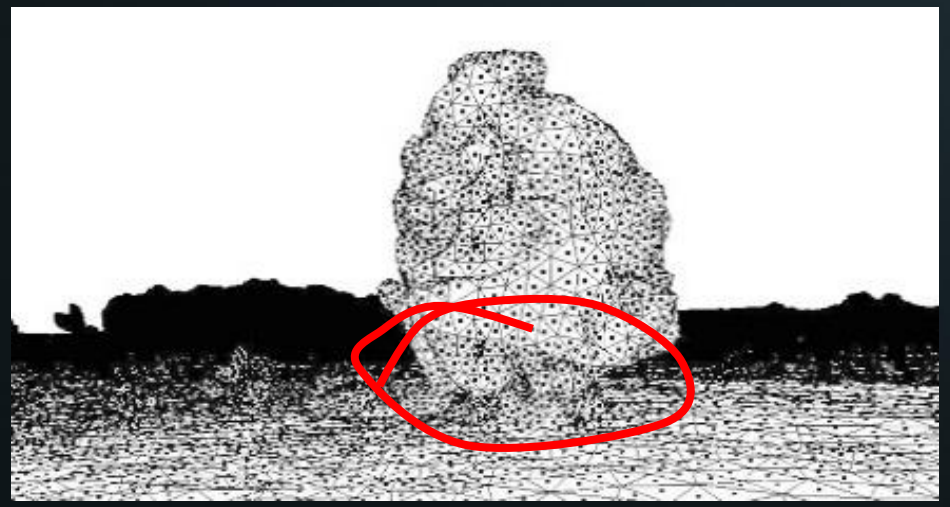


Amount of viewpoints needed to surface reconstruction of a tree from geotagged images


Show
toolbar
-286.95 : -233.69
Probably our brains can accept gaps between points better than imperfect
structures coming from mesh based 3D objects.

WHAT ARE POINT CLOUDS EXACTLY?





They don´t represent surface, only samples of surface

Discreete points, that do not give information about neighbouring points or connectivity.

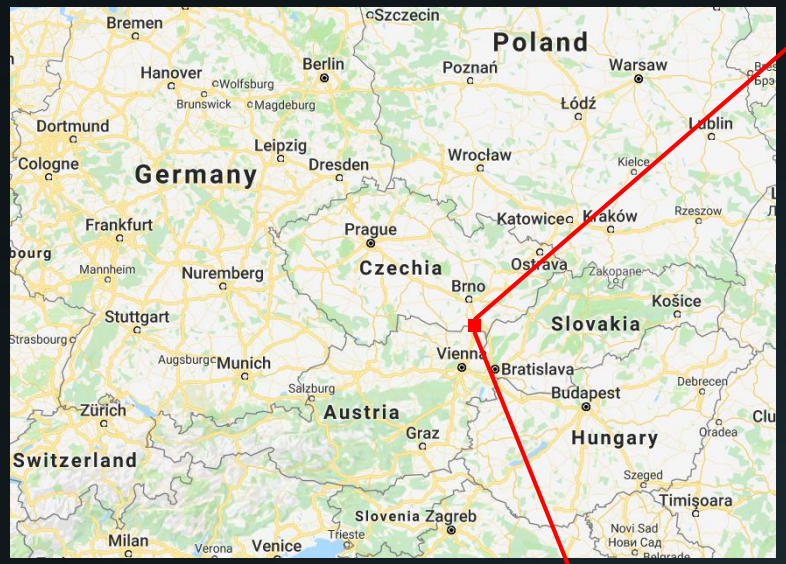
That make them useless where data topology is needed (GIS analysis)

But makes an advantage in representation of complex, nature-like objects with complicated surface

Lednice –Valtice Area, Unesco heritage site

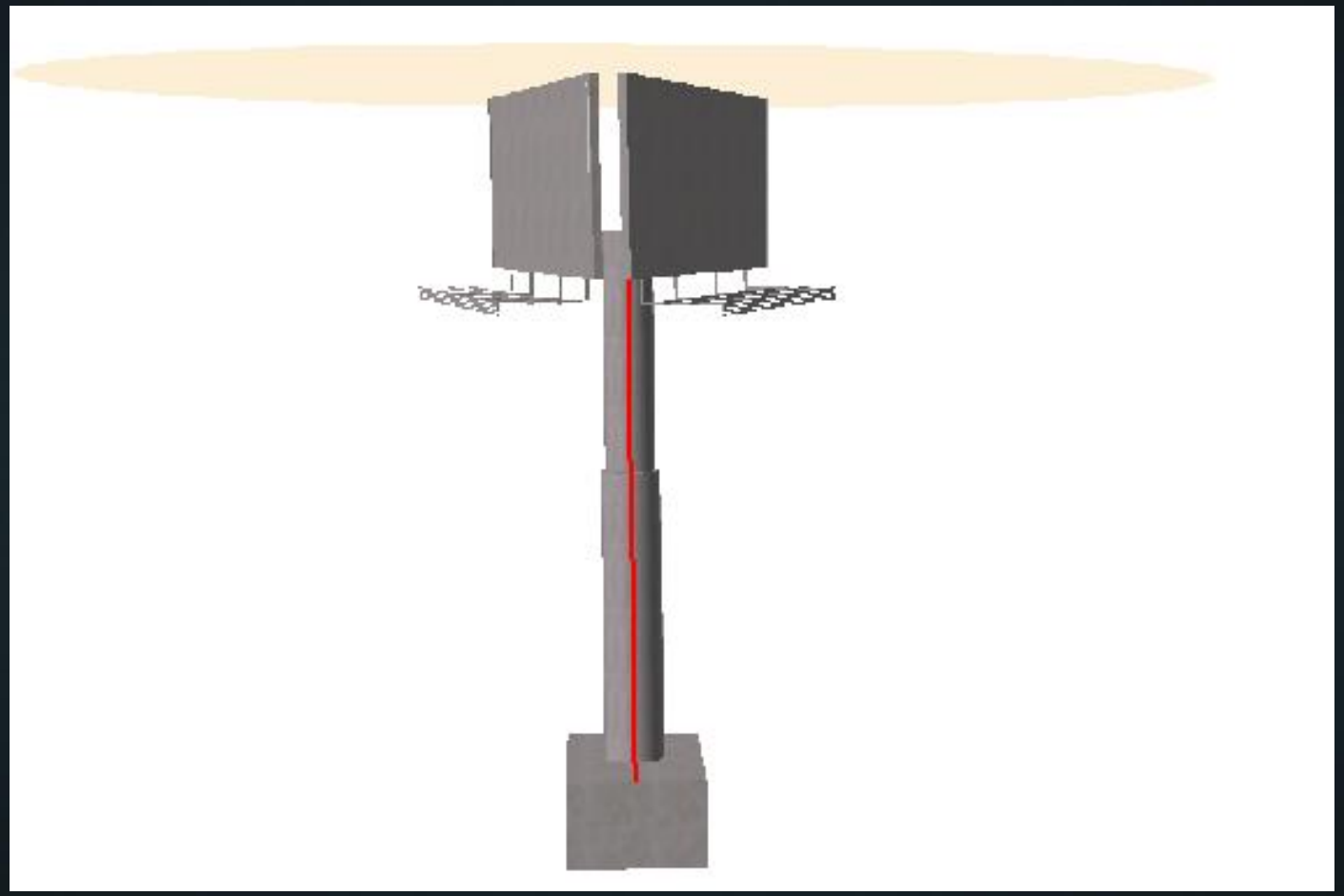
Open space, often used for recreational activities (hiking, cycling)

Vegetation – trees and shrubs are significant features of a landscape scene.

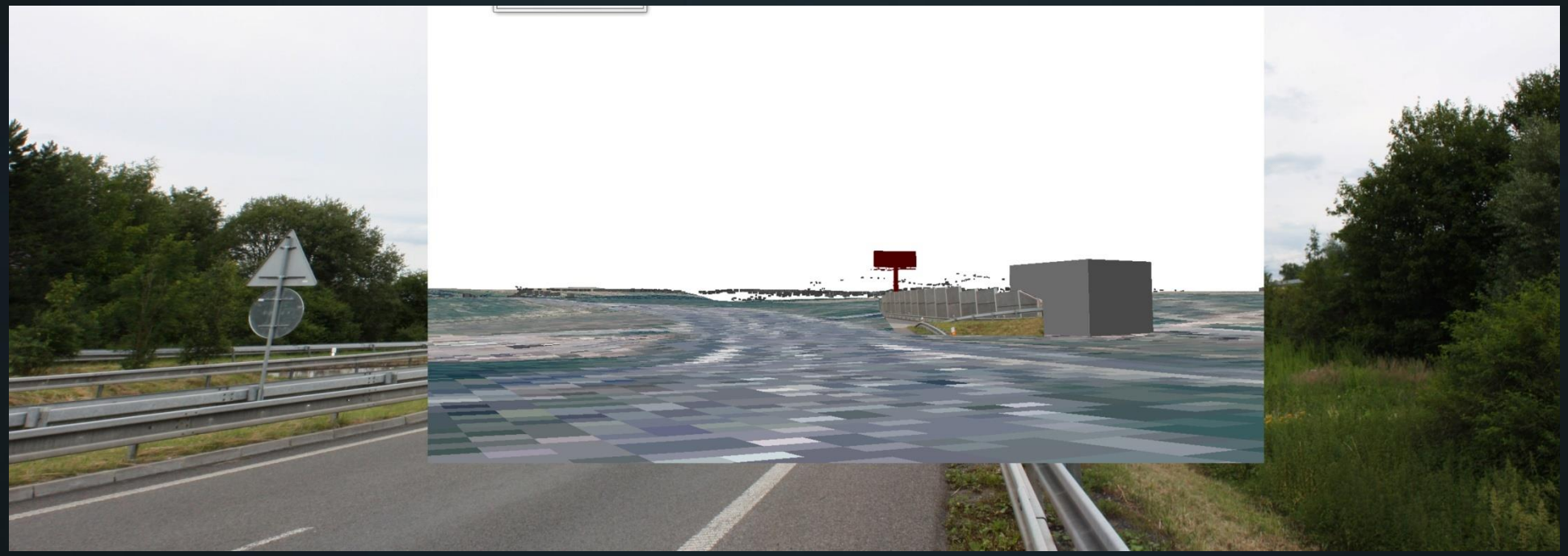


Lednice-Valtice Unesco Heritage Site

Registering and merging a proposed object into photograph (ArcScene+Photoshop)



Registering and merging a proposed object in photo (ArcScene+Photoshop)



Registering and merging a proposed object in photo (ArcScene+Photoshop)

Registering and merging a proposed object in photo (ArcScene+Photoshop)

Registering and merging a proposed object in photo (ArcScene+Photoshop)

The method is time consuming, tricky, and connected to just one viewpoint

DIGITAL TWIN AS AN ALTERNATIVE TO PHOTOREALISTIC SIMULATION?

We can capture the whole landscape scene and make it 3D.

We can use pointclouds to visualize vegetation better than mesh-based object.

It will be easy to modify the digital landscape scene and put a proposal in it

We can publish it online via point cloud rendering web service

Cultural heritage site, historic horse stables in background

Open space, often used for recreational activities (hiking, cycling)

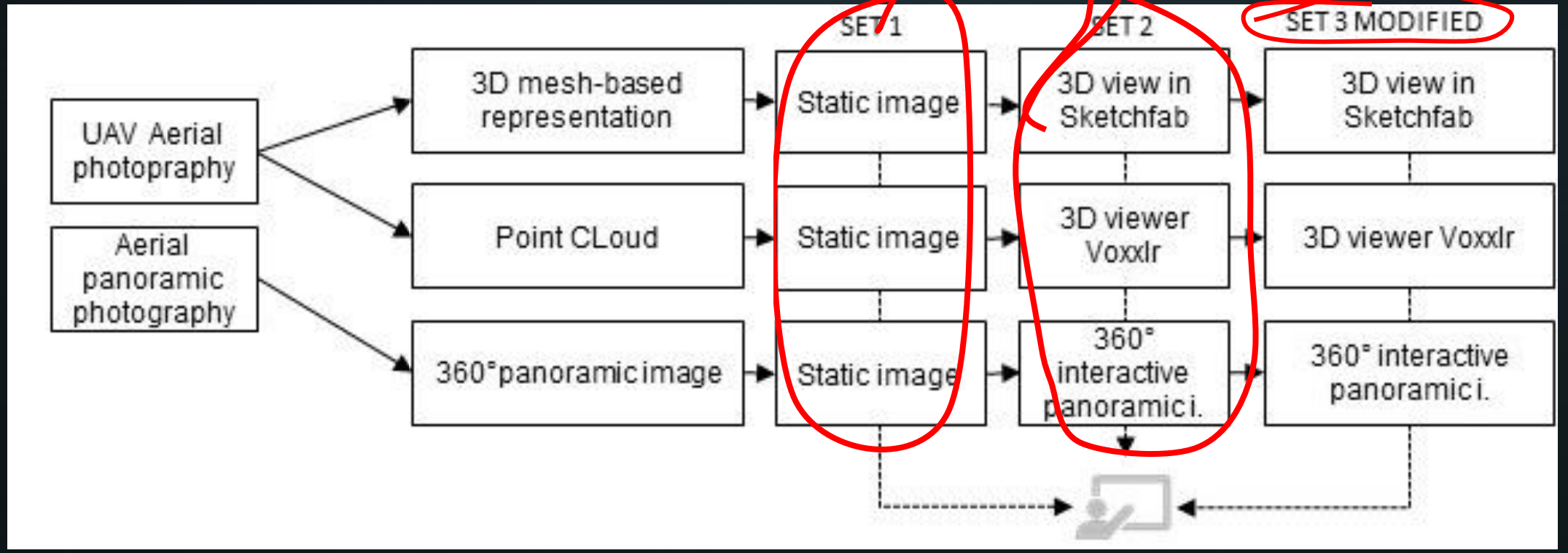
Vegetation – trees and shrubs are significant features of a landscape scene.

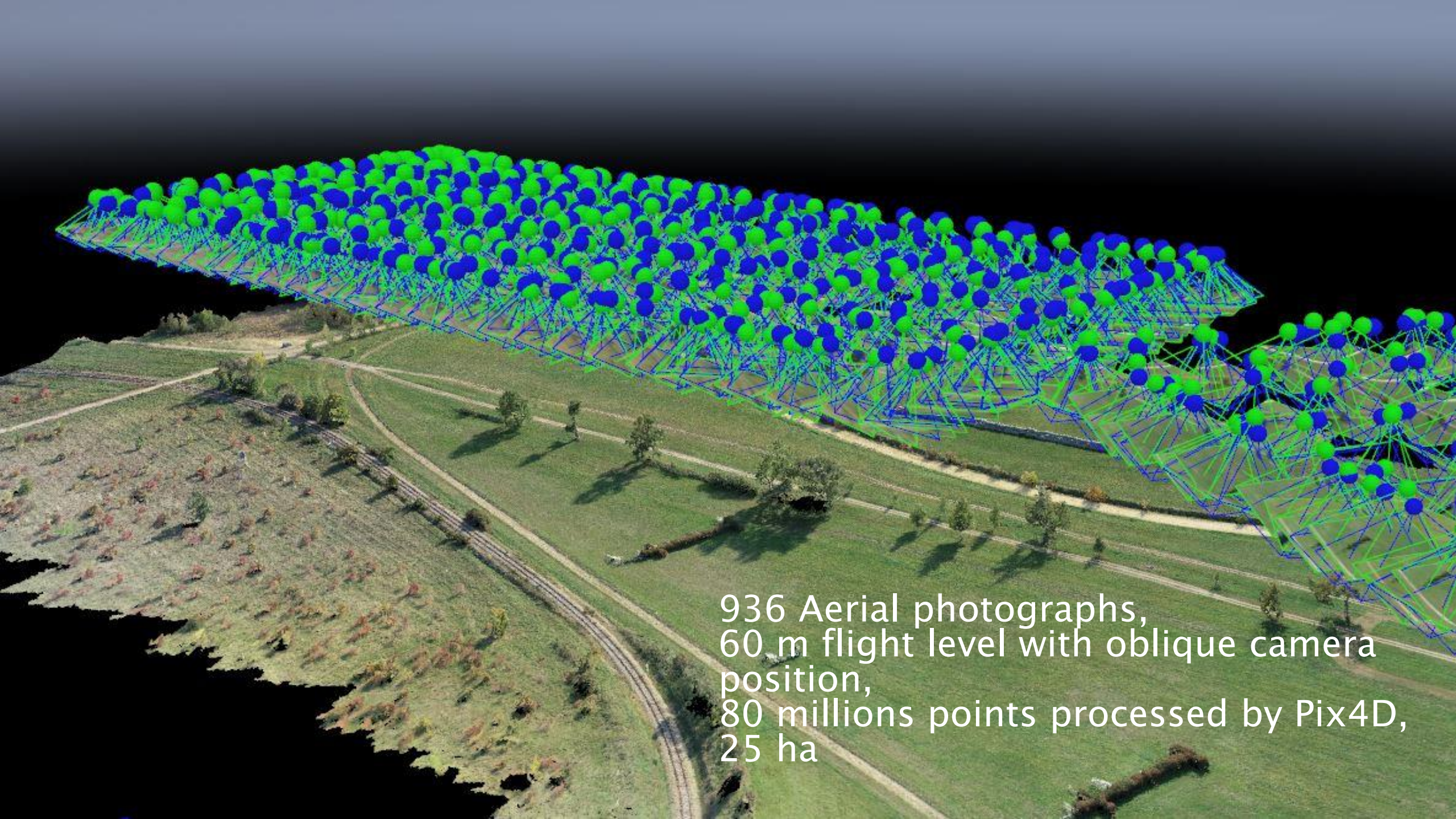
THE EXPERIMENT

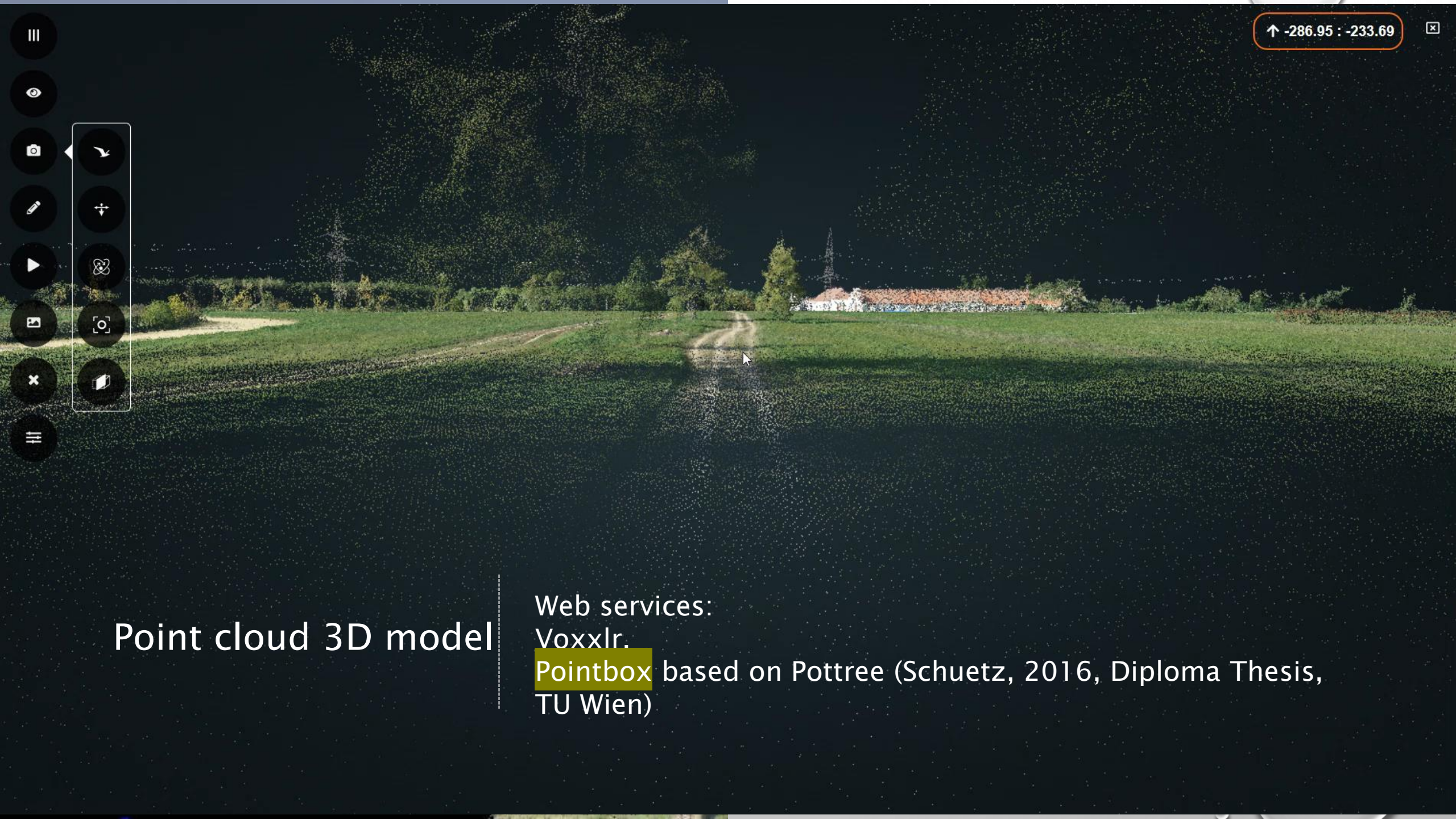
DATA ACQUISITION

DATA PROCESSING

DATA PRESENTATION




936 Aerial photographs,
60 m flight level with oblique camera position,
80 millions points processed by Pix4D,
25 ha



Point cloud 3D model

Web services:
Voxxlr,
Pointbox based on Pottree (Schuetz, 2016, Diploma Thesis, TU Wien)

Mesh-based 3D model

Sketchfab online viewer

All 3d model were reduced by 50%, in order to reduce size.

DATA PRESENTATION

Photograph:
Round.me 360 photograph online service

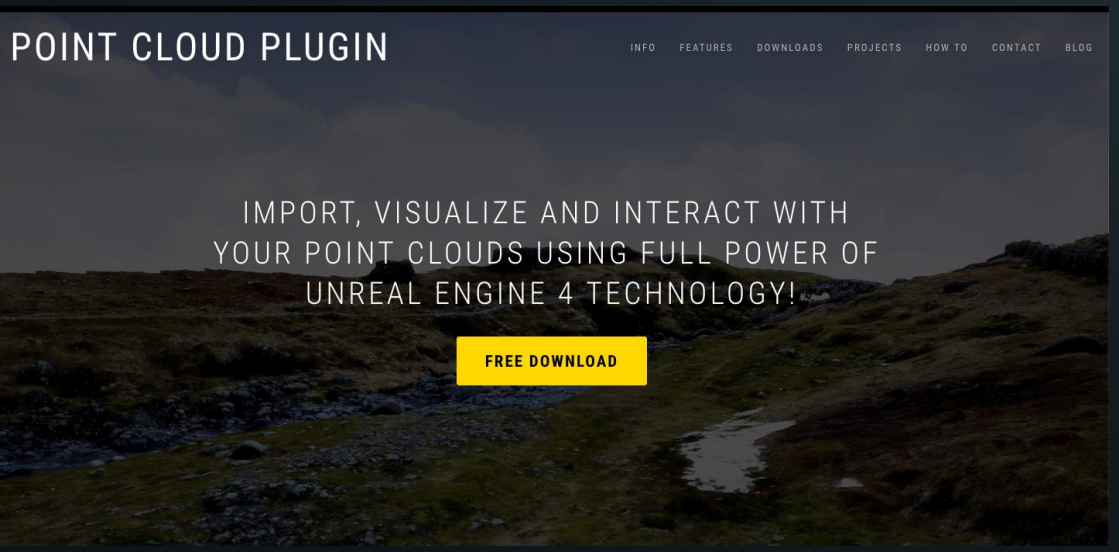
DATA PRESENTATION

SO YOU HAVE NICE POINT CLOUDS AND WHAT YOU CAN DO WITH THEM?

Difficulties with rendering both mesh-based object and point clouds together.

We used Unreal game engine with the point cloud renderer, but it has problems with rendering large scenec

Cloud Compare can create point clouds from mesh (and vice versa) and modify them.



A QUESTIONNAIRE

1. Which of the three images do you think best reflects real space?

2. Which of the three images do you consider as a second best?

3. If the best image you selected was rated 1, how would you rate the second-best slide using a 1-5 scale (1 being the positive and 5 being the negative end).

4. Which of the presented images do you find most interesting?

A QUESTIONNAIRE

We didn’t want to know if the photograph is better than point cloud.

We want to know how much is better.

A „RANDOM SAMPLE“

The results are based on 55 responses.

Questionnaire was distributed among students of landscape architecture, who already visited the place.

The questions were explained before the questionnaire.

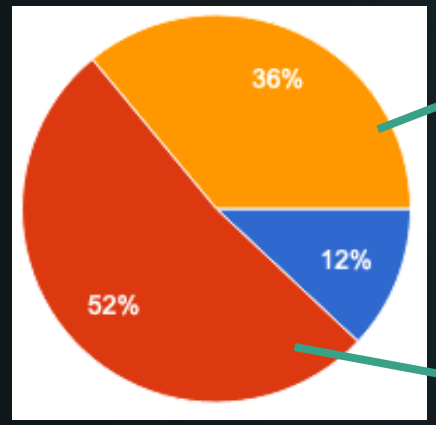
Interactive image

Static image Interactive img. modi

Question	Presentation method	SET No.1 [% of responses]	SET No. 2 [% of responses]	SET No. 3 [% of responses]
Q1: Which of the three images do you think best reflects real space?	photograph	84,6	68,4	63,2
	mesh based model	0	10,5	21,1
	point cloud model	15,4	21	15,8
Q4: Which of the presented images do you find most interest-ing?	photograph		47,4	63,2
	mesh based model		5,3	15,8
	point cloud model		47,4	21,1

SET No. 1: Static image

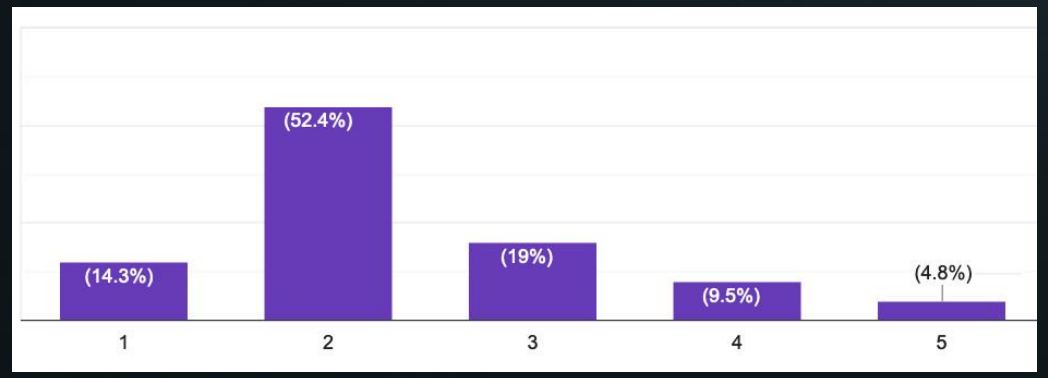
Which of the three images do you consider as a second best?



Point cloud model

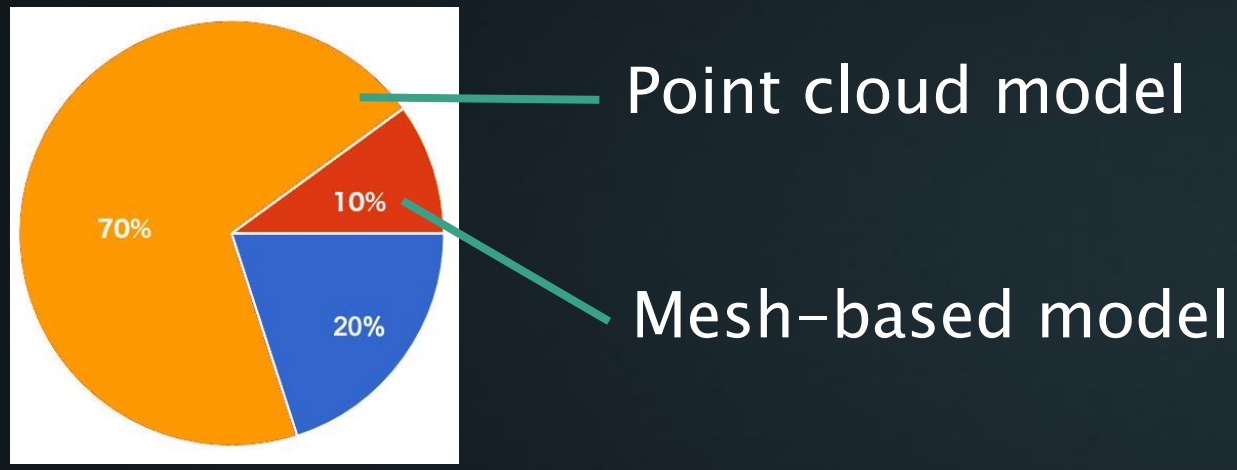
Mesh-based model

Grades (1best, 5 worst)

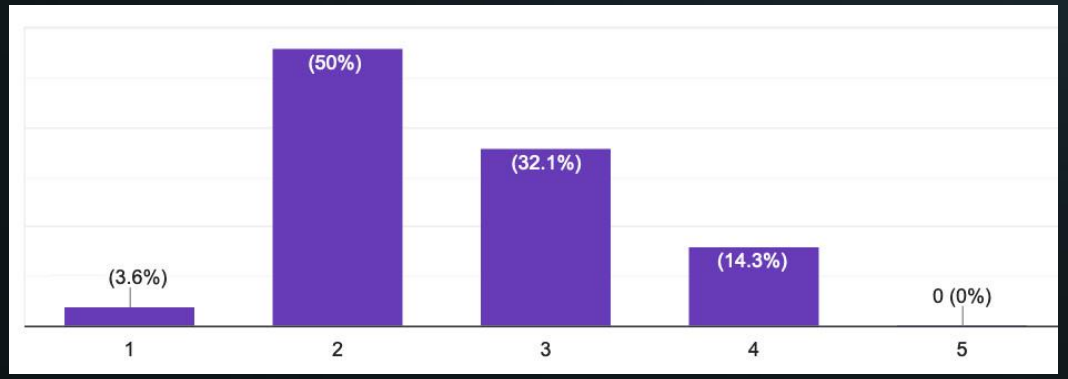


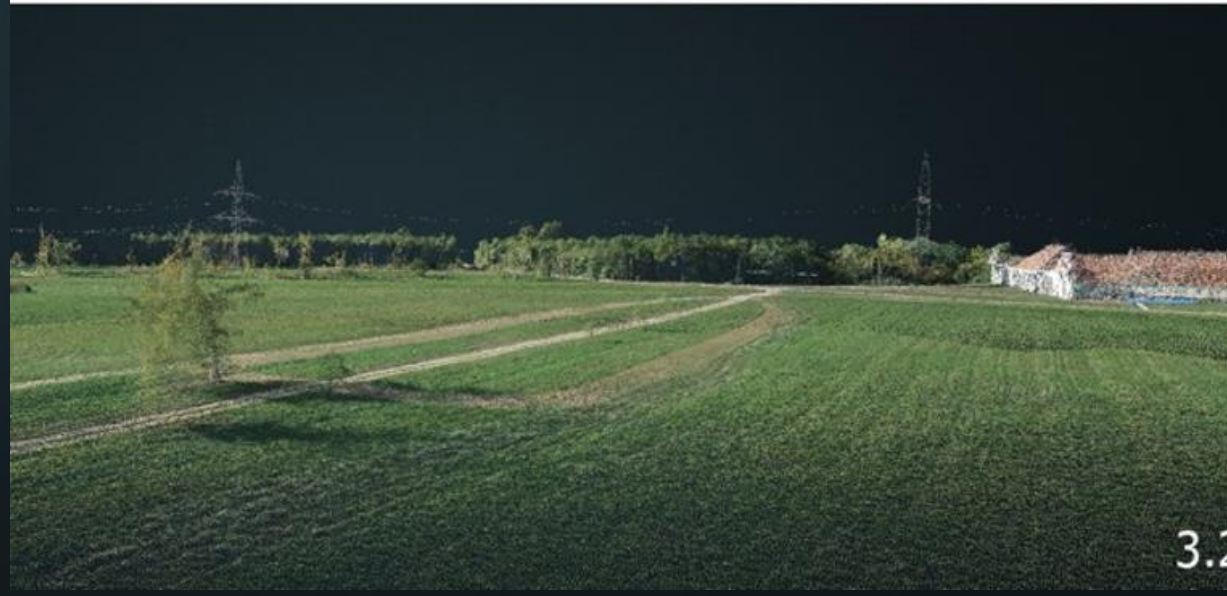
SET No. 2: Interactive scene

Which of the three images do you consider as a second best?

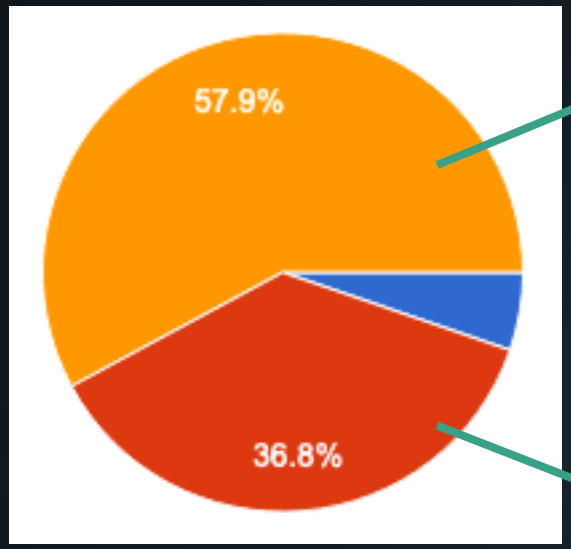


Grades for point clouds (1best, 5 worst)



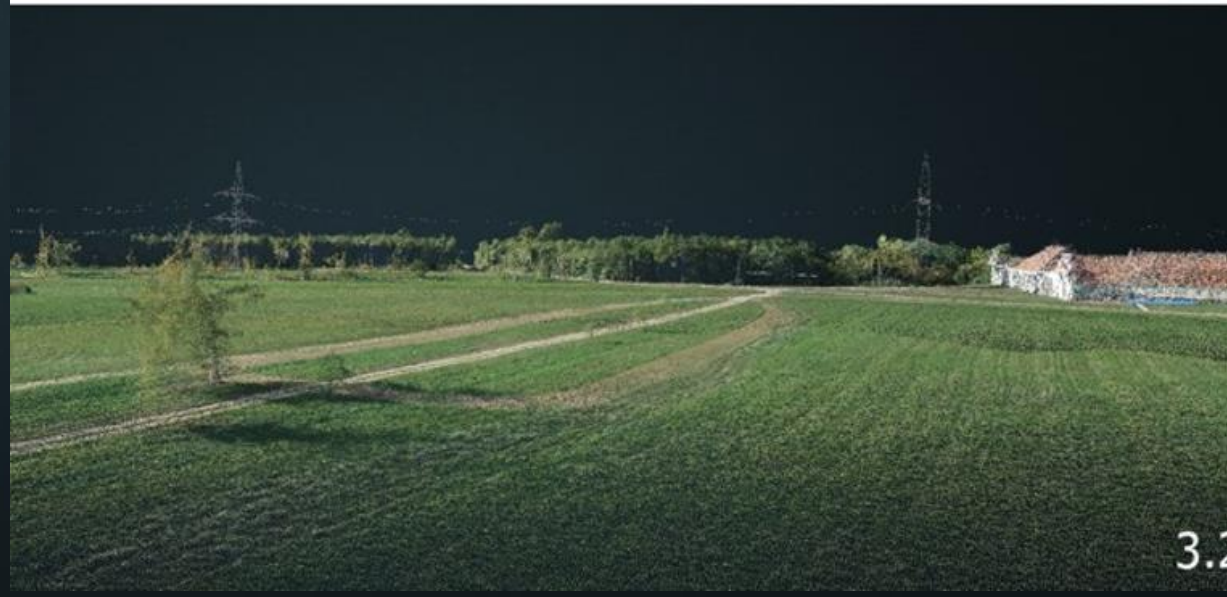


SET No. 3: modified interactive scene

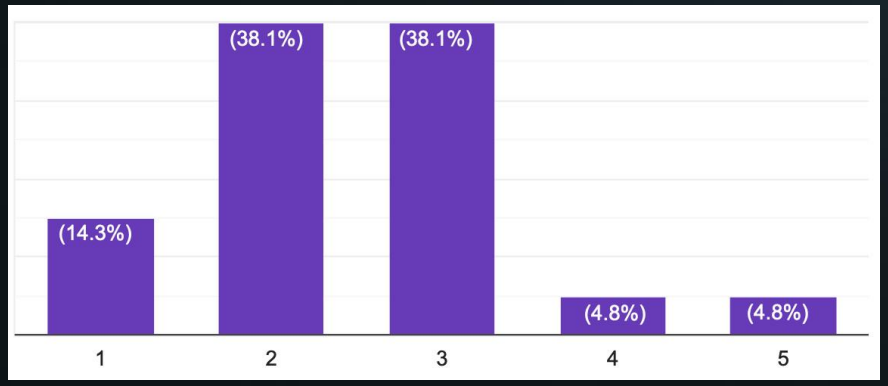


Point cloud model

Mesh-based model



Grades for point clouds (1best, 5 worst)



WHAT WE CAN EXPECT IN THE FUTURE?

Photo simulation still better by huge margin

Can we expect better grades for the second best in the future?

Can we find a way, how we can employ point cloud datasets in combination with mesh-based objects?

Easiest workflow offered Open Source software Cloud Compare

THANK YOU

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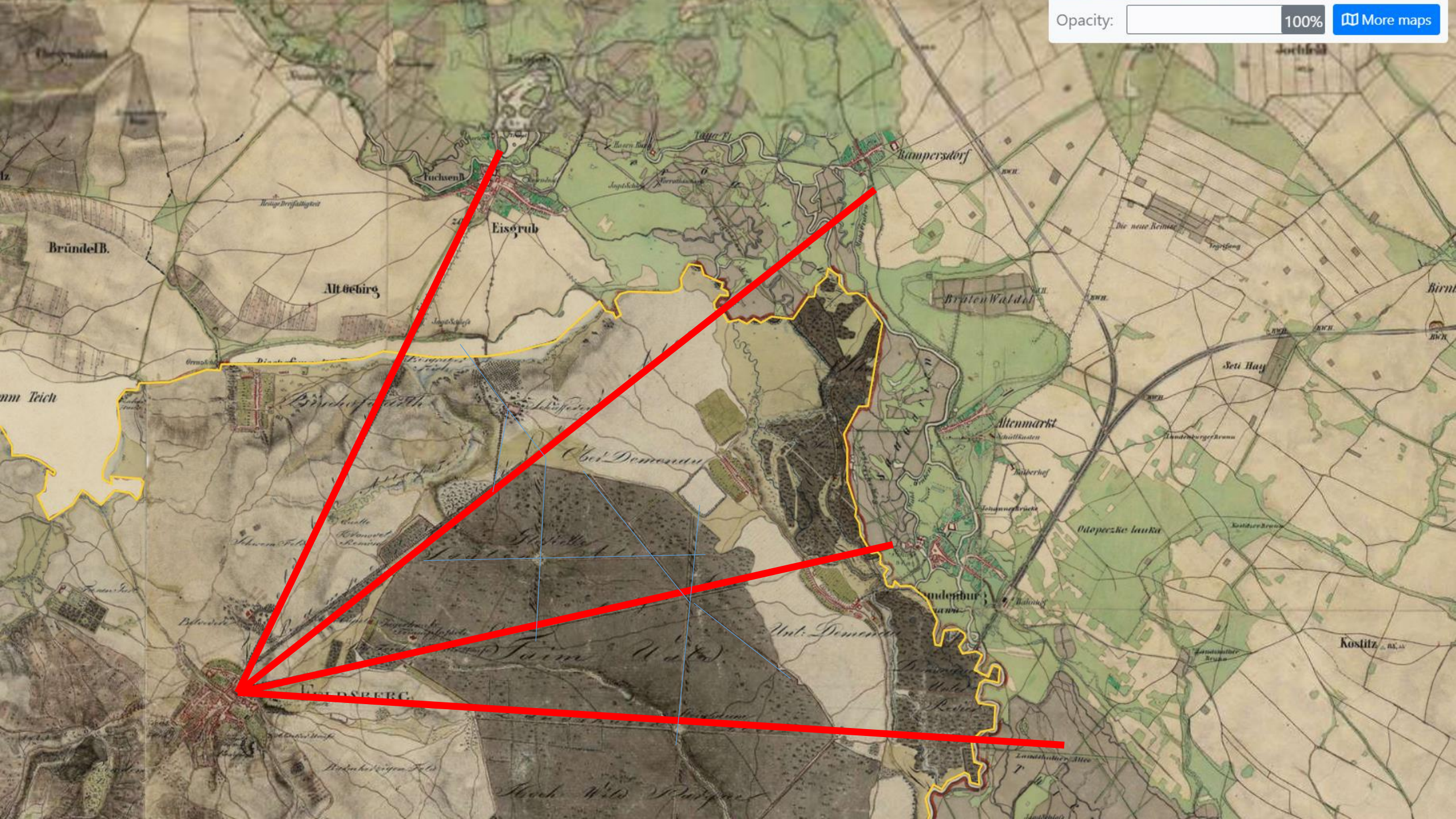
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100%
More maps
Rampersdorf
Eisgrub
Bründel B.
Alt Gebirg
Bräten Waldel
Seti Hay
Altenmarkt
Odopeczke lauka
Kostitz
Unt: Demenau
Taim Wald
Feldsberg