

SLAM lidar alkalmazása az erdőgazdálkodásban, adatfeldolgozás nyíltforráskódú megoldásokkal

Kiss Csaba

13. Foszforgész
2026. június 5.



PILISI PARKERDŐ
PARKERDŐ AZ EMBERÉRT









GNSS Frequency bands:

- GPS: L1 C/A, L1C, L5, L2C
- GLONASS: L1, L2
- Galileo: E1, E5a, E5b, E6
- BDS: B1I, B1C, B2a, B2b, B2I, B3I
- QZSS: L1 C/A, L1C, L5, L2d
- NavIC: L5
- SBAS: L1 C/A
- L-band PPP:
 - PPP: B2b
 - QZSS: L6
 - Galileo HAS: E6
- Concurrent signal reception: 5 + QZSS
 - L1, L2, L5, E6 frequency bands
- Built-in NIC anti-jamming unit
- Tracking Channels: 1040
- Horizontal Position Accuracy:
 - Autonomous: 0.7m
 - RTK: 0.8cm + 1ppm
- Vertical Accuracy:
 - Autonomous: 2.5m
 - RTK: 1.5cm + 1ppm

- Velocity Accuracy Without Aid: 0.03m/s
- Accuracy of 1PPS Signal: 5ns (RMS)
- RTK Convergence Time: 5s
- Time to First Fix (without AGNSS):
 - Cold Start: 28s
 - Warm Start: 28s
 - Hot Start: 1.7s
- Sensitivity:
 - Acquisition: -146dBm
 - Tracking: -160dBm
 - Reacquisition: -155dBm
- Dynamic Performance:
 - Maximum Altitude: 10000m
 - Maximum Velocity: 490m/s
 - Maximum Acceleration: 4g
- Update Rate:
 - Default: 10Hz
 - Max: 20Hz
- Operating temperature: -40°C to +85°C

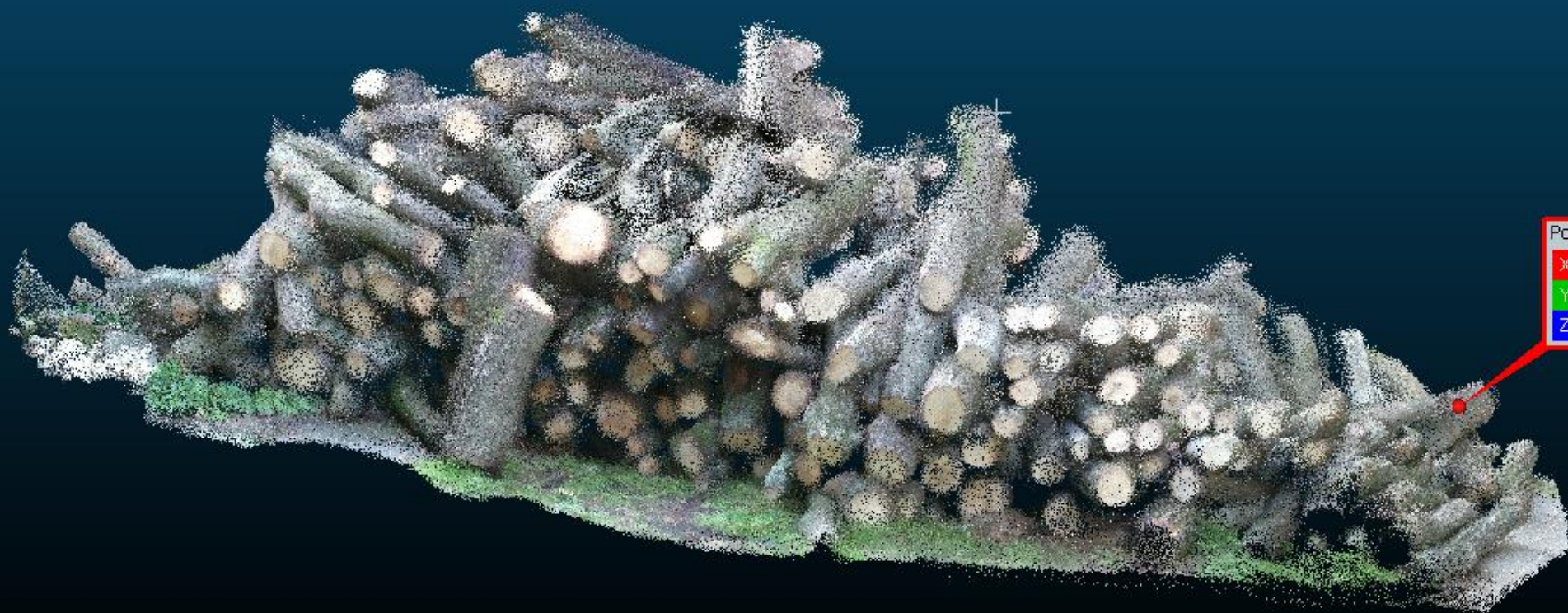












Point #761617

X	0.670119	Nx	-0.518319	R	130
Y	0.280285	Ny	0.585852	G	133
Z	-0.987362	Nz	0.622995	B	131



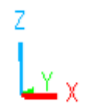
Sándor Ágnes

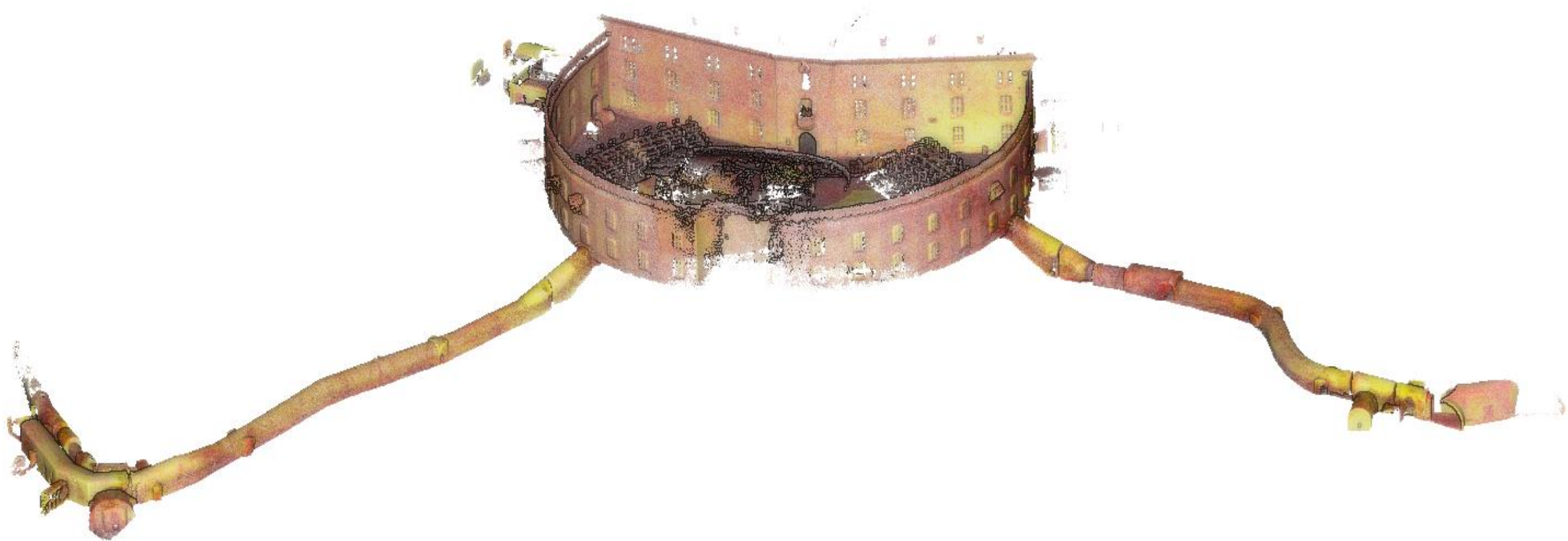
MID-360

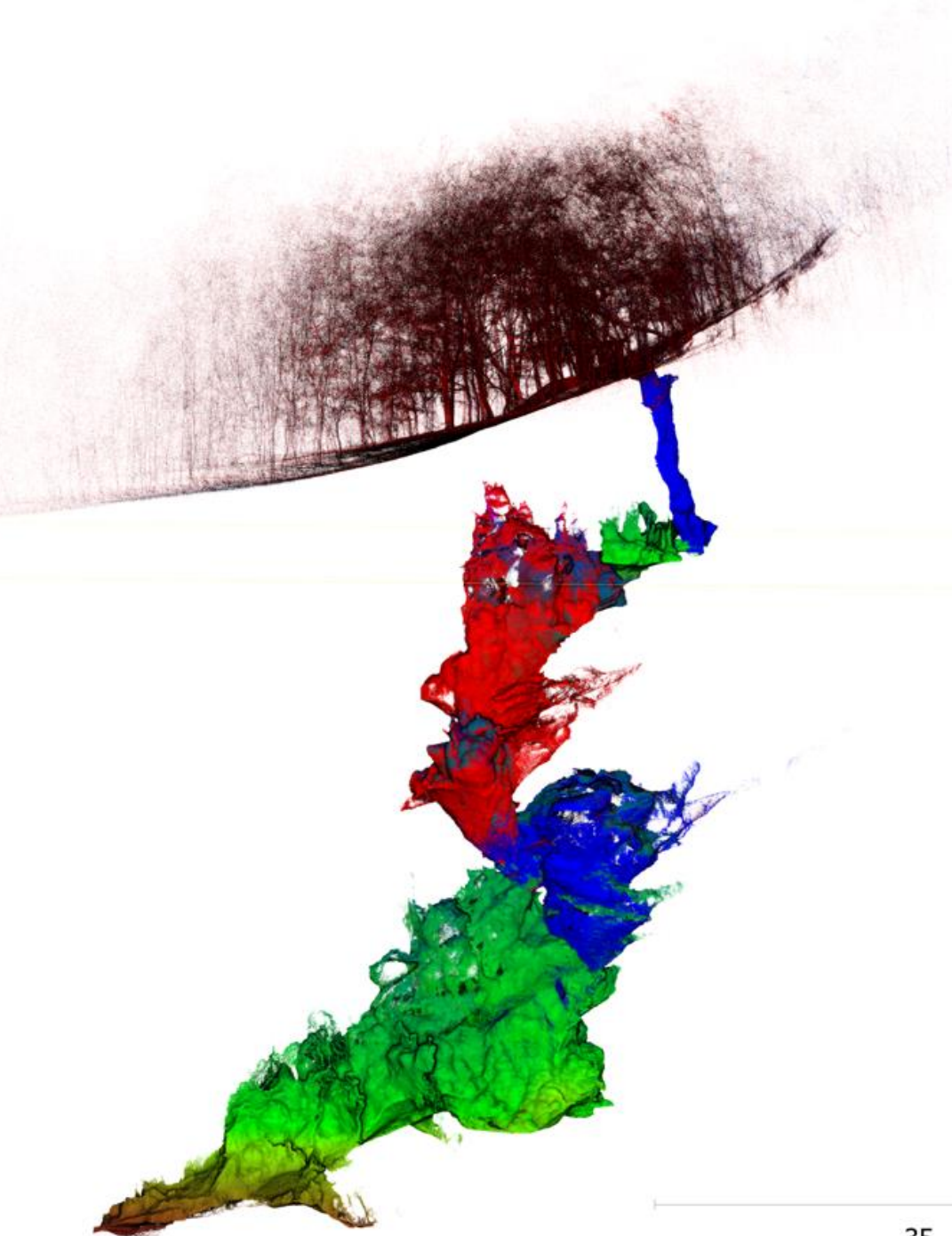
Small But Mighty





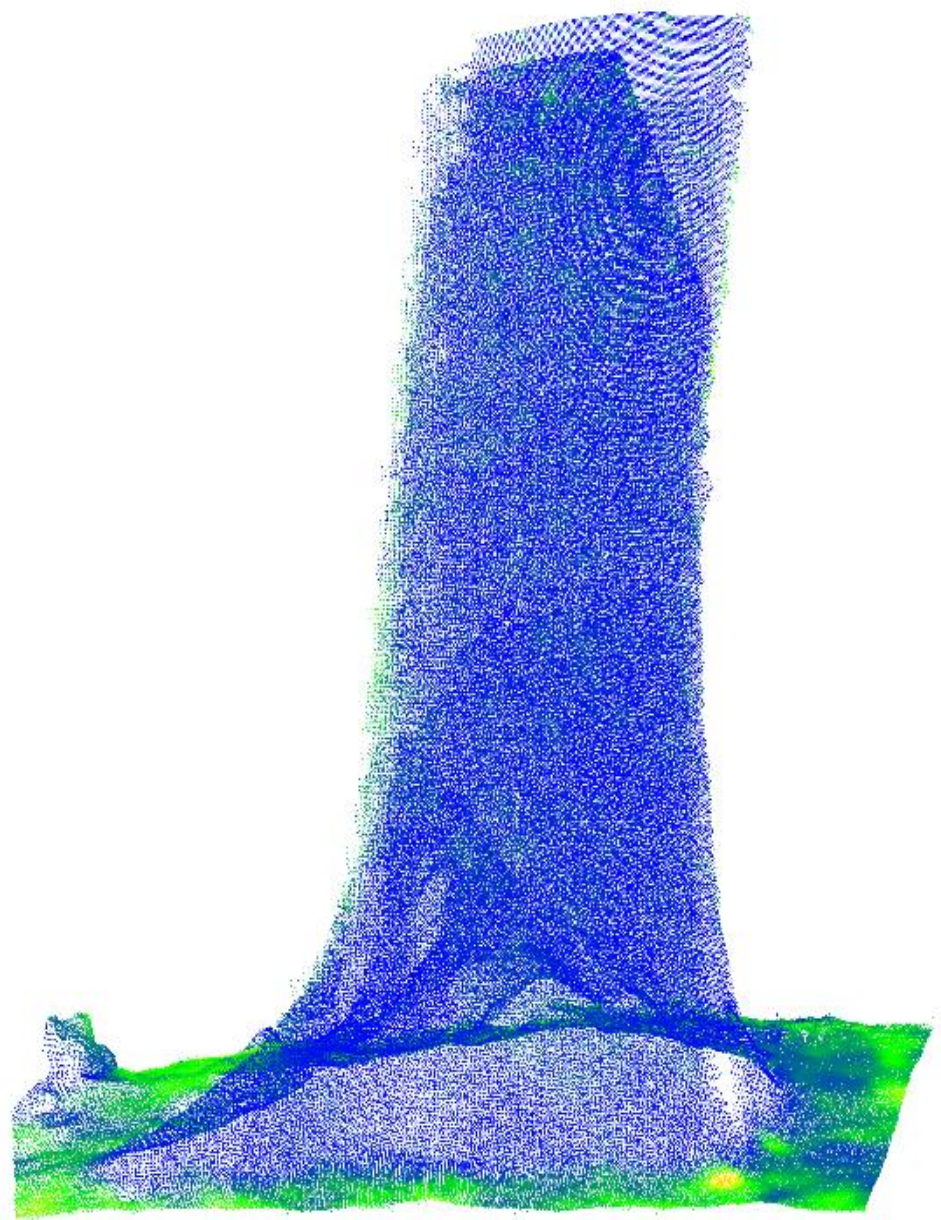






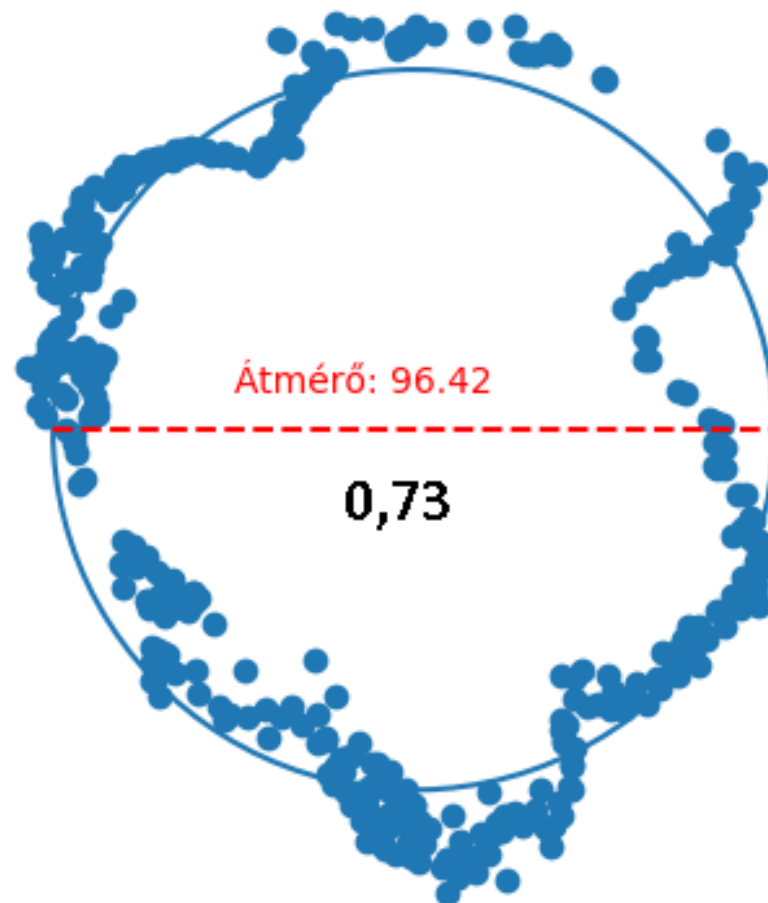
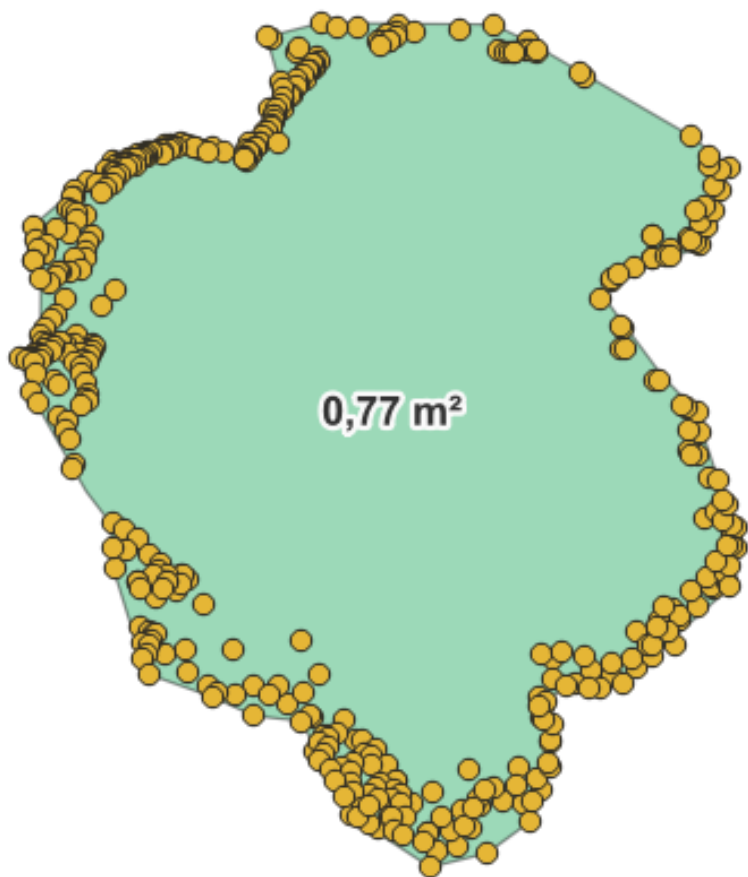
- ▶ Könnyen betanulható
- ▶ Hurok zárások csak ritkán
- ▶ Eszközök közötti jelentős hardware különbség
 - ▶ Felhasználói tapasztalat
 - ▶ IMU és szoftveres diferencia
- ▶ Mégis könnyen kombinálható adatállományok
- ▶ Szín kérdése
 - ▶ 3DGS, egyéb fotogrammetria, Blender







Eszköz	Törzs A [cm]		Törzs B [cm]		Törzs C [cm]	
Pontfelhő	Részleges	Teljes	Részleges	Teljes	Részleges	Teljes
BLK360	11,12	14,93	23,91	23,87	52,32	55,02
L515	12,54	-	22,31	-	53,13	-
Átlaló	12,00		22,00		53,00	





DB Tree

- 8_SS_20.las (D:/LidarData/lves_ut/CC/8)
- 8_SS_20.las
- 8_SS_20_3DFin

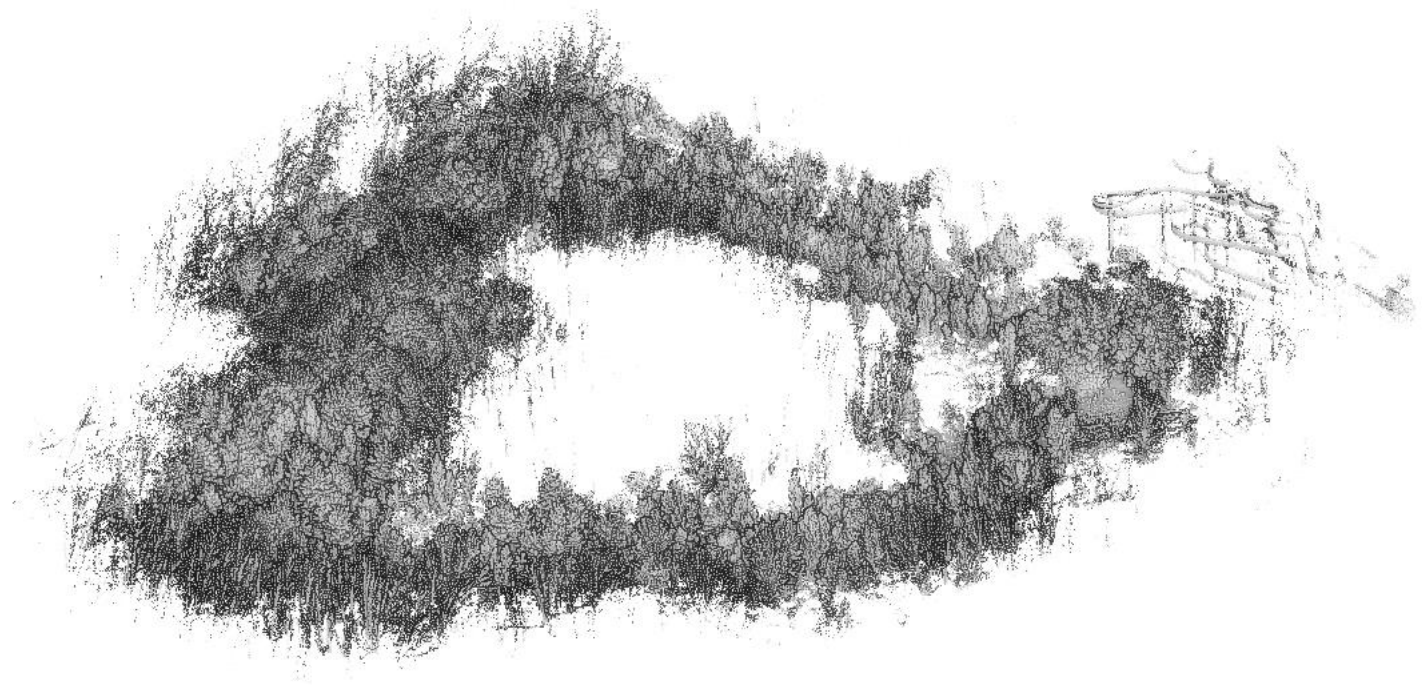
Properties

Console

[08:41:05] Warning: 3DFin has detected a potential error in the terrain modelling.
[08:41:05] This usually happens when the "cloth resolution" parameter didn't fit well the terrain.
[08:41:05] Learn more about this here https://github.com/3DFin/3DFin_Tutorial

[GL filter] EyeDome Lighting (disable normals and increase points size for a better result!)

default point size — +
default line width — +



75





DB Tree

8_SS_20.las (D:\LidarData\lves_ut\CC\8)
8_SS_20.las
8_SS_20_3DFin

Properties

Property	State/Value
CC Object	
Name	8_SS_20.las
Visible	☒
Colors	RGB
Show name (i...	☐
Box dimensions	X: 283.959 (-0.00420959 ; 283.955) Y: 256.498 (-0.00399414 ; 256.494) Z: 101.396 (-6.657 ; 94.739)
Shifted box ce...	X: 141.975 Y: 128.245 Z: 44.041
Global box ce...	X: -52.444704 Y: -6.344990 Z: 44.041000
Info	Object ID: 260 - Children: 0
Current Display	3D View 1
Cloud	
Points	18,475,213
Global shift	(194.42;134.59;0.00)
Global scale	1.000000

Console

[08:57:10] Failed to start Python actions: RuntimeError: Please select one point cloud

At:
C:\Program Files\CloudCompare\plugins\Python\Lib\site-packages\three_d_fin\cloudcompare\plugin.py(68): main

3DFin v0.4.1

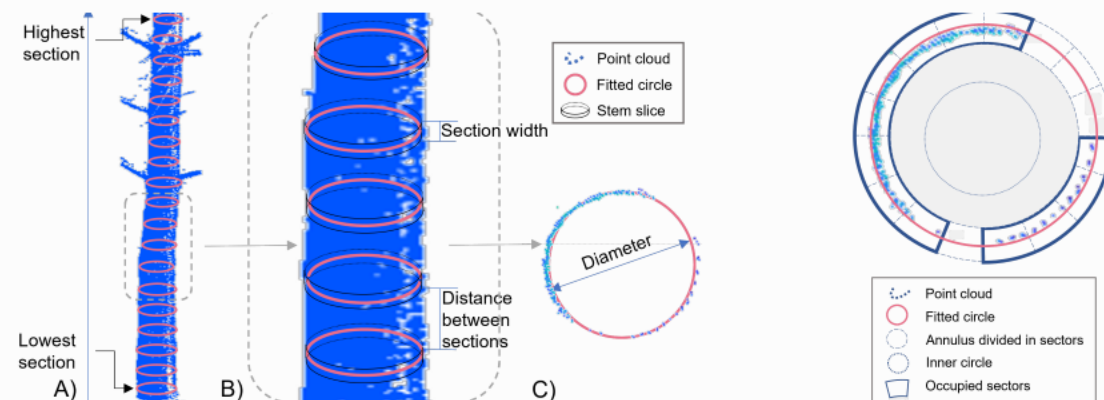
Basic Advanced Expert About

Expected maximum diameter 1.0
Stem search diameter 2.0
Lowest section 0.3
Highest section 25.0
Distance between sections 0.2
Section width 0.05

Advanced Parameters

If the results obtained by just tweaking basic parameters do not meet your expectations, you might want to modify these.

You can get a brief description of what they do by hovering the mouse over the info icon right before each parameter. However, keep in mind that a thorough understanding is advisable before changing these. For that, you can get a better grasp of what the algorithm does in the attached documentation. You can easily access it through the documentation button in the bottom-right corner.



A) Sections along the stem B) Detail of computed sections showing the distance between them and their width C) Circle fitting to the points of a section

Several quality controls are implemented to validate the fitted circles, such as measuring the point distribution along the sections.

File already set by the application

Output Directory

Select file

D:\Users\kisscs.PPRT

Select dir

Compute

75





DB Tree

- 8_SS_20.las (D:/LidarData/lves_ut/CC/8)
- 8_SS_20_3DFin
 - dtm
 - Stems in stripe
 - 8_SS_20.las
 - Highest points
 - Fitted sections
 - Axes
 - Tree locator

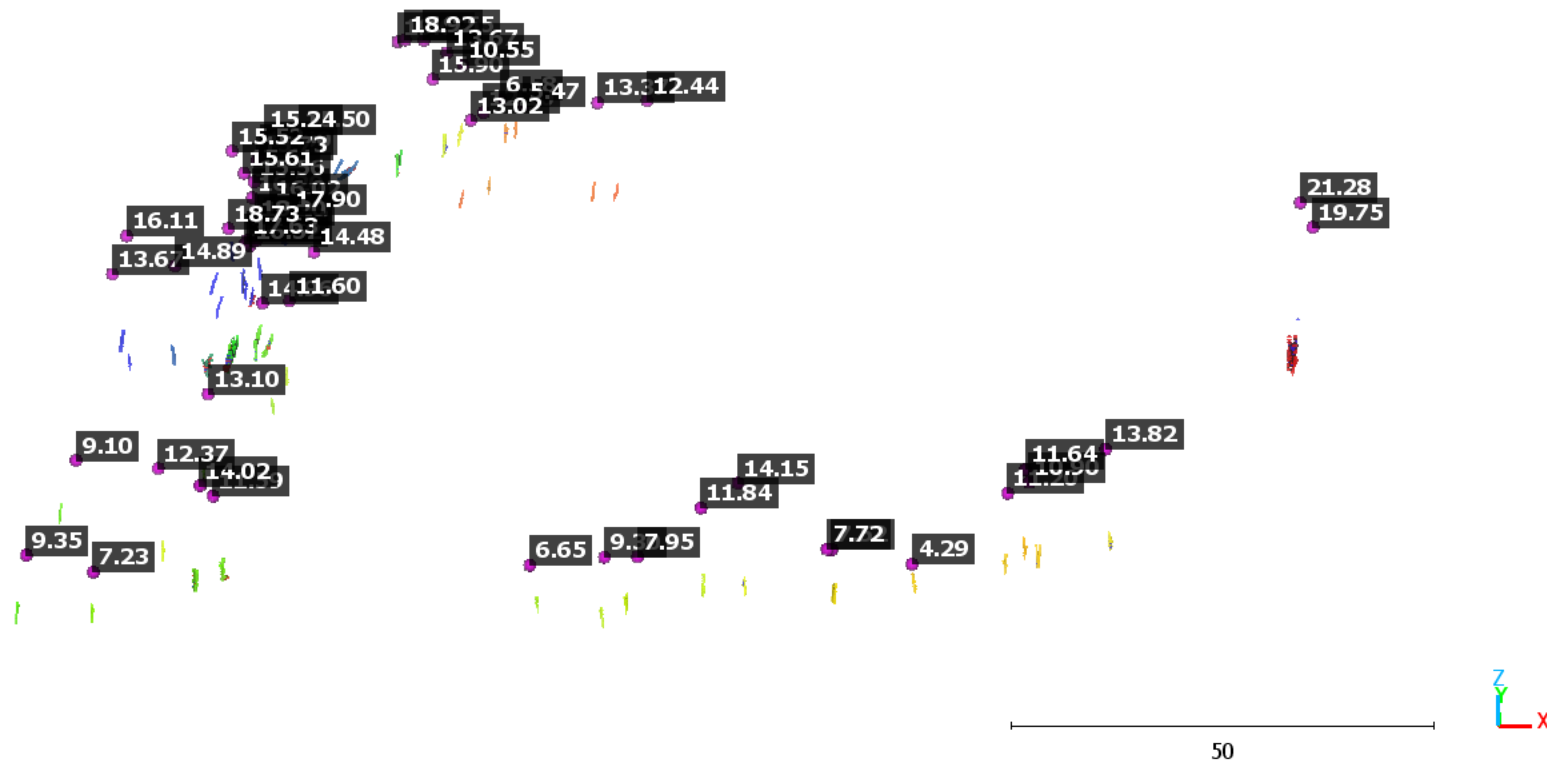
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[GL filter] EyeDome Lighting (disable normals and increase points size for a better result)





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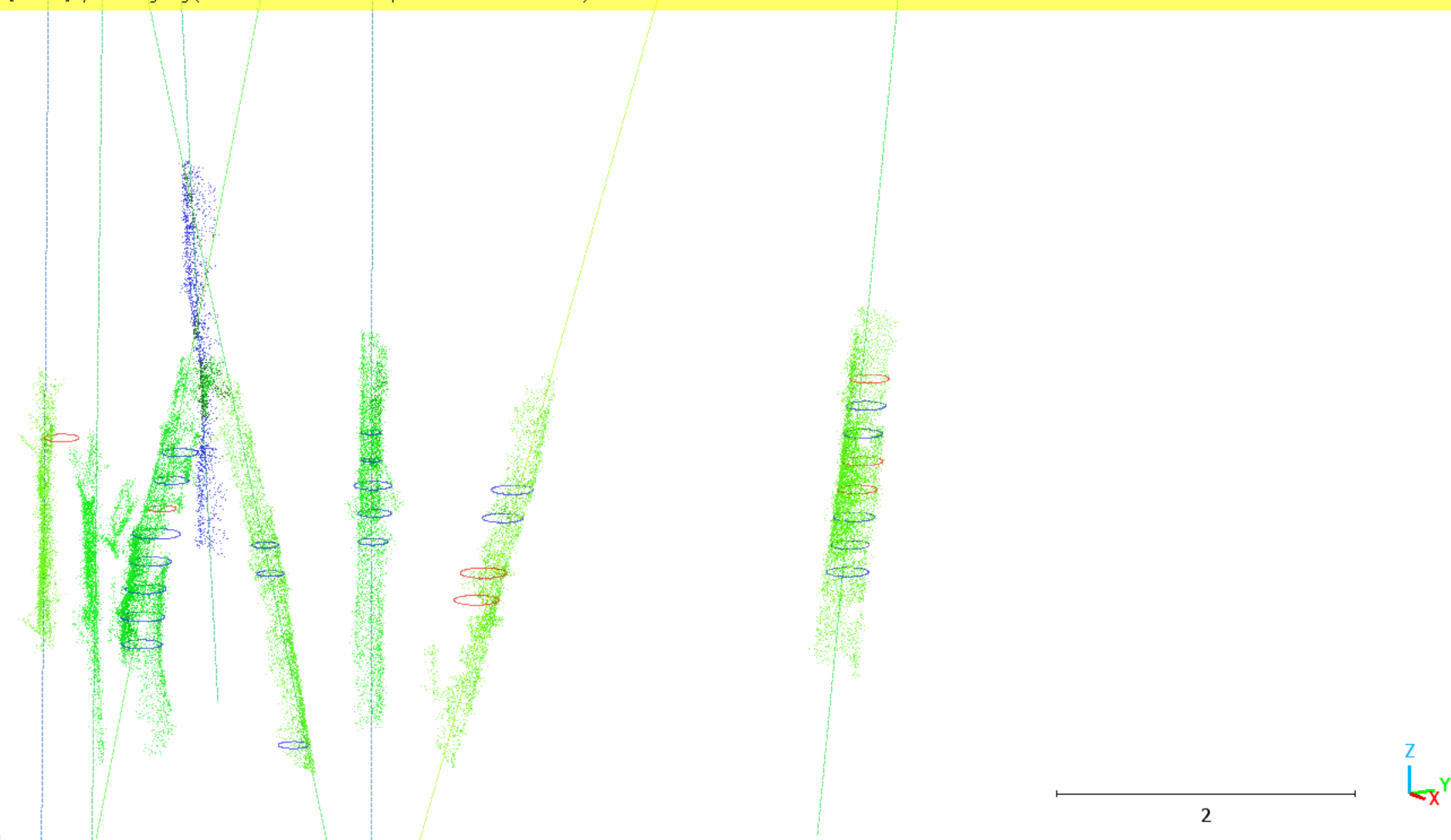
Properties

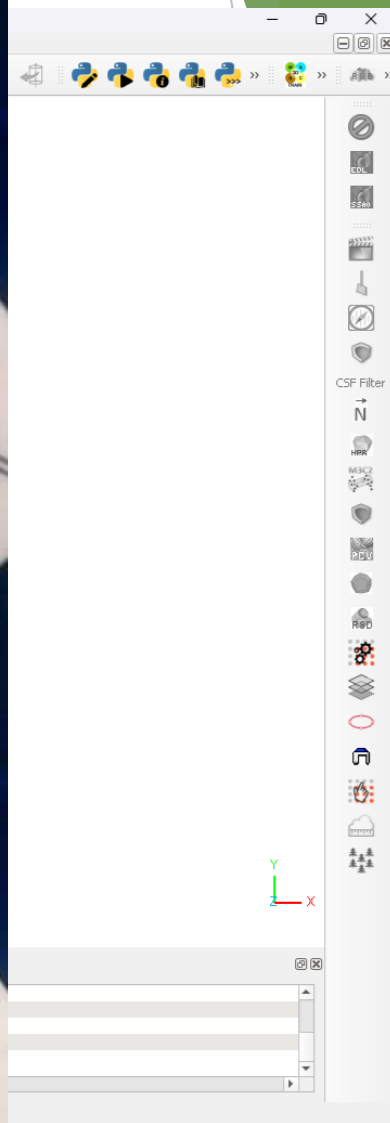
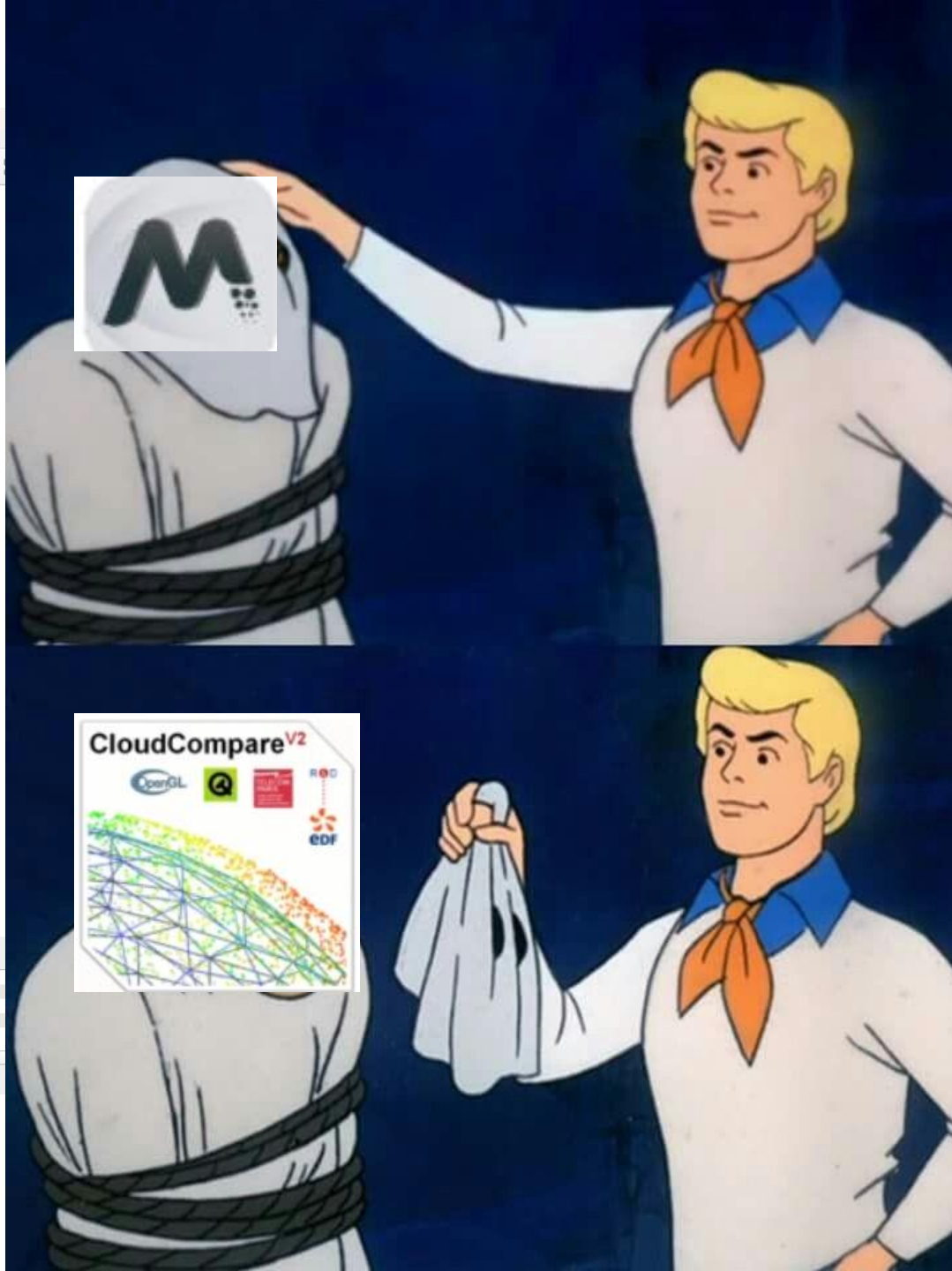
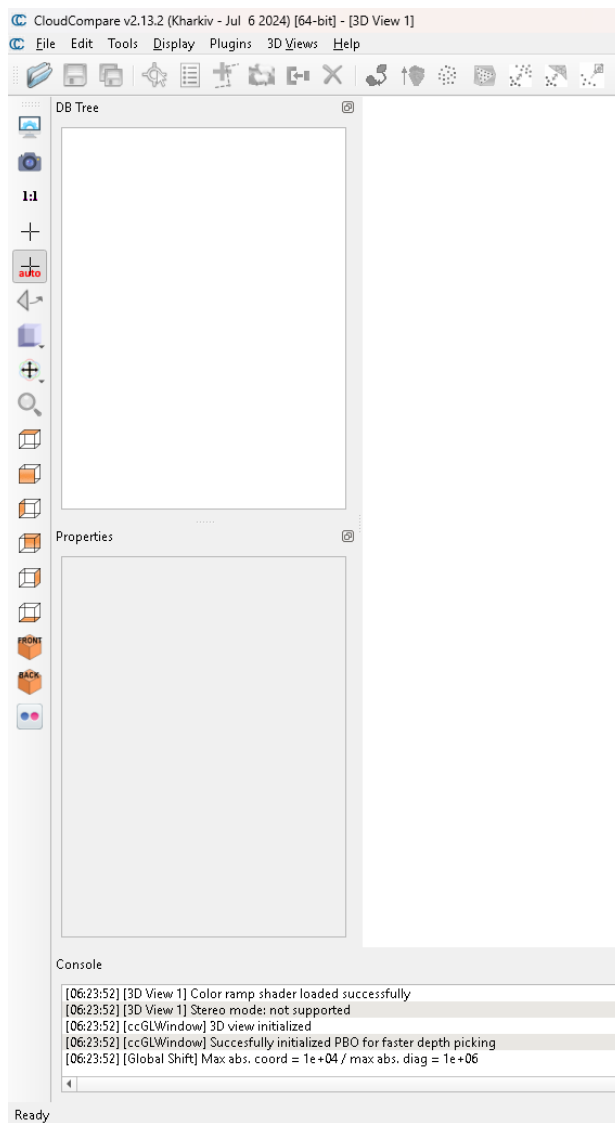
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CC Object	
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Colors	RGB
Show name (i...	☐
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[GL filter] EyeDome Lighting (disable normals and increase points size for a better result!)

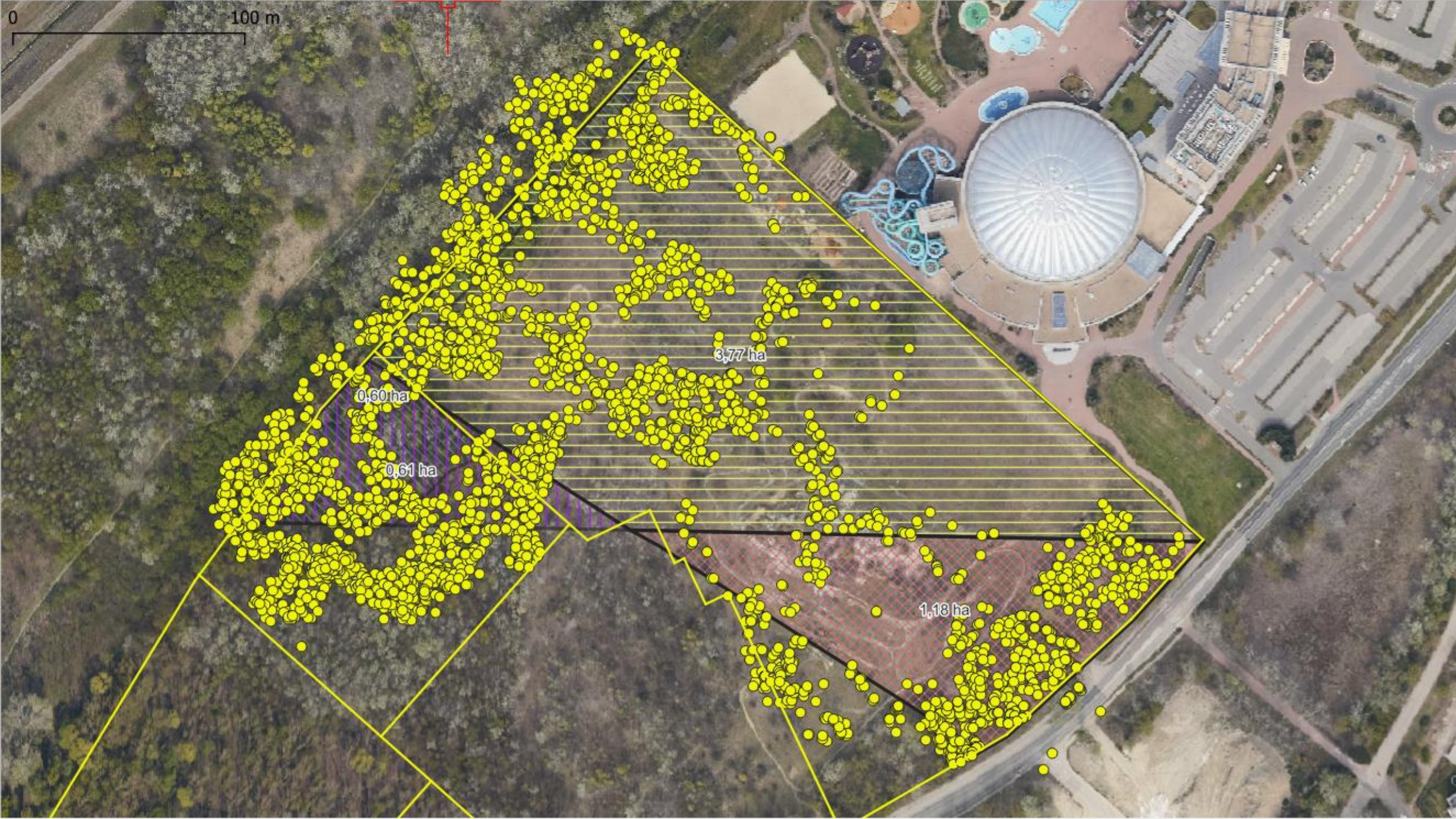




Offset (h)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	Decoded text	
00000000	B	D	8F	12	33	26	37	62	B8	B1	AC	33	3B	26	72	71	DE	ÏÏ2.3&7b,±-3; &rqT
00000010	CE	DE	5F	5B	52	12	62	FE	DE	DE	4C	6D	52	55	DC	C0	ÏT_[R.btTTLmRUÛR	
00000020	DE	DE	5E	5A	52	52	42	DE	DE	DE	5E	5C	52	52	42	DA	TT^ZRRBTÏTT^ \RRBÛ	
00000030	DE	DE	5E	5A	52	52	42	DE	DE	DE	5E	5B	52	52	42	DE	TT^ZRRBTÏTT^ [RRBT	
00000040	DE	DE	5E	5A	52	52	42	DE	DE	DE	5E	5A	52	52	42	DE	TT^ZRRBTÏTT^ ZRRBT	
00000050	DE	DE	5E	5A	52	52	42	DE	DE	DE	5E	5A	52	52	50	E9	TT^ZRRBTÏTT^ ZRRPe	
00000060	DE	F0	24	2B	5F	5D	BA	DE	D6	D4	67	5A	5D	1E	4D	11	Td\$+_] §TÖÖgZ] .M.	
00000070	D3	51	53	67	5E	E5	49	26	D4	1A	54	63	52	52	42	DE	ÓQSg^ ÍI&Ô. TcRRBT	
00000080	DE	DE	5E	5A	52	52	42	DE	DE	DE	5E	5A	52	52	42	DE	TT^ZRRBTÏTT^ ZRRBT	
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00000100	DE	DE	5E	5A	52	52	42	DE	DE	DE	5E	5A	52	52	42	DE	TT^ZRRBTÏTT^ ZRRBT	
00000110	DE	DE	5E	5A	52	52	42	DE	DE	DE	5E	5A	52	52	42	DE	TT^ZRRBTÏTT^ ZRRBT	
00000120	DE	DE	5E	5A	52	52	42	DE	DE	DE	5E	5A	52	52	42	DE	TT^ZRRBTÏTT^ ZRRBT	
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00000240	DE	DE	5E	5A	52	52	42	DE	DE	DE	5E	5A	52	52	42	DE	TT^ZRRBTÏTT^ ZRRBT	

encrypt_config.exe
faiss_smoke.exe
colmap.exe

Binary (8 bit)	10001101
Int8	go to: -115
UInt8	go to: 141
Int16	go to: -28787
UInt16	go to: 36749
Int24	go to: 1216397
UInt24	go to: 1216397
Int32	go to: 856854413
UInt32	go to: 856854413
Int64	go to: -51605015858080
UInt64	go to: 132862424879015
LEB128	go to: 296845
ULEB128	go to: 296845
AnsiChar / char8_t	Ï
WideChar / char16_t	轡
UTF-8 code point	Unexpected conti
Single (float32)	3,41238326484472
Double (float64)	-4,2824262198399
OLETIME	1899. 12. 30.
FILETIME	Invalid
DOS date	2051. 12. 13.
DOS time	Invalid
DOS time & date	Invalid
time_t (32 bit)	1997. 02. 25. 7:06:
time_t (64 bit)	Invalid



- ▶ Dedikált feldolgozó gép vagy parancssoros mód
- ▶ Fafaj meghatározás kérdése?
 - ▶ Pontfelhő morfológia
 - ▶ Fénykép, RGB
 - ▶ 3DGS
 - ▶ Kéreg mintázat
 - ▶ Elegyarány geotag-gel illesztőpont felvétel helyett
 - ▶ AI



Köszönöm a figyelmet!

