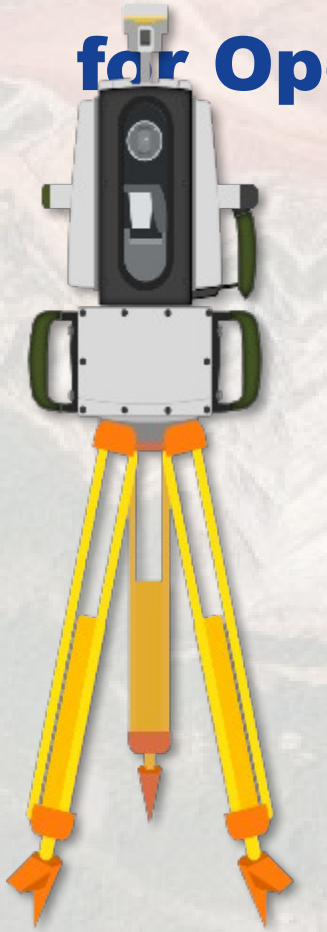
Absolute Accuracy Improvement of UAV Photogrammetric Point Clouds using TLS-Derived Cloud Ground Control Points (CGCPs) for Open-Pit veying (C Mae Moh Coal ine, Thai



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Electricity Generating Authority of EGAT

30 KM²

MINING AREA

2 KM² / MONTH

ACTIVE MINING AREA

1.1 MILLION

TONS / MONTH

COAL PRODUCTION

6.2 MILLION

CUBIC METERS / MONTH

WASTE REMOVAL

EGAT

CONTRACTOR

9.3 MILLION €

/ MONTH

CONTRACTORS PAYMENT

UNIT EXCAVATION COST

COAL ≈1.05 € / TON

WASTE ≈ 1.3 € / CUBIC METERS

PROBLEM & CHALLENGE

Terrestrial Laser Scanner (TLS) : Maptek I-site XR3

Lose ≈ 60 hours of excavation times / month

can obstruct the line of sight

- Relocate the scanning position during scanning for several times safety and to avoid to achieve full area coverage.
- Stop machinery blocking the scan.

Range: 2.4 km

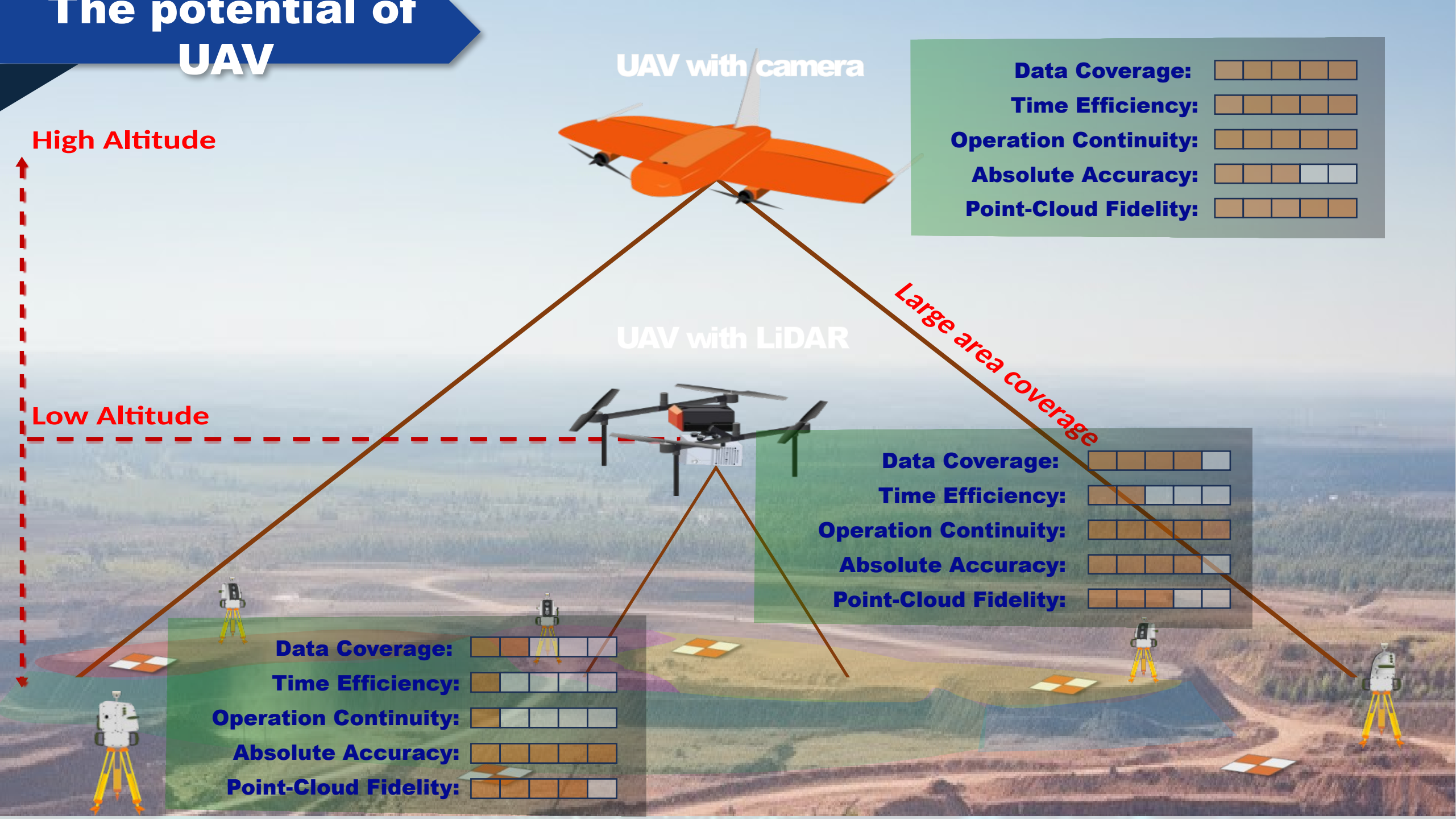
Weight: 9.4 kg

Operational temp 0 - 50 °C

Camera resolution: 20 MP

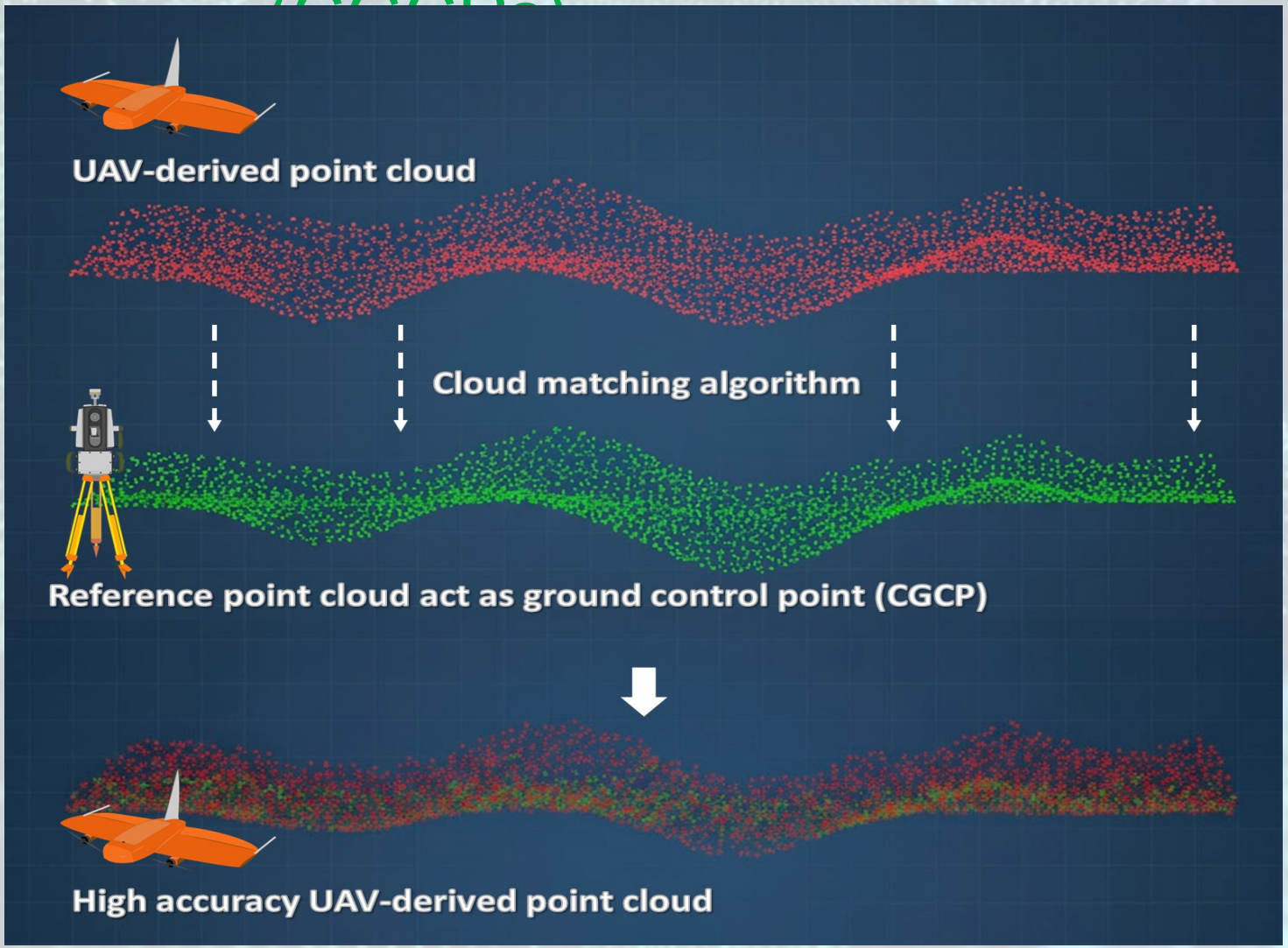
Accuracy 5 mm @ 65 m

The potential of UAV



GCP-free solution

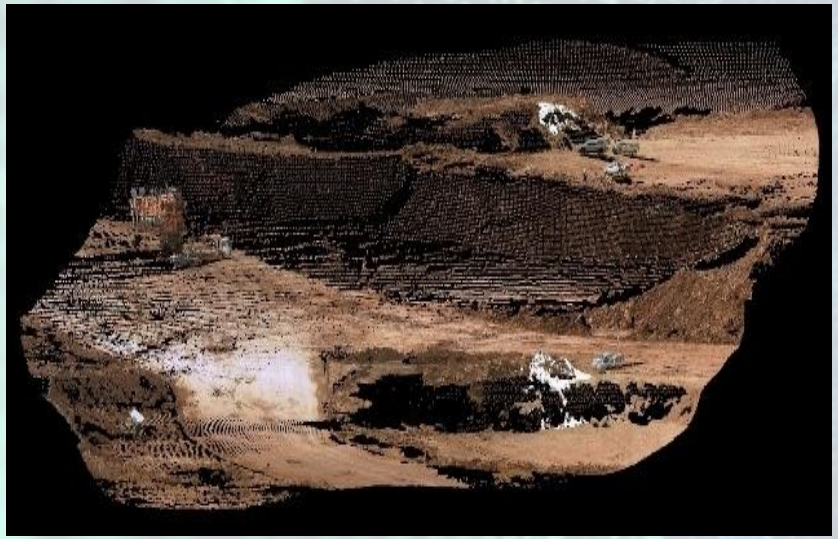
TLS-Derived Cloud Ground Control Points (CGCPs)



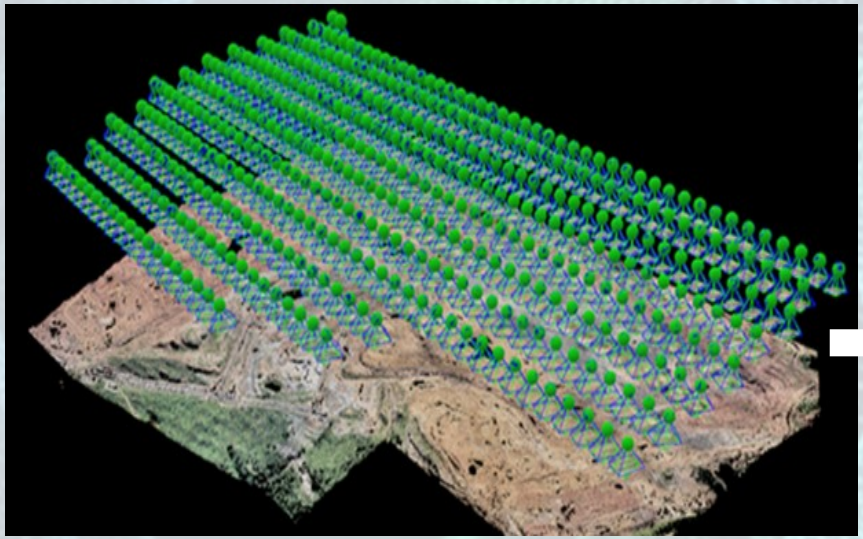
Point Cloud processing

27 independent survey plots

TLS Point Cloud Processing

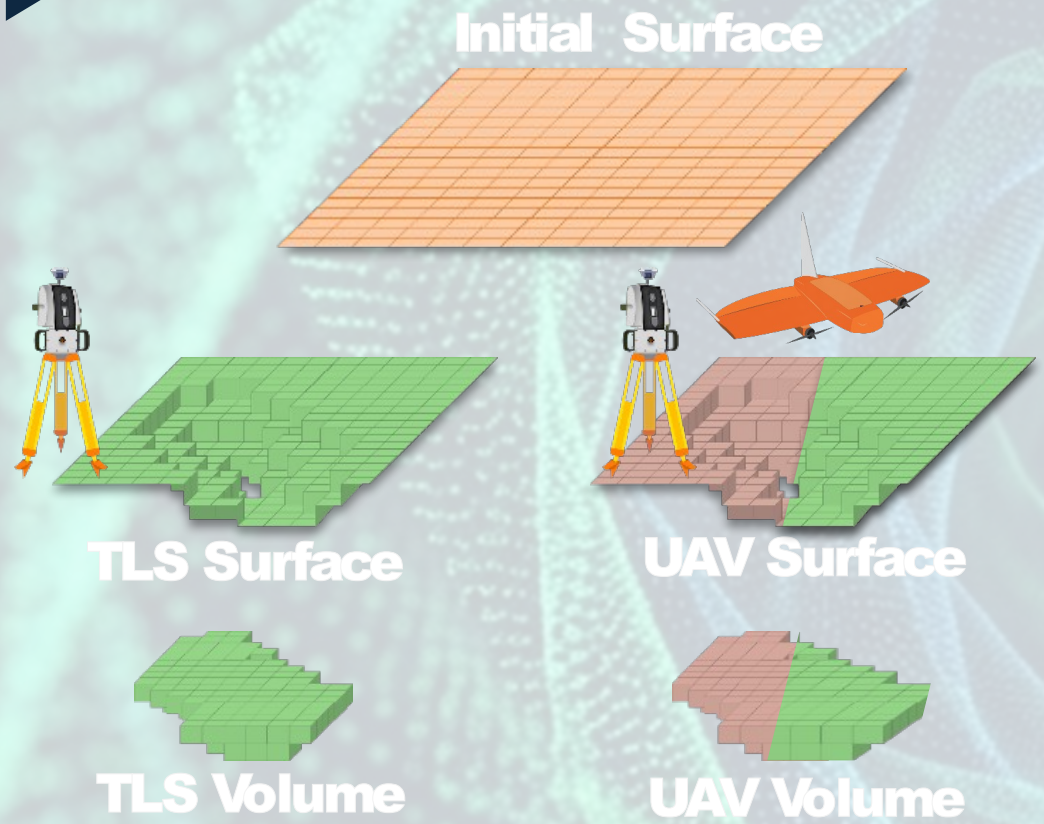


UAV Point Cloud Processing

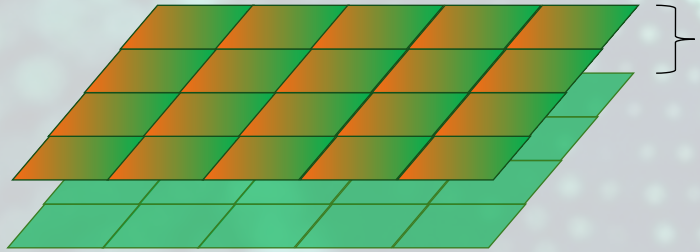


- **Unwanted data** (such as vehicles, excavators, and conveyors) is filtered out.
- The filtered UAV point cloud is clipped to match the TLS's boundary for consistency.
- **Global registration** is performed using a Cloud-to-Cloud registration.
- **Selective data integration** is executed to merge the datasets effectively.
- The resulting point cloud can be utilized across **various applications**.

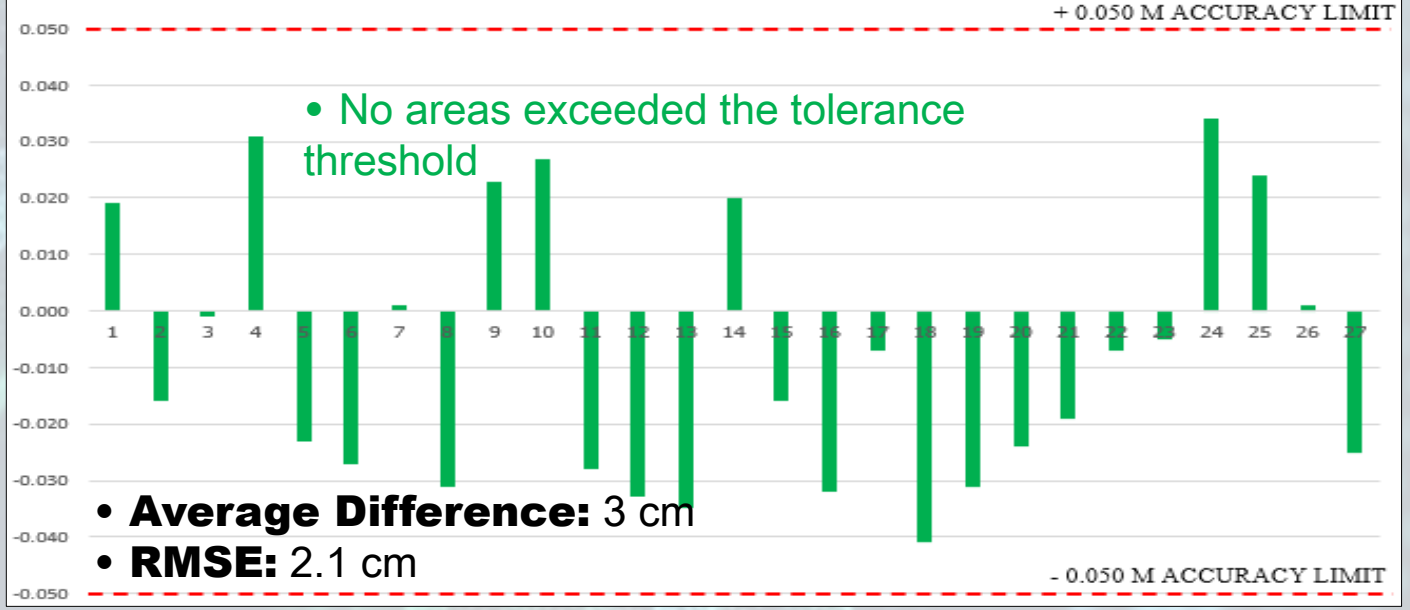
Comparative Assessment



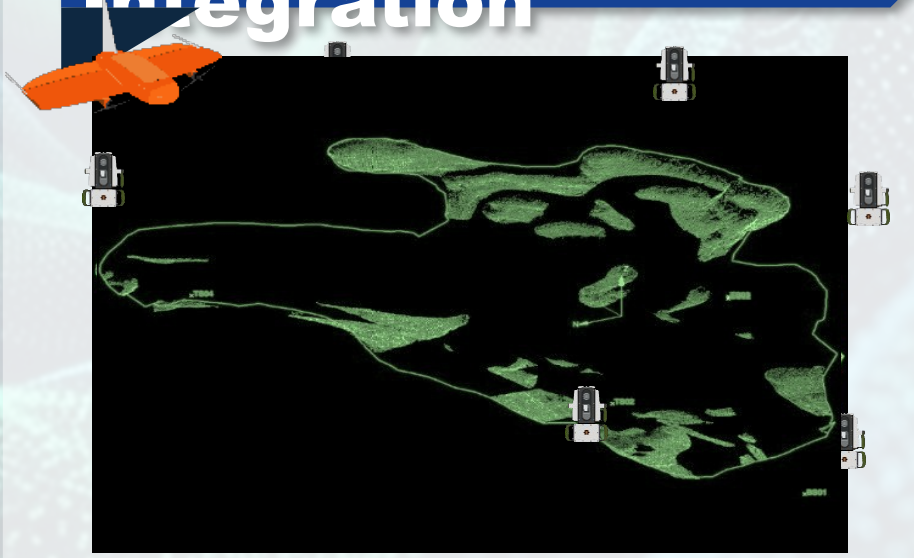
divided the volume difference by the survey area



< ±5 cm equivalent elevation difference

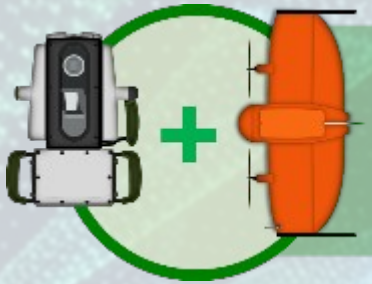


Hybrid Data Integration

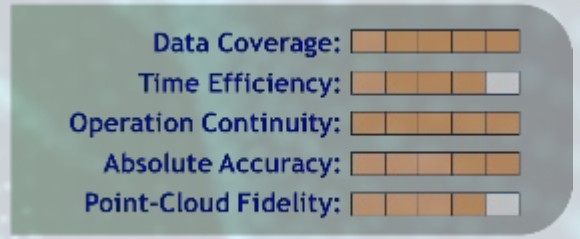


- **TLS** data is used where available
- **UAV** data is used selectively to "patch" gaps.

Conclusion



The result is reduced operational downtime, increased safety, and significantly enhanced productivity.



High Data Accuracy

without relying on full laser scanning coverage.

Enhanced Safety

Surveyors no longer need to enter hazardous mine pits.

Expectation

Feedback

We would appreciate your perspectiv on:

- The reliability of this approach
- Potential **limitations or risks** in practical implementa

Share your perspectives!

Thank you

EGAT

Electricity Generating Authority of Thailand