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USE CASE

20+ WAYS TO USE HOVERMAP

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Hovermap, a versatile LiDAR scanning solution, makes mapping of inaccessible areas safe, easy and fast.

Designed as a drone payload, Hovermap combines advanced collision avoidance and autonomous flight technologies to safely and rapidly map hazardous and GPS-denied environments.

Easily mounted on a drone, a vehicle or backpack, Hovermap captures high resolution point clouds when flying, driving or walking.

HOVERMAP

- Versatile: fly, drive, walk, tether—multi-application mapping
- GPS-denied flight—unaffected by GPS loss
- SLAM[1]-based mapping—accurate mobile LiDAR mapping without GPS
- Tap-to-Fly autonomy—autonomous flight beyond line-of-sight and communication range
- 360° field of view—shadowless point clouds and omnidirectional collision avoidance

IMPROVED SAFETY

Keep personnel away from edges, confined spaces or heights. Fly Hovermap beyond line-of-sight and capture critical data to assess the condition of assets and improve safety decision-making.

PRODUCTIVITY & EFFICIENCY

Quickly and safely map inaccessible areas and assets with minimal disruption to operations. Fly, walk or drive Hovermap to capture data where and when you need it.

GREATER INSIGHTS

Explore and map inaccessible areas. Hovermap's beyond line-of-sight flight enables capture of accurate, high resolution point clouds without shadowing and delivers greater confidence in analytical or modeling outputs.

COST & TIME SAVING

Hovermap pilots can fly an entire mission from take-off to landing using a tablet, with minimum training. With Hovermap it takes a few minutes to image complex assets that would take hours using traditional survey techniques.

Discover 20+ of Hovermap's many data capture applications across a wide range of industries.

For information on Hovermap's use cases for mining go to www.emesent.io

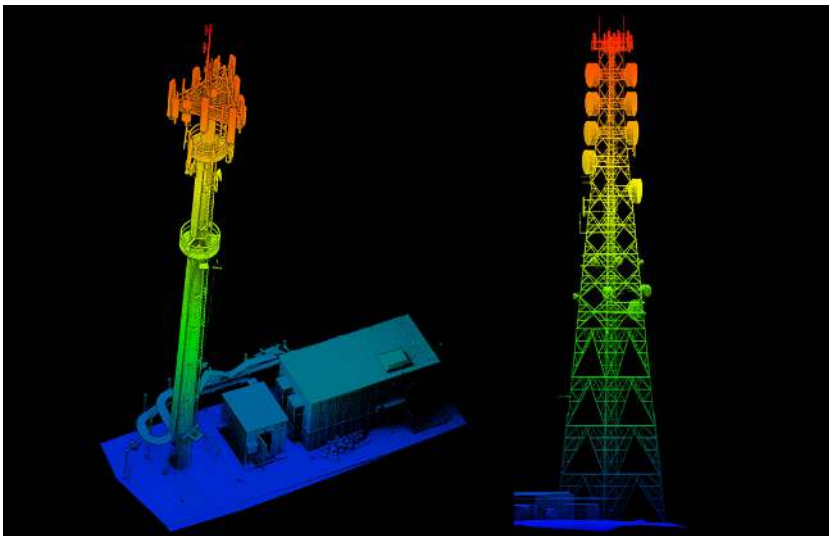
[1] Simultaneous Localization and Mapping

1 TELECOMMUNICATION TOWERS

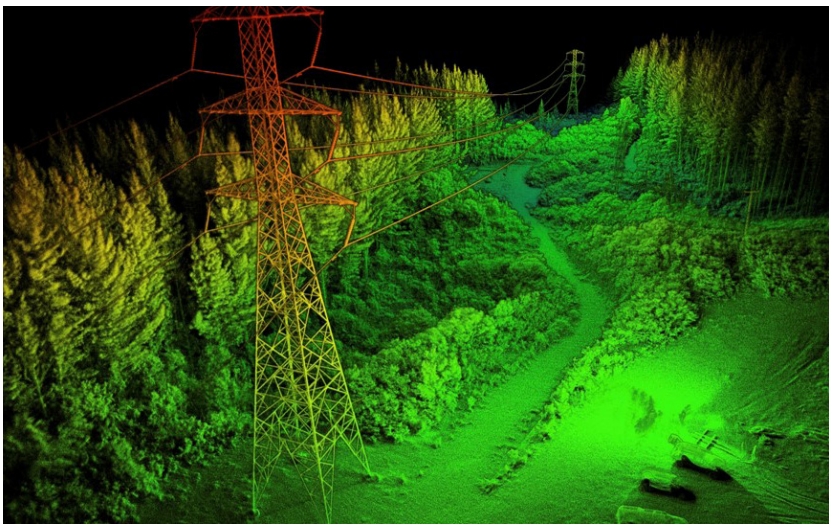
Hovermap maintains a safe standoff distance, keeping the asset, operator and drone safe, while capturing high resolution, high-quality point cloud data.

Applications

- Antenna direction confirmation
- Antenna mount inspection
- Condition monitoring
- Corrosion deformation
- Change detection
- Space availability for new antennas
- Structural analysis



Hovermap's advanced collision avoidance and autonomy capabilities keep the drone at a safe standoff distance, reducing risk to the asset. These point cloud data sets were captured within a single flight and colorized by elevation. Additional cameras can be carried for condition assessment.



Hovermap's collision avoidance and virtual shield ensure the drone maintains the standoff distance from these critical structures.

2 TRANSMISSION TOWERS AND LINES

Hovermap flies along power lines for inspection of conductors, insulators, and towers, and to identify vegetation encroachment. The 360° field-of-view and SLAM ensure high-quality data capture continues even with loss of GPS.

Applications

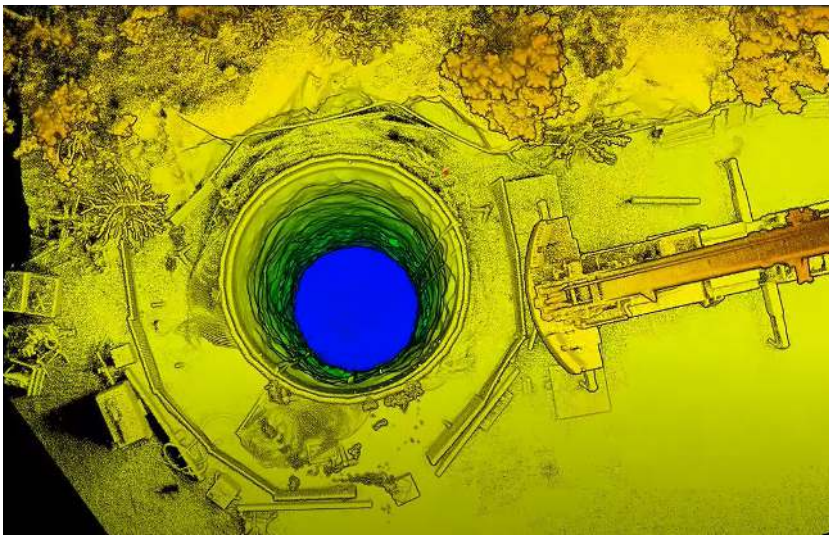
- As-built
- Condition monitoring
- Vegetation encroachment monitoring
- Insulator mount inspection

3 VERTICAL SHAFTS

Inspections of vertical shafts and structures occur during construction, in operation, or when abandoned. Current methods are hazardous to personnel and equipment, costly, time-consuming and typically result in low quality data. Hovermap can be flown or lowered in a protective cage to capture inspection data.

Applications

- Geotechnical inspection
- Seismic monitoring
- Airflow modeling
- Rehabilitation/shaft-closure



This tunnel ventilation shaft was mapped and inspected with a 5-minute flight down the shaft.

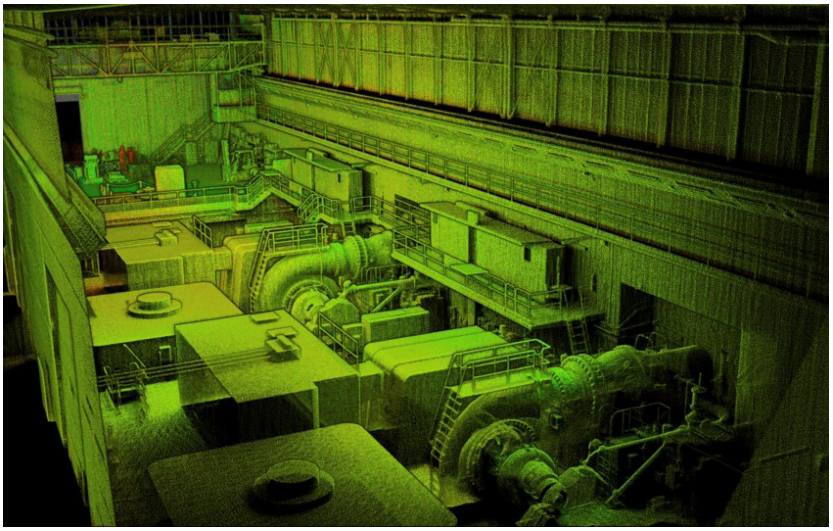
4 OUTDOOR INDUSTRIAL PLANT

Whether scanning for an as-built or a safety and change detection inspection, Hovermap delivers high resolution, accurate data that can be registered to a spatial reference system or previous scans.

Applications

- As-built
- Condition monitoring
- Change detection
- Reverse engineering
- Safety and visual inspections
- Structural analysis
- Space management
- Stakeholder engagement

Previous inspections at this site were hampered by the metal structures interfering with drones' magnetometers. Hovermap uses only LiDAR data so is unaffected by potential interference from large metallic structures and GPS shadows.



This pump house as-built was captured with a 5-minute indoor flight. Prior to the flight, the pilot demonstrated Hovermap's collision avoidance to assure the customer the drone could be safely flown around this critical piece of infrastructure.

5 INDOOR INDUSTRIAL PLANT

Obstacles, moving equipment and narrow areas make these challenging GPS-denied environments to map, but ideally suited to Hovermap's capabilities. Advanced collision avoidance, SLAM mapping and versatile data capture methods enable accurate and rapid data capture.

Applications

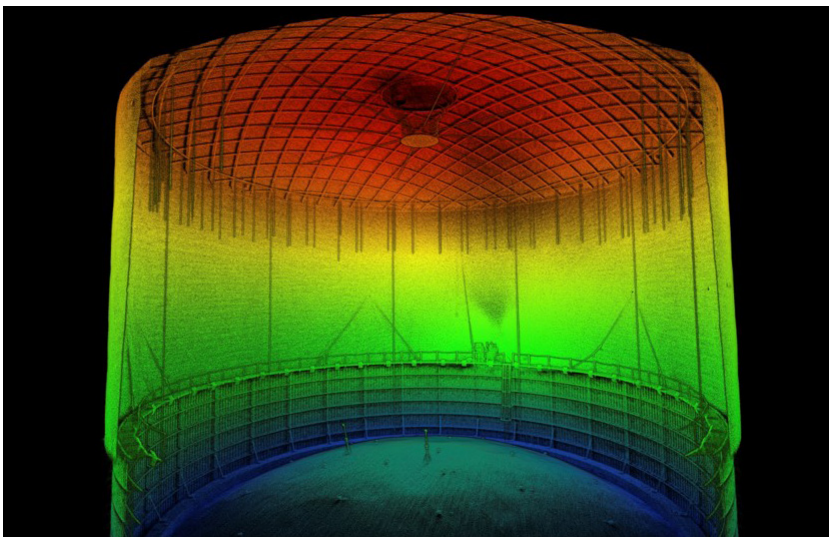
- 3D models
- As-built / digital twin
- Change detection
- Pre-construction inspection
- Reverse engineering
- Safety inspection
- Stakeholder engagement

6 ENCLOSED SPACES (TANKS)

Enclosed space inspections are extremely hazardous, but can be performed safely using Hovermap attached to a drone, or a tether to identify defects or functional issues.

Applications

- As-built
- Condition or functional assessment
- Deformation monitoring (bulging)
- Reverse engineering
- Visual safety inspections



Hovermap's collision avoidance and versatile deployment methods enable data capture of enclosed spaces, such as this storage tank.

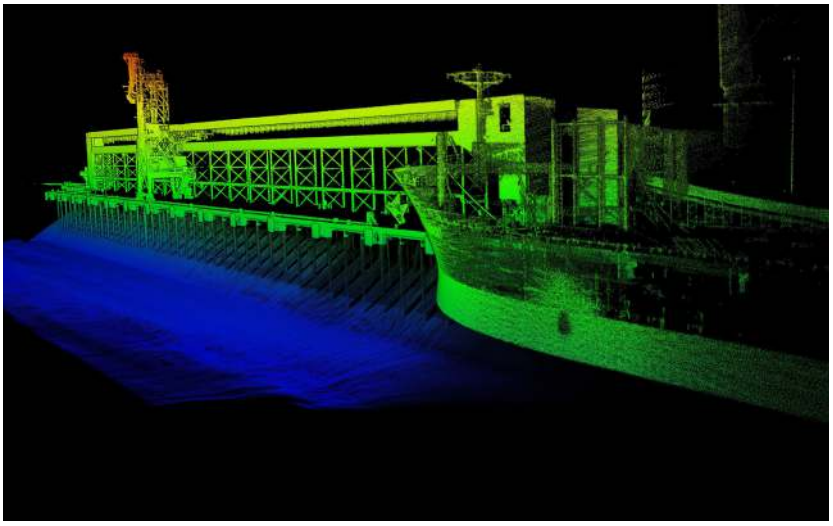
7 BRIDGES

Any engineering work on bridges starts with accurate and high-quality data. Hovermap captures high resolution, accurate point cloud data of bridges, even in areas of GPS-shadow. Scans can be merged with hydrographic surveys or other scans at points of overlap to deliver a whole-of-asset data set.

Applications

- As-built
- Condition monitoring
- Reverse engineering
- Services inspection
- Structural integrity
- Visual inspection

Bridge inspections are required throughout the entire bridge lifecycle. Flying a drone is the most time- and cost-effective way to scan these assets. Hovermap captures accurate data even when flying underneath the deck, where GPS may not always be available.



This port facility was comprehensively mapped above the pier with a flight and walking scans, and below with Hovermap on a craft. The point clouds were merged with an acoustic survey to form a complete asset data set.

8 PIERS AND PORTS

Hovermap's versatile data capture methods enable scanning of above- and below-pier infrastructure with minimal disruption to operations. LiDAR scans merged with bathymetric surveys produce a complete data set of the asset.

Applications

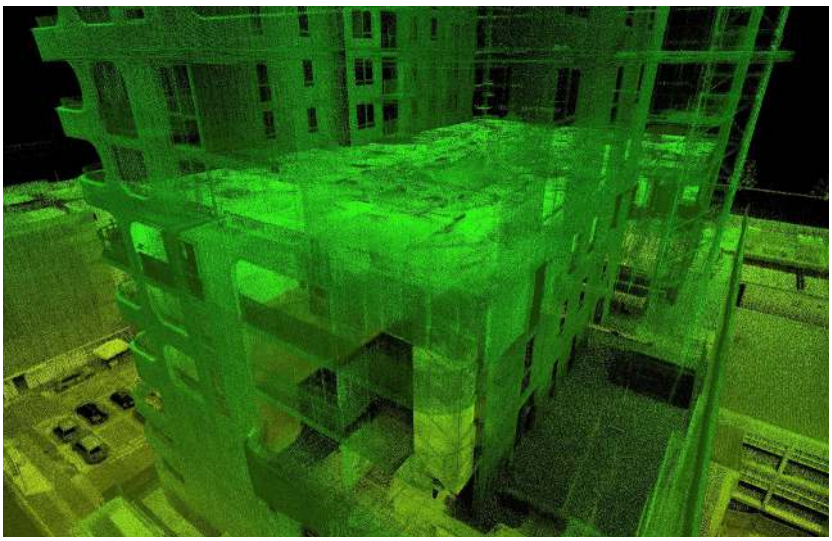
- As-built
- Condition inspection
- Reverse engineering
- Sea level rise modeling
- Stakeholder engagement

9 BUILDING AND CONSTRUCTION

Complex urban built environments are challenging environments to map. Hovermap negotiates tall or vertical structures, such as cranes, and flies in areas of GPS shadow to produce accurate, high resolution point clouds.

Applications

- As-built
- Clash detection
- Condition inspection
- Progress or QA reporting
- Reverse engineering
- Stakeholder engagement



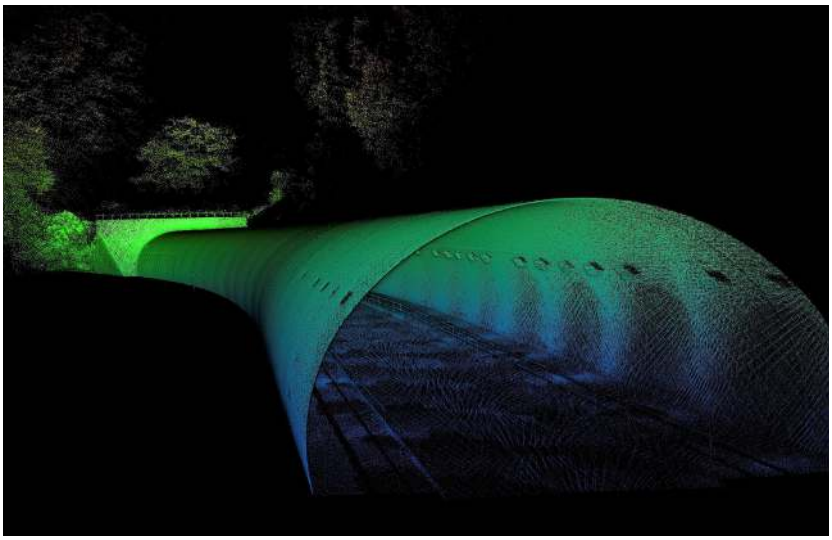
Construction sites contain many hazards for drones, but Hovermap is ideally suited to these complex environments. The details of this building were captured from flights and a walk through of the floors, merged to form a single data set.

10 TUNNELS

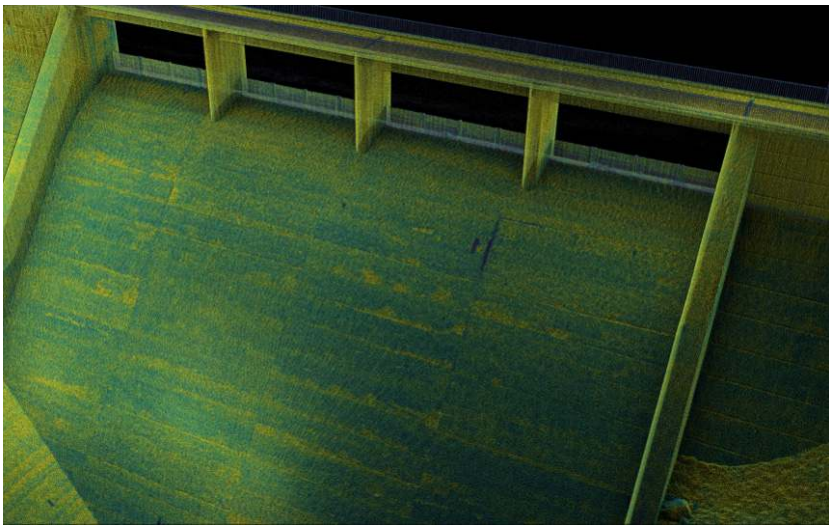
Tunnels are vital infrastructure and require inspections to ensure asset safety, efficiency, and reliability. Hovermap rapidly and accurately scans these GPS-denied environments with minimal delay to construction or operations.

Applications

- Compliance inspection
- Condition monitoring
- Fire control
- Geotechnical inspection
- Services monitoring
- Ventilation modeling



Hovermap's SLAM LiDAR mapping makes it the ideal solution for tunneling applications. Data capture can be a walking scan, or vehicle-, or drone-based.



Hovermap adds LiDAR data capture to the traditional visual inspection of dams. Point clouds colored by intensity, as above, identify areas of deterioration and moisture seepage.

11 INFRASTRUCTURE

Infrastructure, such as dams, requires a variety of assessments, from geotechnical, hydrological, hydraulic, mechanical, and structural. Traditional terrestrial LiDAR scanning is expensive, time-consuming and may not capture the entire asset. Hovermap captures high resolution data across 100% of the asset.

Applications

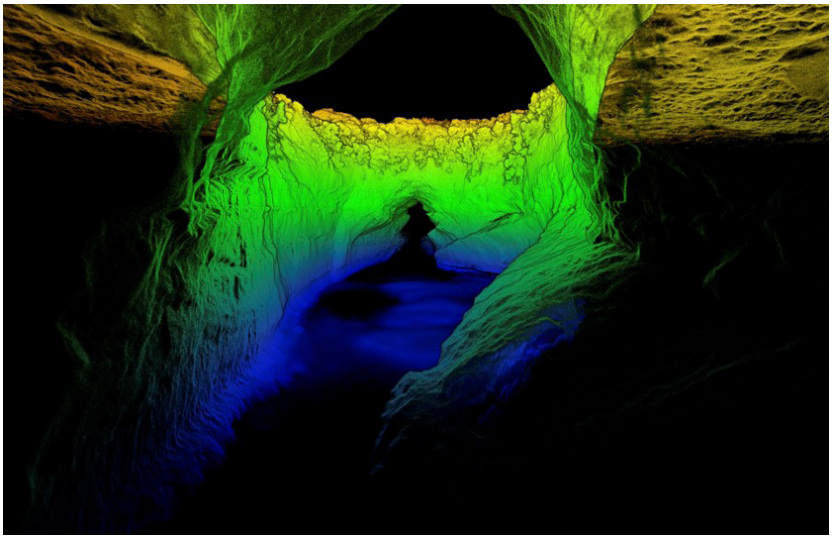
- As-built
- Condition monitoring
- Reverse engineering
- Stakeholder engagement
- Surface moisture detection

12 CAVES AND CLIFFS

Hovermap's rotating LiDAR sensor captures data in all directions, making it ideally suited to scan along a cliff edge or map a cave system. A 360° scan using a traditional scanner requires two passes, but Hovermap captures these environments in one.

Applications

- Contour mapping
- Environmental assessment
- Pre-construction assessment
- Watershed analysis



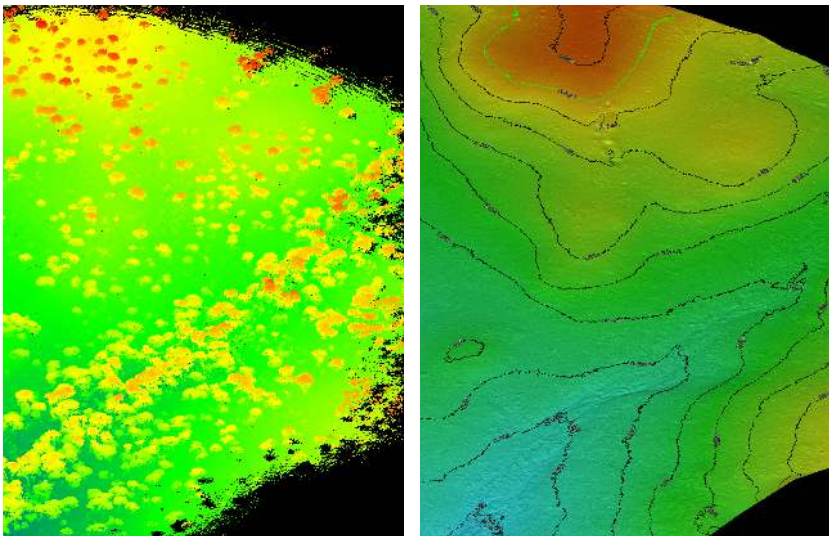
Development plans for the area around this blowhole, a natural formation that extends under the cliff, included the construction of a viewing platform. A 5-minute Hovermap flight captured data of the cliff and blowhole for the risk assessment and geotechnical inspection.

13 TERRAIN

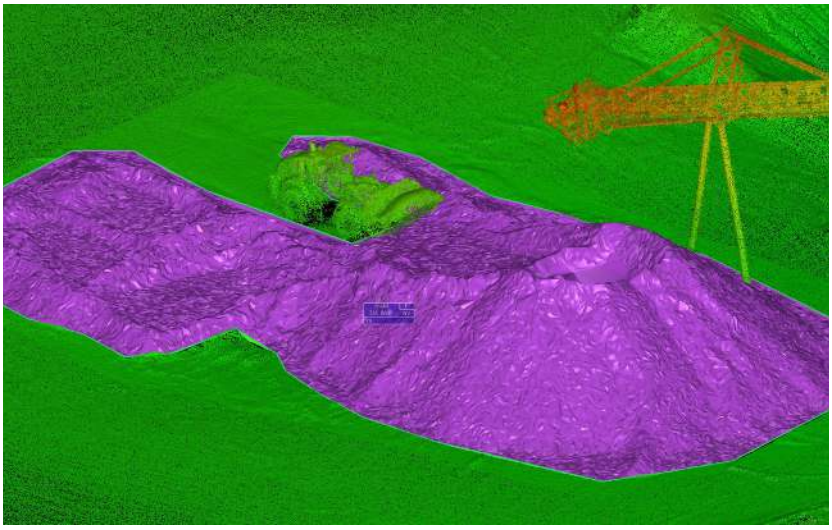
A digital terrain model (DTM) is a 3D representation of a terrain surface, created from elevation data, with objects such as vegetation or infrastructure digitally removed. Hovermap flies above and below the canopy to capture a complete picture of the terrain.

Applications

- Modeling flood and drainage
- Subsidence modeling
- Land use and management
- Geological studies



Captured with Hovermap (left), vegetation has been removed to produce a DTM (right) of the study area.



Using Hovermap for stockpile scans keeps the drone operator at a safe distance from heavy equipment and quickly generates data for end-of-month reporting.

14 STOCKPILES

Traditional stockpile survey methods can be slow, require multiple setups, and may not achieve 100% coverage. Hovermap's measured point cloud data informs accurate volumetrics and a wide range of other slope and stockpile analyses.

Applications

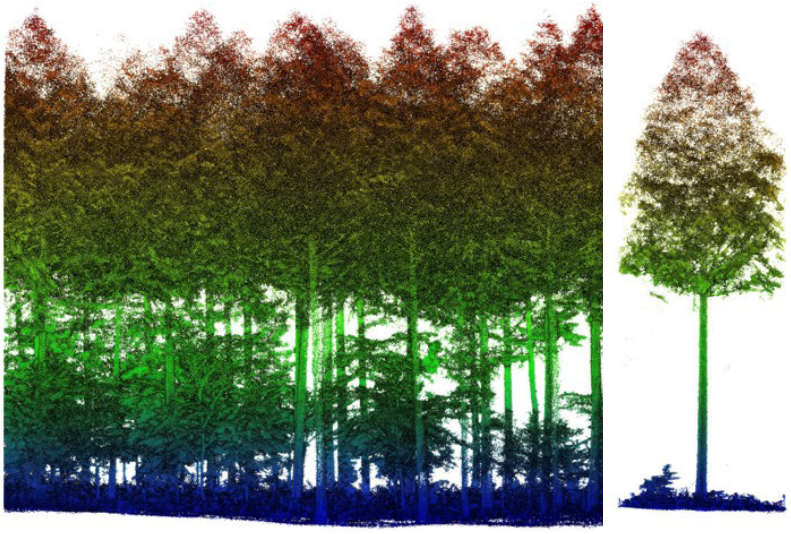
- Contour mapping
- Fragmentation
- Slope and stability analysis
- Volume (indoors and outdoors)

15 FORESTRY

Mapping plantations is set to revolutionize forestry management. While existing solutions capture above canopy, Hovermap captures above and under canopy data to create a complete picture of a forest and characterize individual trees by location, size, straightness, and branching.

Applications

- Canopy structure analysis
- Tree thinning
- Wood volume calculations
- Watershed modeling



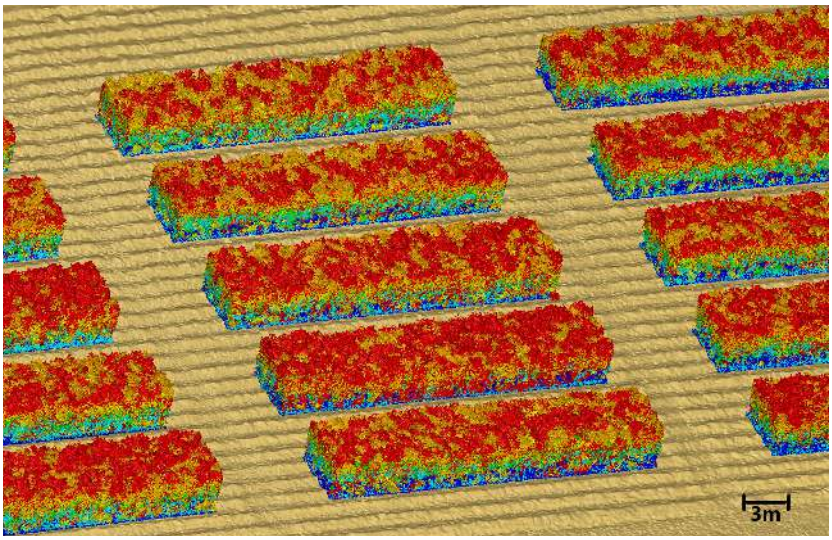
This forestry point cloud, colorized by elevation, was produced by merging above and below canopy scans.

16 CROP MANAGEMENT

LiDAR is widely used in agricultural science to identify crops, estimate planted area and yield. Manned airborne operations, often costly and susceptible to cloud cover, are being replaced by drone-based LiDAR, such as Hovermap, which are more cost efficient and offer more flexible operations to better inform crop management decisions.

Applications

- Detection of pests and disease
- Estimation of crop yield
- Monitoring crop growth
- Plantation management



Six Hovermap surveys (colored blue to red) conducted over a nine-month growth cycle of a sugarcane crop measured the effects of varying nitrogen fertilizer treatments.

This image of 122-meter high Garuda Wisnu Kencana, in Bali, Indonesia, combines flight and walking scans.

17 CULTURAL HERITAGE

Constructed with no or little spatial information, heritage buildings and structures require up-to-date data prior to and during preservation, redevelopment, or construction activities. Hovermap's virtual shield ensures the drone maintains a safe distance while it captures high resolution, colorized data.

Applications

- As built
- Pre-mediation inspection
- Progress monitoring
- Public marketing
- Stakeholder engagement

18 URBAN MAPPING

As local and city governments move to digitized 3D models for city planning, the need for rapid collection of data suitable for Level of Detail 3 or 4 increases. Hovermap's versatility and dense colorized point clouds make it an ideal solution for urban mapping.

Applications

- As-built
- Context modeling
- Construction sequencing
- Lighting/shadow studies
- Viewshed analysis
- City planning
- Corridor management

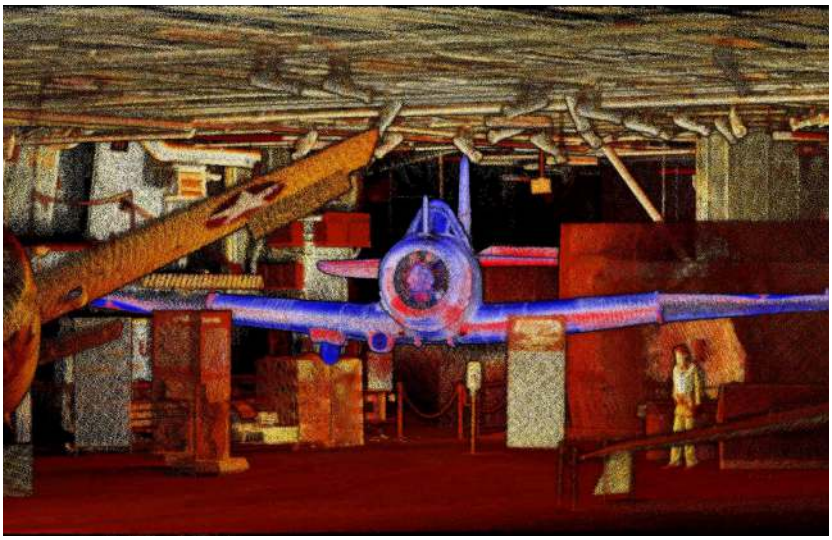
This building scan is colorized with realistic colors and texturized to produce an intuitive element in a city model.

19 SPACE OPTIMIZATION

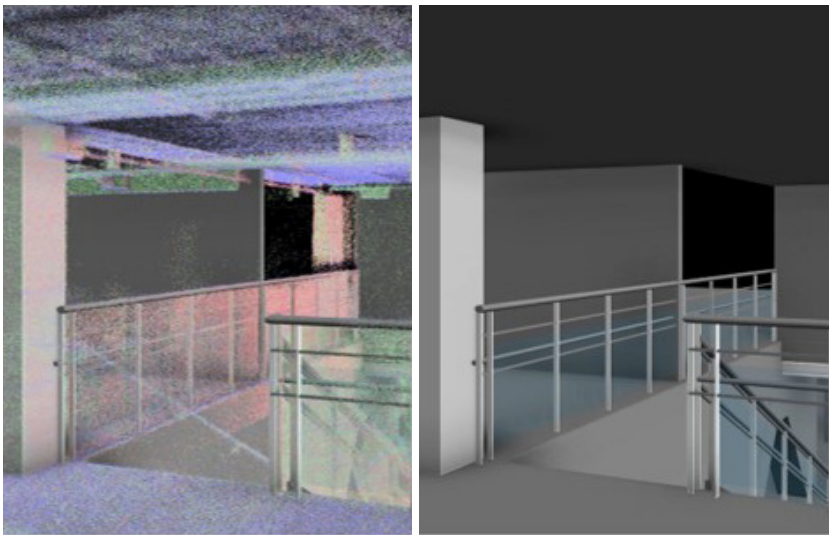
"Does it fit?" is the key question to answer prior to moving equipment or an asset from one location to another. Scan the asset, the transport route, and the new location for virtual fit prior to relocation.

Applications

- Clash detection
- Space management
- Stakeholder engagement
- Transport corridor clash detection



Prior to relocating a WW II aircraft, the USS Midway Museum needed to know if it would fit in new location. A 5-minute walking scan and post-processed point clouds revealed the plane could be relocated to the new exhibition space.



The Hovermap point clouds (left), captured with a walking scan, were converted to a CAD model (right) using Autodesk tools.

20 BIM

The construction industry relies on accurate 3D Building Information Modeling (BIM) to efficiently plan, design, construct and manage buildings and infrastructure. Fly, walk, or tether Hovermap to quickly capture accurate and shadowless data for complex built environments.

Applications

- As-built
- Clash detection
- Information sharing
- Mechanical, electrical, plumbing design
- Project collaboration

BONUS

21 VIRTUAL EFFECTS (VFX)

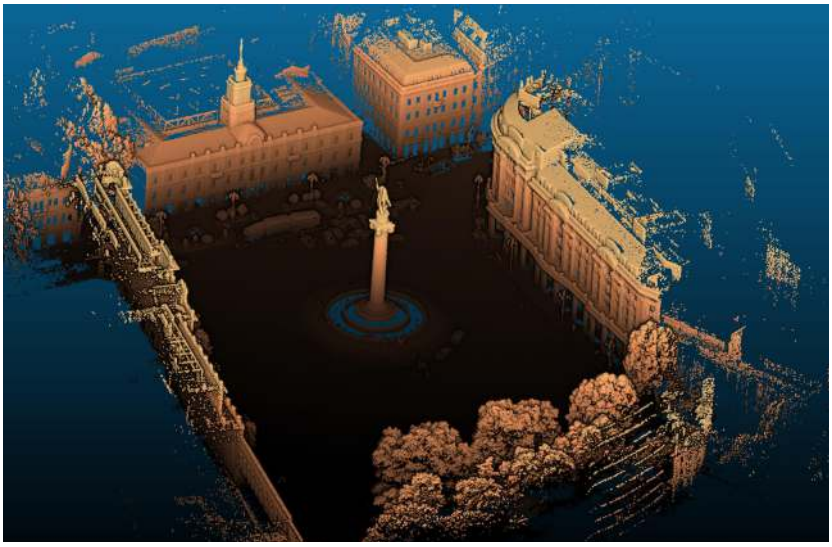
When operating on a live set to capture VFX data in the film industry, speed is key. With Hovermap, scanning a set can now occur between takes, capturing areas in 5 minutes that would have taken an hour. Hovermap can capture above buildings and around complex set pieces, areas that traditionally had no effective LiDAR capture method.

Applications

- 3D modeling
- Overview scan of sets and piece locations

"We have been using Hovermap in the VFX industry for years to supplement our terrestrial LiDAR offerings in this fast moving environment where our access to scan any location is severely time limited."

Dan Thomas, Drone Pilot, XM2



This main square in a major city was shut down for just five minutes by police for capture to take place in a key scene of a major motion picture. Traditional scanning would have shut down the area for hours.

ABOUT HOVERMAP

Hovermap is a versatile mobile mapping solution able to operate in GPS-denied and hazardous environments.

Hovermap combines a rotating LiDAR sensor, which captures a near 360˚ x 360˚ spherical field of view, with simultaneous localization and mapping (SLAM) algorithms for mapping, navigation, collision avoidance and position hold capabilities without a GNSS positioning system.

When mounted on a drone, Hovermap enables autonomous flight—beyond line-of-sight and communication range—in challenging GPS-denied environments, making it possible to venture farther into inaccessible areas.

When using Autonomy Level 2 flight mode, drone pilots fly an entire mission, from take-off to landing, using a tablet and smart waypoints. Data is processed on-board in real-time to stream a 3D map back to the operator, while Hovermap navigates to waypoints, avoids obstacles, and captures high resolution, accurate point cloud data.

Weighing only 1.8 kg (4 lb.), Hovermap is easily deployed and able to switch between mounts to enable flying, walking, vehicle-mounted, and other data capture techniques.

MAPPING SPECIFICATIONS

SLAM mapping	Simultaneous Localization and Mapping (SLAM) based LiDAR mapping +/- 0.03% drift
LiDAR range	0.40 to 100 m
LiDAR accuracy	+/- 30 mm
Mapping accuracy	+/- 20 mm in general environments +/- 15 mm in typical underground and indoor environments +/- 5 mm for close range scanning
Angular field of view	360° x 360°
LiDAR data acquisition	Up to 300,000 points/sec
Maximum data capture travelling speed	Vehicle: 40 km/h; flight: 5 m/s above ground, 2 m/s underground or confined spaces
Start / stop scanning while in motion	Yes
Outputs	Full resolution point clouds, decimated point clouds, trajectory
Point cloud file format	.las, .laz, .ply, .dxf
Point cloud attributes	Intensity, range, time, return number and ring number
Processing parameters	Pre-set profiles with 20+ adjustable parameters
File size	300MB/min
USB3	High speed data offload
Storage	480 Gigabytes – approximately 12 hours of sensor data
Operating temperature	0-50°C (32 - 122°F)

PHYSICAL SPECIFICATIONS

Weight	1.8 kg (4 lb.)
Input voltage	12 - 50V, powered from a battery or auxiliary power input
Deployment	Drone/UAV, robot, vehicle, backpack, tether, bike
Drone max wind resistance	M210 10 m/s; M600 8 m/s; M300 15 m/s
Quick release mounting mechanism	Yes

AUTONOMY SPECIFICATIONS

Flight modes	Autonomy Level 1: Non-GPS flight, position hold and assisted flight Autonomy Level 2: Non-GPS waypoint flight
AL2 waypoint types	2D, 3D, planar, height
AL2 navigation modes	Guided exploration, local and global path planning
Autopilot compatibility	DJI A3
Omnidirectional collision avoidance	360° x 360°; range 0.4 – 40 m; size of an obstacle > 2 mm wire

Included accessories	Handle Universal carbon fiber mounting plate with appropriate drone mount
Optional accessories	Colorization camera Vehicle mounts: suction grip, magnetic, bull bar Protective cage Hard case backpack

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Version 1