VertiCAM

In-Air Structure Positioning & Verticality

VertiCAM is one-of-two real time, contactless inclination monitoring sensors offered by Zupt. VertiCAM is specifically for in-air use and designed to be installed on construction installation vessels in which monopiles need very accurate inclination and monitoring while the monopile is being lowered into the seabed. The system utilizes combined LiDAR/camera imaging sensors and IMUs to monitor the pile from two different angles at offsets of up-to 50 meters. The system enables the offshore team to automatically determine the verticality and heading of the structure without having to pause hammering or physically mount any sensors to the structure.

The structure is detected in real time by a LiDAR - camera system at two different angles and the relative transformation is determined. The inertial data is then processed to compute the high update rate absolute attitude of the structure, independent of the motion of the installation vessel. The requirements are for the pitch/roll of the pile to be determined as the pile is lowered into place in a gripper, during pile self-penetration under its own weight and during the pile installation via either a pile hammer system or via a suction installation methodology. The solution is required to deliver the required accuracy/resolution without any specific targets being placed onto the pile.

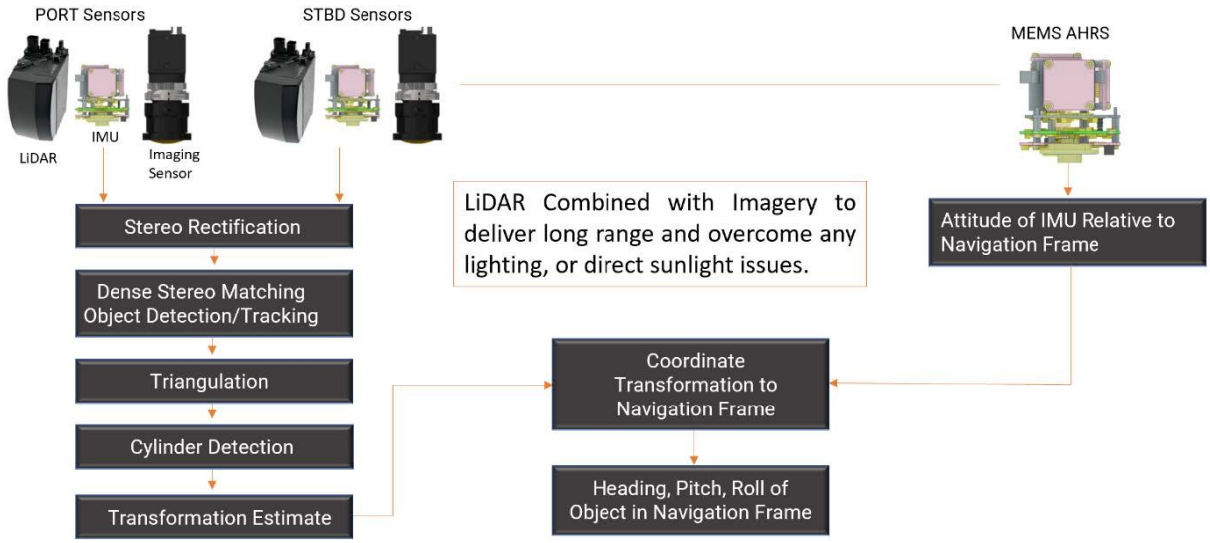
This solution is connected to an NVIDIA GPU processor running real time verticality calculations, also providing a remote human machine interface (HMI) processor connected to the core processor via a network (Ethernet) connection to allow remote data viewing and interface to the system.

Accurate position and verticality data

delivered in real time.

VertiCAM Benefits:

- VertiCAM is a dual redundant solution, combining a LiDAR system, HD Imaging Sensor, and IMU at two different viewing locations to a structure being installed
- VertiCAM is a contactless, in-air solution that does not require mounting hardware the structure
- Zupt's solution enables long range measurements via LiDAR sensors that are color palletized by the imagery sensors. The verticality data is provided to the user in real-time
- The system will perform down to the onset of "zero" or "very low visibility" as defined by ICAO Annex 3 Meteorological Service for International Air Navigation
- Applicable for Structure Piles, Wind Turbine Pile Foundations, Jackets, etc.



VertiCAM Specs:

Exterior Sensor Housings - IP67/IP68 Housed
Pitch and Roll Required (Accuracy) - Target 0.05°, Minimum 0.1°
Pitch and Roll Required (Resolution) - Target 0.01°, Minimum 0.05°
Heading Accuracy - <1° *If structure Features Are Present
Pitch and Roll Range - +/- 20°
Maximum Vessel Motion - +/- 10° Pitch/Roll, +/- 3m Heave, 5°/s Rate of Rotation
Max Offset From Pile to Sensors - 20m Imagery, 50m LiDAR
Pile Dimensional Control Information - Diameter +/-3mm, Ovality 5%

System Components

VertiCAM includes two LiDAR systems, two cameras, inertial measurement units and various PPP or RTK GNSS solutions depending on the client's requirements. The system components (one subsystem fore and one aft, or one on the port and one on the starboard) will be installed onto the construction installation vessel with clear visibility to the area where the pile installation operations will take place.