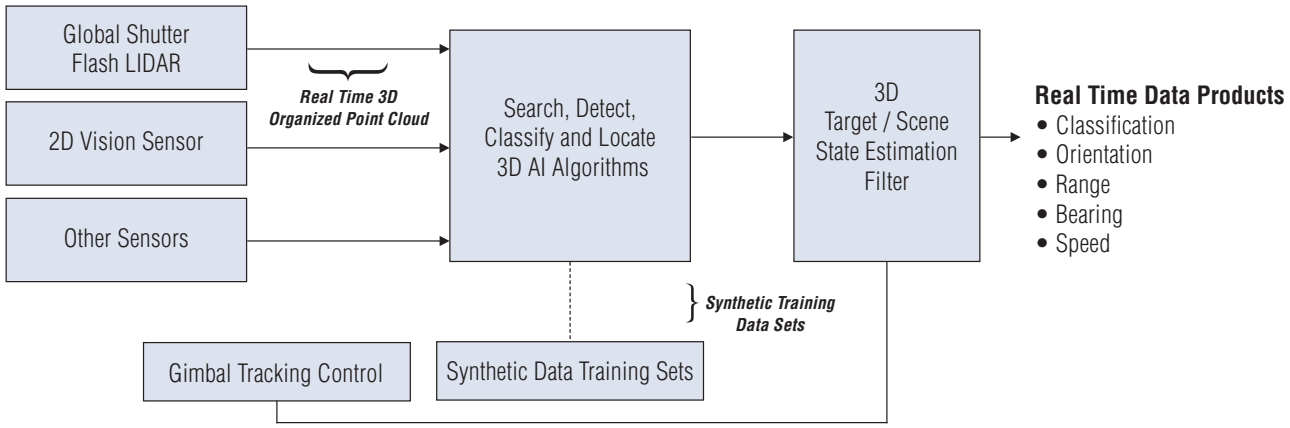
Intelligent Software Defined 3D Vision System (isd-3DVS®)

Architecture for Autonomous Relative Navigation, Mapping, and Situational Awareness Applications



Advanced Scientific Concepts (ASC) Intelligent Software Defined 3D Vision System (isd-3DVS) represents the next-generation 3D vision sensor architecture designed for autonomous relative navigation, real-time 3D mapping, and situational awareness applications. This system combines ASC's exclusive global shutter LIDAR technology (GSFL), 2D vision sensors, and other GNC sensors with advanced artificial intelligence / machine learning (AI/ML) processing enabling the system to autonomously detect, classify, and track objects at real-time video rates.

ASC's flash LIDAR technology functions by illuminating the entire scene using a single laser pulse and subsequently capturing the reflected light using a solid-state global shutter sensor array. This unique approach to sampling allows the GSFL to generate an organized point cloud comprising of range and intensity data points that are both spatially and temporally correlated, all while avoiding the motion blur often encountered in other LIDAR systems. Furthermore, the GSFL incorporates a built-in range gating feature, which selectively samples a specific range within a scene. This range gating capability enables the LIDAR to effectively range and image objects even in challenging visual conditions such as those influenced by dust, rain, or snow.

Three-dimensional AI/ML algorithms are responsible for managing tasks related to scene detection, classification, and orientation. These algorithms undergo training using simulated datasets created by the physics-based digital twin simulator of the flash LIDAR. This methodology allows for a software-defined sensor capability, wherein algorithms can be retrained and upgraded directly on the deployed platform. This flexibility enables the optimization of the ISD-3DVS for various missions as needed.

A state estimation filter, often referred to simply as a state estimator algorithm or technique calculates the state variables of a system based on available measurements and a model of the system's dynamics. The primary function of a state estimator is to provide the best possible estimate of the system's true state, even when the state variables cannot be directly measured or are subject to noise and uncertainty.

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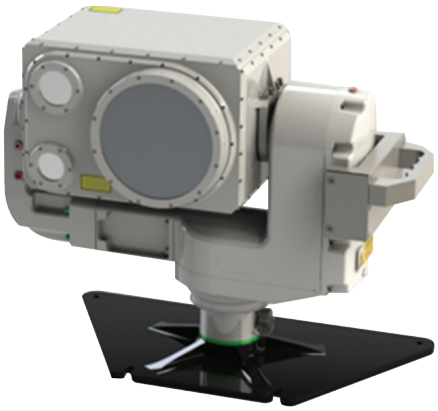
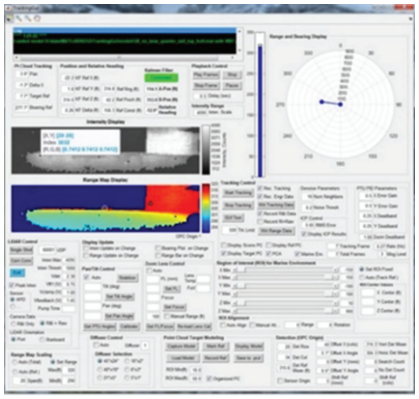
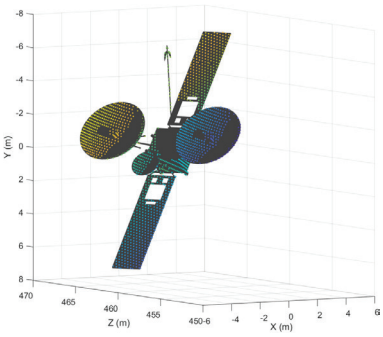
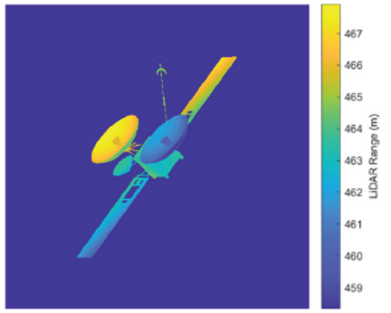
ASC's first product to use the ids-3DVS® architecture is the DPVIS Autonomous Vessel Range & Bearing Vision Sensor for the US Navy. The sensor autonomously searches, detects, classifies, and tracks target surface vessels and provides target vessel relative range and bearing data at video rates.

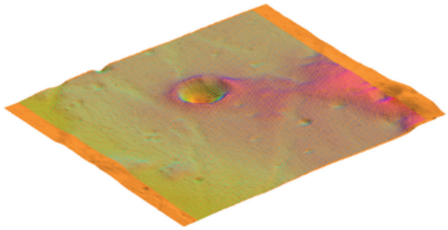


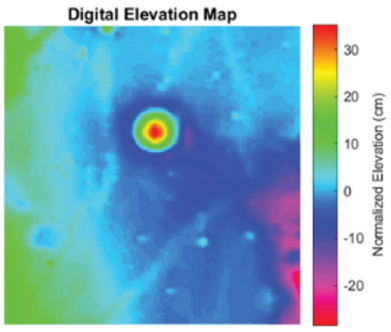


The system architecture can be adapted to support resident space object (RSO) and planetary mapping applications.









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