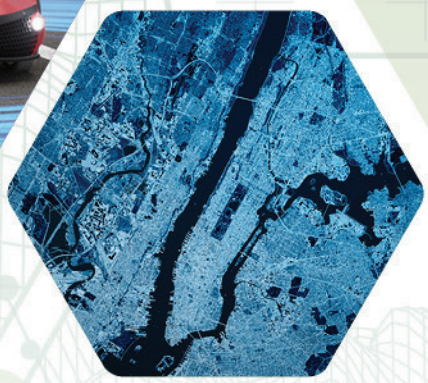

Science and Technology

TRANSPORTATION SECURITY & EXPLOSIVES CHARACTERIZATION SOLUTIONS

HIGH RESOLUTION ENHANCEMENT FOR 3D LIDAR SYSTEMS

THE ORBITING ACTUATED 3D SPINNING SENSOR DEVICE CAN BE ADDED TO A LIDAR SYSTEM TO CREATE HIGH-RESOLUTION 3D COMPOSITE IMAGES

3D sensors such as spinning light detection and ranging (LiDAR) sensors have been applied to numerous applications including additive manufacturing, defect detection, target tracking, and autonomous vehicle sensing capability. Current LiDAR systems have limitations to capture a comprehensive view and are costly to produce.

3D scanning/imagery have become increasingly important capabilities for sensing equipment. One of the most popular types incorporates spinning sensor to scan a horizontal strip in a 360-degree range. Whether they are the small, inexpensive, single sensor version or the higher-end, expensive multi-sensor LiDAR, they all are limited by their repeated sampling of a small region/strips of the actual environment. This creates an image composed of a set of discrete horizontal planes. Typically, the 360° horizontally scanned view is composed of densely spaced data points, yielding high resolution on a single axis, typically around 0.02°. The vertical scanning is limited to the number of sensors in the LiDAR. Normally, there is only one horizontal plane per sensor, which produces a vertical

KEY BENEFITS

+ Converts typical LiDAR to a high-resolution LiDAR
+ Advanced driver-assistance system to allow enhanced object detection and classification
+ Increases the operational safety of autonomous vehicles and self-navigating robots
+ Cost reduction allows cheaper LiDAR units to be utilized or increases effectiveness of those in use

STAGE OF DEVELOPMENT

Prototype

PARTNERSHIP SOUGHT

License

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DHS COMPONENT

U.S. Secret Service

stack of planes. These planes are separated by the viewing angle of each sensor. For a mid-sized LiDAR with 16 sensors, this produces a vertical resolution of approximately 2°. The difference in the horizontal to vertical resolution is 100:1. There are effective dead-zones in the scans between the horizontal planes. If the points that are scanned horizontally were dispersed to cover the dead-zones between vertical scans, the effective resolution could be increased without increasing the number of points to process or adding additional sensors/LiDARs. The Orbiting Actuated 3D Spinning Sensor device accomplishes this increase in effective resolution with minimal additional hardware or expense.

THE TECHNOLOGY

By 2026, the driver-assistance and autonomous vehicle LiDAR market is projected to have a valuation over $4B. Current market available enhancements provide increased safety in complex environments, but with increased processing times and more expensive sensors. The Orbiting Actuated 3D Spinning Sensor decreases costs by reducing the number of lasers required and provides an increased field of view. The actuated spinning sensors allow the creation of 3D images with high levels of composite detail and using enhanced sensors with composite vertical views will produce more accurate high-resolution images.

The device can be added to a LiDAR system to increase the composite vertical field of view and composite resolution. It adds an extra "wobble" to the rotation around an axis that results in increased resolution by spreading out data points. The addition enhances the sensor's view, reducing blind spots, thus increasing accuracy and safer operation. If used with a high-resolution LiDAR, the result could be a super-resolution LiDAR.

Diagram of an actuator including a mount and a rotator configured to mount a spinning sensor.

APPLICATIONS

+ Autonomous Vehicle Sensing
+ Surveying
+ Object Mapping
+ Object Tracking

PATENT INFORMATION

US Patent numbers 11,086,018 and 11,448,766

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TECHNOLOGY SOLUTION

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