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Evaluation of Detector Array Designs for Optical Communication between Unmanned Underwater Vehicles

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Abstract (250-word limit)

The communication interface is essential for unmanned underwater vehicles (UUVs) to interact with each other or with a stationary target, such as docking station. In this paper, we investigate different optical array designs using a simulator. In addition to the hardware characteristics (e.g., sensitivity of the detectors and noise sources), the environmental conditions affecting the light field underwater were also taken into account. The simulator product is an image of the light field sensed by the detector array. The simulator product provides a signature that allows the UUV to track its position and orientation with respect to a light source. A variety of motion types (i.e., translation in the x, y, z directions including rotation about these axes) were analytically tested and evaluated for different array designs. The results from the simulator are to be validated against empirical measurements conducted in the water tank facilities in the Ocean Engineering Laboratory at the University of New Hampshire. Preliminary results suggest that unique image signatures can be obtained for the relative translational and rotational motion between two platforms.

Abstract (100-word limit)

The communication interface is essential for unmanned underwater vehicles (UUVs) to interact with each other or with a stationary target, such as docking station. In this paper, we investigate different array designs using a simulator. The simulator product is an image that allows the UUV to track its position and orientation with respect to a transmitted light source. A variety of six-degree-of-freedom motion types are to be tested and evaluated against the different array designs and compared to empirical measurements conducted in the Ocean Engineering Laboratory at the University of New Hampshire.