Poly-open LIDAR: Fast and High Resolution Adaptive LIDAR with original Multi-Opening Polygon Mirror System

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LIDARs are imaging systems that obtain the model of the determined area in a virtual environment by directing the rays around the axes. LIDARs have various applications including mapping, military, robotics, UAV and UGVs. Although LIDARs have serious advantages, they are not preferred in many cases because their prices are higher than other imaging systems. The most used type of LIDARs in the market are mirrored optomechanical LIDARs. The biggest advantages these systems have over other LIDARs are that it has a wider field of view, and that it allows faster scans. However, these systems have serious problems as their resolution in the vertical axis is low, the sizes of the systems are too large, and noise in the data is disruptive. In addition, since the beams are reflected from at least two mirrors, mirrors with higher reflectivity consonants and stronger rays are used. These incrementations further increase the cost of LIDARs. Our project consists of a LIDAR prototype that enables three-dimensional, high-speed, high-resolution scans with a single reflection unlike systems in the literature. It eliminates all of the disadvantages of the mirrored optomechanical LIDARs, reduces the size of LIDARs up to the transmitted beam length, increases resolution on the vertical axis significantly, and minimizes the absorption of the transmitted rays by the mirrors which reduces the cost. Furthermore, a second LIDAR prototype that enables faster scans with a unique cross-sensed scanning technique has been developed. Image enhancement algorithms such as noise cleaning, object detection, calibration have been developed. Five different LIDAR models have been prototyped during our studies. The last two prototypes are unique in the literature, and patent applications have been made.

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