

An aquatic-vision-inspired camera based on a monocentric lens and a silicon nanorod photodiode array

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Conventional wide field-of-view (FoV) cameras are bulky and heavy due to their complicated multi-lens optics and flat image sensor arrays, thereby unsuitable for advanced mobile electronics including drones and autonomous vehicles. In this regard, the aquatic eye in nature that consists of a single spherical lens and a highly sensitive hemispherical retina has inspired the development of a novel wide FoV imaging system. We herein report an aquatic-vision-inspired camera that consists of a single monocentric lens (*mo*-lens) and a hemispherical silicon nanorod photodiode array (*h-SiNR*-PDA). Such a bio-inspired imaging system features the wide FoV, miniaturized design, minimum optical aberration, deep depth-of-field, and facile visual accommodation. Even under vignetting, the *h-SiNR*-PDA enables high quality panoramic imaging due to its enhanced photodetection by the silicon nanorod photodiodes. Theoretical analyses and experimental validations exhibit that all such performances, for which complicated system constructions have been required, can be achieved in one simple integrated device.