An Object Detection Software for Extreme Low-light Conditions

Track Code: 2022-CHAN-69559

Categories:
- Computer Technology
- Electrical Engineering

Keywords:
- Electrical Engineering
- Microscopy
- Night Vision
- Surveillance

Researchers at Purdue University developed a method of photon detection in low-light conditions that limits noise using a non-local module and a student-teacher network. The non-local module ("student") aggregates the light from bursts of frames instead of single frames, and the student is trained to match the features produced by a teacher, which detects light in high-photon conditions. Existing techniques for image processing are not designed for photon-limited conditions; attempts to overcome photon-limited conditions are less successful when the noise is strong. Integrated with the latest photon counting devices, the algorithm developed by the Purdue researchers achieves more than 50% mean average precision at a photon level of 1 photon per pixel, which is over 6% higher than the market leader. The high performance demonstrated by this algorithm in low-light conditions has potential applications in night vision, surveillance, and microscopy.

Related Publication: C. Li, X. Qu, A. Gnanasambandam, O. A. Elgendy, J. Ma and S. H. Chan, "Photon-Limited Object Detection using Non-local Feature Matching and Knowledge Distillation," /2021 IEEE/CVF International Conference on Computer Vision Workshops (ICCVW), Montreal, BC, Canada, 2021, pp. 3959-3970, doi: 10.1109/ICCVW54120.2021.00443.

Technology Validation: Integrated with the latest photon counting devices, the algorithm achieves more than 50% mean average precision at a photon level of 1 photon per pixel, which is over 6% higher than the market leader.

Advantages:
-Versatile
-Precise
-Limits shot noise

Applications:
-Night vision
-Surveillance
-Microscopy

People:

- Chan, Stanley H (Project leader)
- Gnanasambandam, Abhiram
- Li, Chengxi
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Intellectual Property:

Application Date: October 11, 2022
Type: Utility-Gov. Funding
Country of Filing: United States
Patent Number: (None)
Issue Date: (None)

Application Date: October 10, 2021
Type: Provisional-Gov. Funding
Country of Filing: United States
Patent Number: (None)
Issue Date: (None)

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