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Editorial: Advances in near infrared optoelectronics: material selection, structure design and performance analysis

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Editorial on the Research Topic
Advances in near infrared optoelectronics: material selection, structure design and performance analysis

Near-infrared (NIR) materials refer to substances that can interact with light in the spectral region from 750–2,500 nm. The NIR waveband has been widely used for ray measurement and detection, industrial automatic control, photometry, infrared thermal imaging and infrared remote sensing. The research on NIR optoelectronics includes the selection of appropriate materials, design and simulation of device structure, performance optimization, and so on. Moreover, NIR optoelectronics has important applications in the field of biology and medicine, such as synapses, reinforcement learning and photothermal therapy. With the development of NIR optoelectronics, the performances and application fields of the devices are continuously improved and expanded.

In order to achieve the purpose of academic exchange and actively promote the latest scientific research results, this column invites experts and scholars engaged in infrared image processing, infrared nondestructive testing and other fields to share the cutting-edge hot Research Topic in this professional field with readers from the perspective of theoretical research and engineering application. "*Research on infrared target detection based on neural network fusion*" by Fu et al. uses near infrared technology to detect targets under special weather conditions, such as night, rainy and foggy days. In order to improve the detection accuracy of vehicles, pedestrians and other targets in infrared images, a fusion neural network algorithm for infrared target detection is proposed. Tu et al. "*An improved YOLOv5 for object detection in visible and thermal infrared images based on contrastive learning*" proposes an improved algorithm to solve the challenges encountered when using visible light and thermal infrared images for target detection. This algorithm introduces the concept of contrast learning into the YOLOv5 target detection network, and adopts the joint loss function of target detection and contrast learning to optimize the network parameters. By using contrast learning strategy, the distinction between background and target in feature space is improved, and the target detection performance of YOLOv5 network is enhanced. "*Infrared defect recognition technology for composite materials*" by Chang et al., proposes a novel method for detecting internal defects of aircraft composite materials using infrared thermal wave imaging detection

technology. The results are discussed and analyzed to realize the identification and location of structural defects of aircraft composite materials, including the type, size and precise depth of defects. The research results will expand the application scenarios of infrared nondestructive testing technology worldwide and contribute to solving the maintenance problems of aircraft in general aviation. "*Accurate segmentation of infrared images for circuit board diagnosis using an improved Deeplabv3+ network*" by Hao et al. aims at the problems such as uneven gray scale of infrared images, multiple target areas and large radiation noise, and a segmentation algorithm based on Deeplabv3+ network is proposed. Lightweight MobileNetV2 is used to replace the original Xception backbone network to improve computing efficiency and reduce overfitting. The composite loss function and cosine annealing learning rate are used to balance foreground and background segmentation and avoid local optimality.

This Research Topic focuses on the fusion application of NIR technology and engineering technology, and shares the latest innovative research and development work of researchers with peers, and the research results can provide a good reference for research and development or technical personnel in the same field. Expect to resonate with fellow experts and scholars, and contribute intelligence to the development of infrared technology.

Author contributions

MY: Writing–original draft. XZ: Writing–review and editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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