Vision-based fire detection facilities work better under new deep learning model

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Fast and accurate fire detection is significant to the sustainable development of human society and Earth ecology. The existence of objects with similar characteristics to fire increases the difficulty of

vision-based fire detection. Improving the accuracy of fire detection by digging deeper visual features of fire always remains challenging.

Recently, researchers from the Institute of Acoustics of the Chinese Academy of Sciences (IACAS) have proposed an efficient deep learning model for fast and accurate vision-based fire detection. The model is based on multiscale feature extraction, implicit deep supervision, and channel attention mechanism.

The researchers utilized the real-time acquired image as the input of the model and normalized the image.

At the low-level feature extraction stage, they introduced the multiscale feature extraction mechanism to enrich spatial detail information, which enhanced the discriminative ability of fire-like objects. Then, the implicit deep supervision mechanism was employed to enhance the interaction among information flows.

Finally, the researchers used the channel attention mechanism to selectively emphasize the features contributing to the task, and effectively suppressed the interference of image noise.

The experimental results demonstrated that the accuracy of this efficient deep learning model for fire detection achieved 95.3%, but the model size was only 4.80 MB, making it easy to be implemented on resource-constrained devices.

The model could process 63.5 frames per second on NVIDIA GTX 2080TI, meaning that it is able to detect fire in real-time. Compared with the current deep-learning-based methods, this model showed great improvement not only in detection accuracy but also in model size and detection speed.

This research provides a feasible solution for realizing fast and accurate fire detection and makes it possible for vision-based fire detection to become practical.

More information: Songbin Li et al. An Efficient Fire Detection Method Based on Multiscale Feature Extraction, Implicit Deep Supervision and Channel Attention Mechanism, *IEEE Transactions on Image Processing* (2020). DOI: 10.1109/TIP.2020.3016431