

EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRE

ABSTRACT:

As part of the early warning system, forest fire detection has a critical role in detecting fire in a forest area to prevent damage to forest ecosystems. In this case, the speed of the detection process is the most critical factor to support a fast response by the authorities. Thus, this article proposes a new framework for fire detection based on combining colour-motion-shape features with machine learning technology. The characteristics of the fire are not only red but also from their irregular shape and movement that tends to be constant at specific locations. These characteristics are represented by color probabilities in the segmentations stage, color histograms in the classification stage, and image moments in the verification stage. A frame-based evaluation and an intersection over union (IoU) ratio was applied to evaluate the proposed framework. Frame-based evaluation measures the performance in detecting fires. In contrast, the IoU ratio measures the performance in localizing the fires. The experiments found that the proposed framework produced 89.97% and 10.3% in the true-positive rate and the false-negative rate, respectively, using the VisiFire dataset. Meanwhile, the proposed method can obtain an average of 21.70FPS in processing time. These results proved that the proposed method is fast in the detection process and can maintain performance accuracy. Thus, the proposed method is suitable and reliable for integrating into the early warning system.