MULTI-FEATURE BASED FIRE DETECTION IN VIDEO

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ABSTRACT. *This paper presents an automatic system for early fire detection in video. In many applications, it is desired to increase the detection sensitivity and, more importantly, improve the reliability of the detection system through improving the false alarm immunity. The reliability is significantly improved such that fire detection systems can automatically control the fire suppression system. The use of multi-feature based detection technology can offer the most promising means for achieving both the improved sensitivity to real fires and the reduced susceptibility to false alarms. In this paper, we present a new mathematical tool based on fractal dimensions, along with the chromatic features, to make a raw localization of fire regions first. Further, we consider the dynamic features of the early fire in video and show how they can be applied to fire detection to improve the fire detection performance. The experiments performed on a large number of scenes demonstrate the effectiveness of the proposed method.*
Keywords: Fire detection, Fire features, Multi-feature, Fractal dimension

1. **Introduction.** Visual fire detection has the potential to be useful in conditions in which conventional methods cannot be adopted. Visual characteristics of fires such as brightness, color, spectral texture, spectral flicker, and edge trembling are used to discriminate them from other visible stimuli. These characteristics are utilized commonly in many algorithms for fire detection. Most of the early fire detection techniques are based on particle sampling, temperature sampling, relative humidity sampling, air transparency testing and smoke analysis, in addition to the traditional ultraviolet and infrared sampling.

Although a lot of work has been done in early fire detection, in many cases, few systems can detect fire both sensibly and reliably, because many algorithms adopt at most two features for fire detection. For example, a fire-detection system that adopts both color and motion information was proposed in [1]. In the proposed system, a Gaussian-smoothed