

Enhanced Multi-modal Surveillance Systems



Existing video surveillance systems suffer from limited operator attention span, and high false alarm rates from the unprocessed video feeds.

The system developed here overcomes these challenges and has more generic applicability as it automatically adapts to its environment and uses unsupervised learning techniques to automatically detect abnormal events.

The system can accommodate one or more surveillance cameras and input from many other sensor types. Although we currently use audio as the supplementary signal input, the architecture can take advantage of any number of other heterogeneous sensor inputs or none. This facility allows the system to be retrofitted into existing surveillance systems.

In its unsupervised training phase the system discovers clusters of normal 'scenes' for a given environment. Then, using adaptive thresholding techniques, 'abnormal' scenes can be identified automatically and an alarm raised. The initial unsupervised training is done once for a given surveillance area. Thereafter the system continually updates its models to adapt to seasonal and environmental changes in the surroundings.

Benefits

- ◆ Better detection than uni-modal systems
- ◆ Integrates video and audio analytics
- ◆ Extendable to any number of heterogeneous sensor inputs
- ◆ System automatically adapts to seasonal and environmental changes
- ◆ Applicable to indoor and outdoor surveillance

Applications

- ◆ Security
- ◆ Defence
- ◆ Video analytics

Potential applications

Security – improving the efficiency of surveillance systems.

Defence – monitoring borders or land areas

Sports science – analysing athletes' performance using video data and other sensor inputs e.g. heart rate, breathing rate

Benefits

Better detection outcomes than from uni-modal systems

Incorporating multi-modal signal sources enables events to be detected that would be undetectable from observing one signal source alone

Integrates video and audio analytics

Audio sensors are a very cost effective addition to a surveillance system and

contribute useful information especially when used in conjunction with video analytics

Extendable to any number of heterogeneous sensor inputs

The surveillance system works on any single type of sensor signal, as long as the sensor signal is digitised and continuous. Additionally, the system can fuse data from different sensors that are observing the same scene. Experiments demonstrate that multi-sensor fusion gives improved results

Applicable to indoor and outdoor surveillance

The trials undertaken to date have taken place in indoor environments. System testing in outdoor environments is currently taking place.

Technology status

Multi-sensor algorithms have been developed for unsupervised event detection and classification with integrated data fusion. The algorithms have been benchmarked against many hours of real-world multi-media sensor data in surveillance type scenarios

The research group is keen to engage with companies interested in further developing this technology

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