Meleagros
fire protection system

The Meleagros system offers one of the most advanced and integrated technology solutions for fire protection.

The meleagros system integrates visual fire detection and advanced machine vision algorithms, "parallel" execution of multiple simulations for different scenarios of environmental parameters, a unique two-tier data fusion scheme for better assessment of the field observations and crisis management console with advanced algorithms and open protocols and interfaces.

The advanced technology and major innovations incorporated in the Meleagros system meet requirements that other systems fail to meet, and offer enhanced functionality, usability and efficiency at lower cost.

The system is a suitable solution for private or public installations.

MiFIDS

Intelligent fire detection system for private properties

The Meleagros intelligent fire detection system (MiFIDS) monitors indoor and outdoor private properties, residential or land, for fire incidences. Fire detection is implemented with intelligent flame and smoke detection algorithms applied to the stream of an IP camera. The system, which consists of a unit deployed in your area and a server hosted by Mobics, informs the owner via SMS and e-mail about potential risks. MiFIDS can be deployed with commercial IP cameras, or be integrated with existing CCTV systems.

Features

- **"24/7 on" robust infrastructure**
  The primary connection method of MiFIDS to the Internet is an ADSL modem/router. The system also uses a mobile network connection for back-up.

- **Adaptive algorithms and adjustable sensitivity for false alarm elimination**
  The sensitivity of the system, which affects the rate of false alarms, is user-adjusted. To control false alarms, MiFIDS applies dynamic event filtering prior to user alerting. Based on user feedback, the algorithms adapt the detection process to reduce false alarms (e.g., smoke from a chimney).

- **Local and remote alerting mechanisms**
  MiFIDS implements two alerting mechanisms, local and remote. When a fire incident occurs, MiFIDS can trigger a local alarm (siren), as well as alert the user through SMS and e-mail.

- **Easy deployment and setup**
  An easy setup wizard and a comprehensive manual enable the user to deploy MiFIDS in his/her property – no IT expertise is required. It is as simple as configuring a DSL modem

- **Live video or snapshots from the monitored area**
  User can check in real-time the supervised area through live video or snapshots.

- **Mobile-friendly user interface for alerts and snapshots**
  Upon an alert, the user is directed to a web page (accessible also from smart phones) for all the information regarding the alert (image, time, etc.).

- **System health monitoring**
  Remote monitoring of system operation through heartbeat mechanism and self-testing operations

Use cases

- Residence, vacation homes
- Outdoor infrastructures (e.g., solar parks)
- Cultural and natural heritage
- Industrial facilities

Configuration

Wireless/Wired IP Camera

MiFIDS (embedded PC & algorithms)

GPRS/3G (backup link)

xDSL

Internet

User Devices

Meleagros Server

Benefits

- **Not yet another video recording system**
- **State-of-the-art machine vision algorithms for early fire detection**
- **System training for reduced false alarms**
- **Continuous support and updates of detection algorithms**
- **Integration with existing infrastructure (CCTV)**
- **Support for multiple cameras**
- **Works with almost any commercial IP camera**
- **Remote (mobile) access**

Specifications

Camera Requirements:
Color Camera, IP connection (wired or wireless), 15 FPS (min.), 320x240 (min. resolution)

Compatible embedded PCs:
Linutop2, VIA ARTiGO (Pico-ITX)

Meleagros simulation environment

Web-based forest fire simulation

The Meleagros simulation environment enables high-performance execution of forest fire simulation scenarios. Through its user-friendly design, operations staff can get important aid during planning or real-time decision making. The system can be hosted by Mobics (SaaS) or installed as a standalone application. It can be easily integrated with real-time data (e.g., wind direction) or historical data (seasonal weather conditions) in order to produce as accurate results as possible.

Features

- Purely web-based, no client setup required

- Interoperable with various GIS systems

- Dynamic input of weather data (temperature, wind, precipitation, etc.) through weather stations

- User-defined simulation area and fire ignition point on a map

- User-defined simulation start/end time and simulation steps

- Support for multiple simulations with variations in weather data (i.e., wind direction)

- Visual output on a map

Use cases
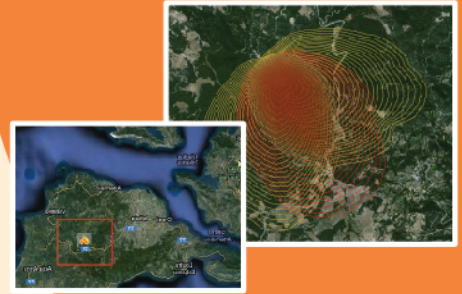
✓ **Near real-time simulations for predicting short-term fire propagation**

✓ **Offline operation for fire protection planning**

✓ **Integrated with Meleagros crisis management console**

Technologies

Implemented with Open Source GIS software such as GRASS, Mapserver, OpenLayers Powered by the FARSITE simulation engine

Meleagros multi-sensor fusion

The Meleagros data fusion subsystem incorporates a unique two-tier fusion scheme of heterogeneous sources for better assessment of the field observations, and for developing safer conclusions about potential risks. The system uses approximate reasoning and Dempster-Shafer theory of evidence. The fusion scheme allows the scaling of the mechanism and the effective implementation of various versions of the Meleagros system (large scale/prefectures, local authorities, private installations).

Features

- **Orchestration of peripheral components (MiFIDS, sensor nodes, weather stations)**
- **Robust detection mechanism**
  Combination of probabilities from peripheral components enables safe conclusions on potential incidents of fire and reduces false alarms.
- **Launch of simulations**
  The fusion component may trigger the execution of simulations in the Meleagros simulation environment

Machine vision for fire detection +

Several flame and smoke features are explored, including motion, color information, geometry attitudes and spatiotemporal characteristics. The system operates on user-defined tiles that are obtained through image segmentation. Tiling, along with appropriately orchestrated algorithms increases the reliability and accuracy of the system.

Features

- **Scene segmentation**
  Finer characterization of the scene regarding distance (far, mid, near) speeds up the detection process while reducing the false alarm rate, too.

- **Day/night operation**
  Luminance conditions are taken into account for algorithm selection and adjustments of detection thresholds.

- **Wide range of algorithms**
  A large pool of algorithms for fire features' detection is implemented. The spectrum ranges from motion and color detection to geometry and spatiotemporal characteristics detection.

- **Adaptive operation**
  User feedback, historic data and time/seasonal parameters can be used to adjust detection thresholds.

Benefits

- Low detection latency response
- Reduced false alarm rate
- Extensible with new detection algorithms
- Wide area coverage
- Minimum operational, maintenance and installation costs
- Compatible with a broad spectrum of available devices (IP cameras)

Use case: Motion detection algorithms

- Time difference
- Mixture of Gaussians
- Eigenbackground
- Running average
- Multilayer background estimation
- KDE (Kernel Density Estimation)

Screenshots

INPUT

OUTPUT