Forest Guardian

Forest Monitoring System
Introduction

Forest fires pose a serious threat to ecological systems, infrastructure and human lives. So early fire detection and fast human intervention are essential to minimize damage. The need for a complete information system that will address these issues, became a priority for Data & Control Systems.

Data & Control Systems

Forest Guardian
Forest Monitoring System
Remote Station – Hardware Specs

The station responsible for fire and smoke detection is an autonomous unit that continuously operates scanning predefined forest areas. When an event occurs the station communicates with main server and notifies the control center by mail or SMS.

- Distance Coverage per System: up to 10 Km radius
- Detection Capability (Day): smoke dimension 10x10 meters at 10km
- Detection Capability (Night): fire dimension 10x10 meters at 10km
- Maximum Detection Time: typically 6 minutes of the detector angle view
- Working Temperature: -20º up to 60º C
- Autonomy :48 hours (without solar radiation)

Camera characteristics
- IR for low lighting conditions and night shot ability
- Pan / tilt / zoom capability
- 35x optical zoom
- JPEG, H.264 & MPEG4 encoding
- Motion detection software

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Forest Monitoring System
Remote Station – Hardware Installation

ForestGuardian excels in detection and the ease of installation. This is due to a lightweight but durable pole, that minimize installation costs.

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Remote Station - Software

Fire detection software locally processes still images retrieved from the camera. In case of an alarm (smoke or fire) it notifies through the modem the control center where the system administrator is located.

To prevent the issuing of emergency alarms for non wildfire events it uses a two step detection process, level 1 and level 2. If a suspected wildfire is within the field of view of the camera, then a level 1 alarm will be issued in less than 10 seconds (yellow alarm- caution). The system will then proceed to automatically determine if the "yellow" event is in fact a wildfire. If the wildfire is confirmed, by the system a level 2 alarm will be issued in less than 1 minute following the level 1 alert. (Red alarm-emergency).

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Weather Station

TCS is a complete meteorological station that in real time updates the control center with vital information's.

- Wind speed & direction
- Precipitation sensor
- Temperature & Humidity
- Fuel Moisture/Temperature Sensors

1) Useful for local fire risk index calculation

2) Fire spread estimation in fire fighting phase.

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Link to Control Center

Various telecommunication technologies can be adopted, depending on the morphology of the installation site.
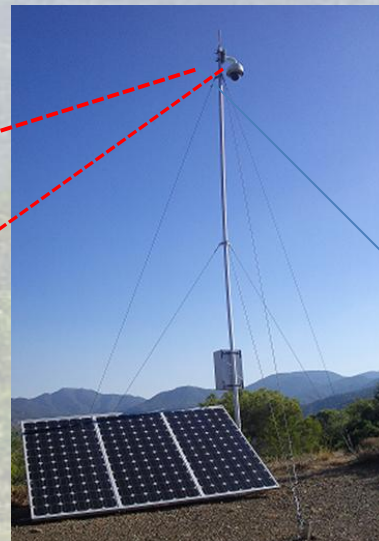
- Satellite link
- GPRS link (local company)
- Radio link
- Wi-Fi

Control Center

Link

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Control Center – Alert Verification

The task of a human operator is to confirm or discard possible fire alarms. After a fire alarm is generated (level 2) and suspicious part of the image is marked, the human operator confirms or discards the alarm.

If the human operator is not sure about a fire alarm he could switch the system to manual operation and make additional inspections using camera pan, tilt and zoom features. The usage of automatic surveillance system, increases human operator efficiency.
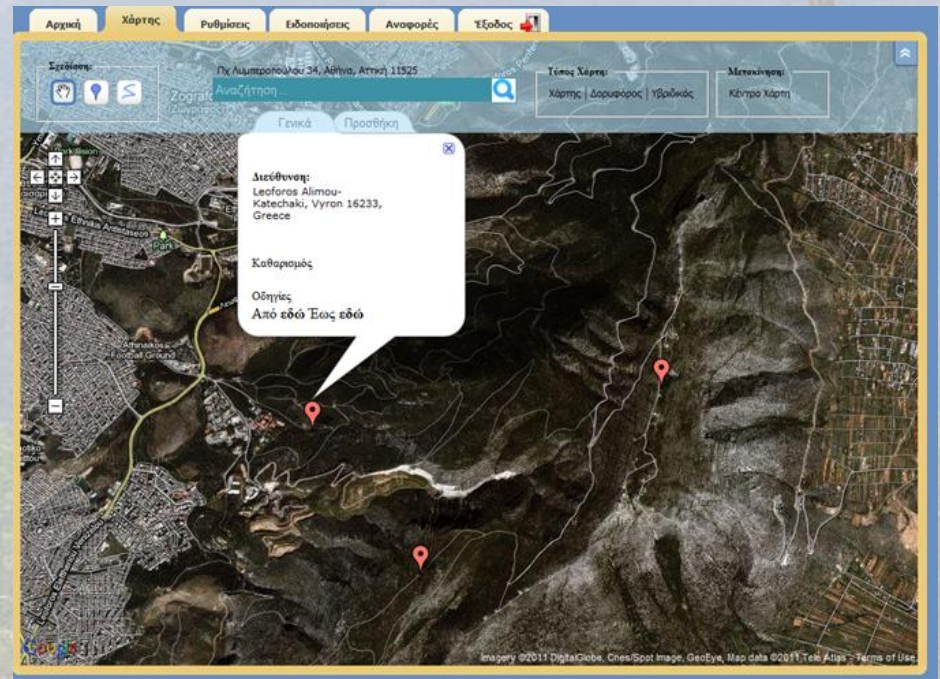

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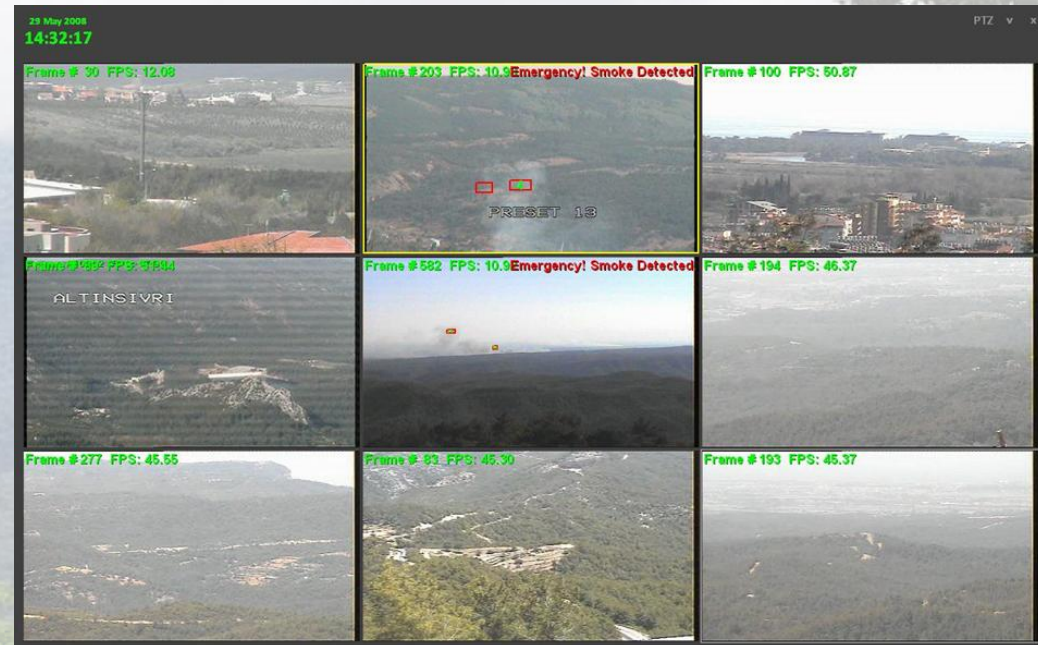
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Forest Monitoring System
Control Center – GIS database

The Geographical Information System (GIS) provides information on vital geographical data, like natural rain-water resource locations, water tanks, soil characteristics and local forest roads.

Time is critical at emergency situations like a forest fire, so in order to secure the necessary quantity of water to supply fire engines in case of a fire incident exact location of water supplies has to be known.
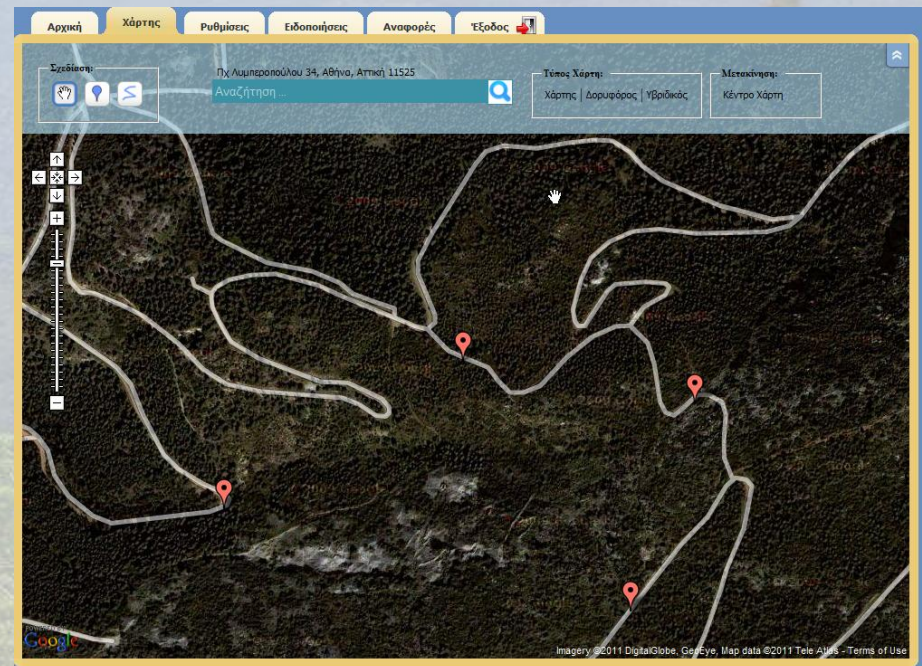

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Control Center –Fleet Management

Fleet Management system is an integrated application that can track and depict the fire department vehicles on Google maps in real time. The system is based on global navigation satellite GPS technology (Global Positioning System), GSM/GPRS telecommunication interfaces and Geographical Information System (Google Maps).

The web-based monitoring and administration application can greatly help with the administration of current vehicles' position, routes etc. and their depiction on Google maps.

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Forest Monitoring System
Control Center – Evaluation of data

The Control center provides to the operator a wide range of vital information's, in summary these are:

- Early detection of any wildfire
- Location of the wildfire
- Awareness of the wind speed and humidity on the area by retrieving data from the meteorological station.
- Location of water resources
- Location of the fire department vehicles

With these information at hand, the operator can effectively coordinate air & land forces, to distinguish any wildfire at its earliest stage.

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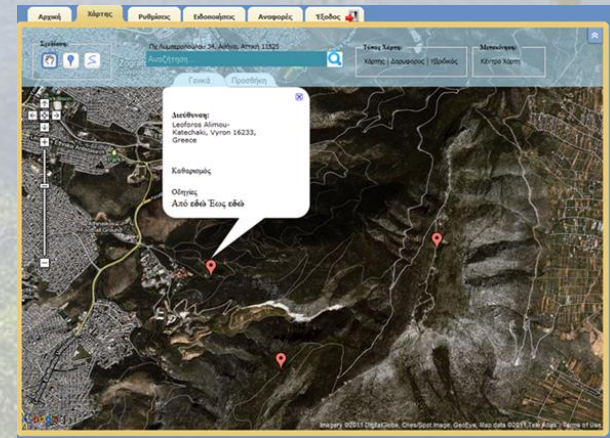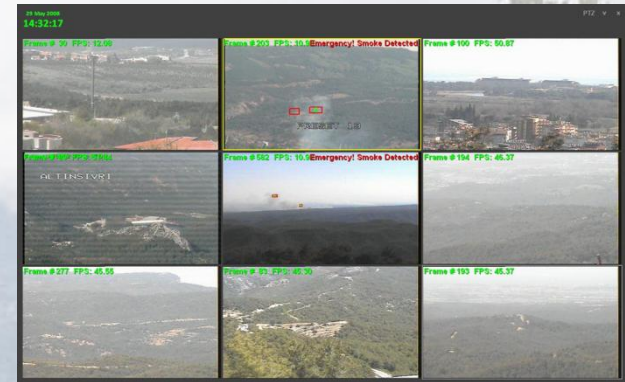
Forest Guardian
Forest Monitoring System
ZigBee wireless Sensors

A Network of Zigbee sensors could support forest monitoring system in special geomorphological cases. The Zigbee network consists of a coordinator, routers and sensors that collect information (temperature, humidity, UV) and appear this information on GIS in real time.