Camera Based Forest Fire Detection and Monitoring System

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Outline of the presentation

- **Key Idea:** Use PanTiltZoom cameras to monitor forests and detect smoke in real-time using computer vision
- Project Team
- Project History and Funding
- Fire and Smoke Detection Algorithm
- Project Status

Project Team

- **Prof. Enis Cetin**, **PhD Univ. of Pennsylvania**
  - +20 years of image and video processing research
  - Editorial Board Member: European Signal Processing Society Journals, IEEE Trans. Image Processing
  - Consulted: Honeywell, visiOprime (UK), GrandEye (UK), ASELSAN, Optron, BellCore (USA) in the past
- Dr. S. Topcu, **PhD Bilkent Univ. , Dr. O. Urfalıoglu, Ph.D. Hannover**
  - +10 years project development experience
- Ph.D. Students and Engineers: Ibrahim Onaran, Çaglar Gonul, B. Uğur Töreyin, Osman Gunay, Kasim Tasdemir

Computer Vision Based Smoke Detection Project

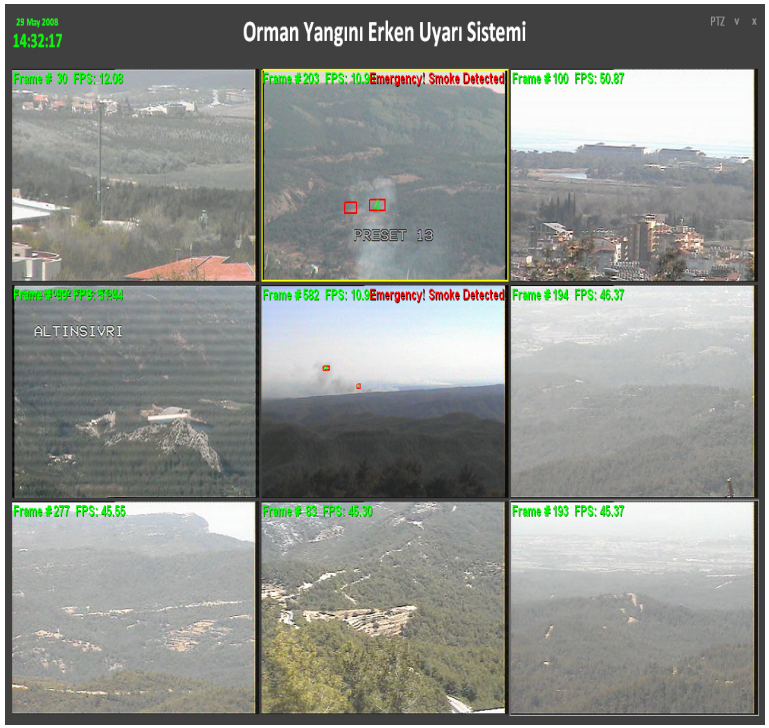
- Initial Funding – EU: Framework 6 Network of Excellence: Multimedia Understanding Through Semantics and Computational Learning (MUSCLE):

  www.muscle-noe.org
- Current Funding – TUBITAK: Turkish Scientific and Technical Research Council
- The system is installed in 10 forest look-out towers
- It is successfully tested by Turkish Ministry of Environment and Forestry: http://www.ogm.gov.tr/gyangin.htm

Motivation

Ordinary CCTV-based monitoring systems are not sufficient

- Human-only systems are not fail-safe
- A human observer cannot monitor more than 16 channels simultaneously
- Video smoke detection helps human observers and leads to the fastest alarm systems

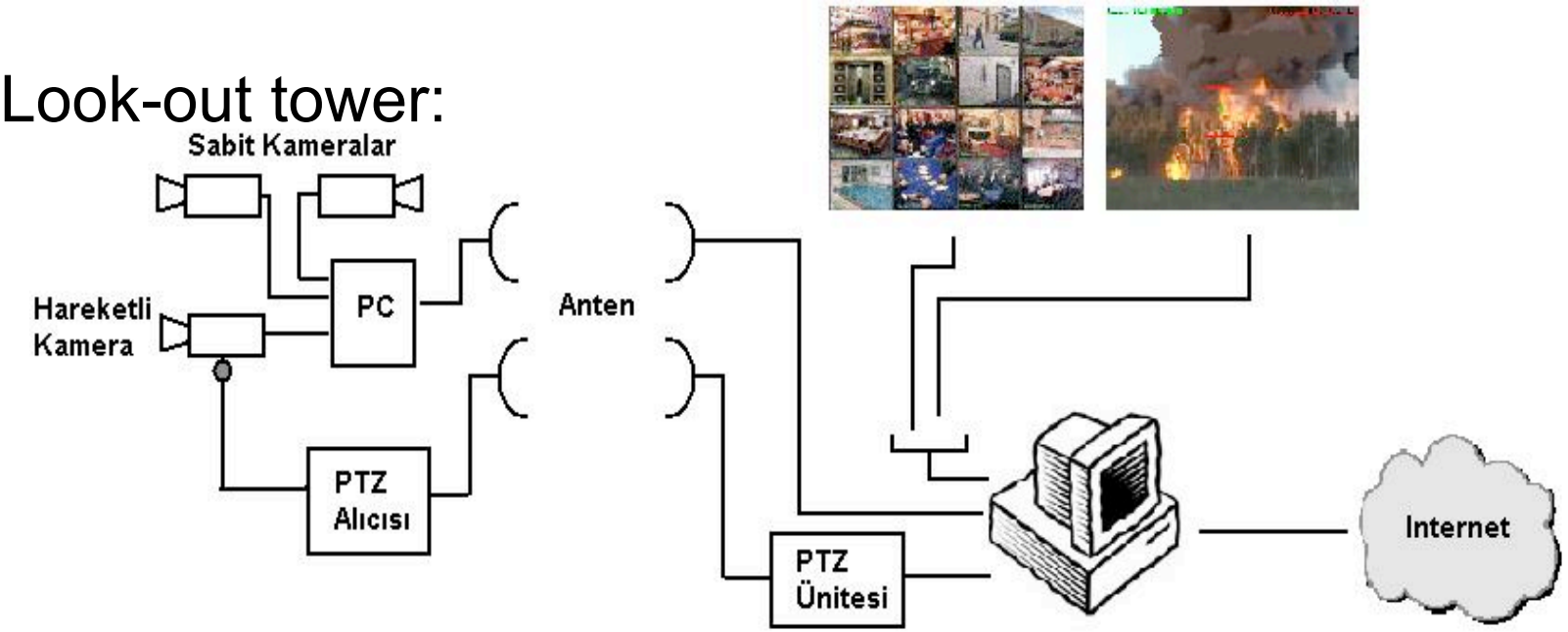


Visual GUI of the current Smoke Detector Software

Current System

- 2-4 cameras in each look-out tower
- Almost real-time detection (less than 20 seconds) if the smoke is in the viewing range of camera

Look-out tower:

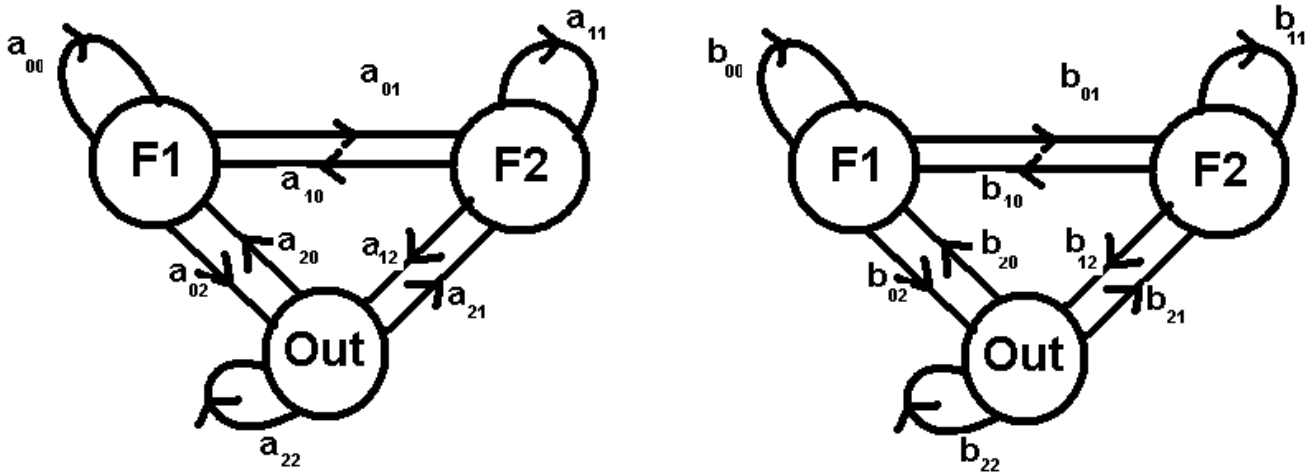


System Features

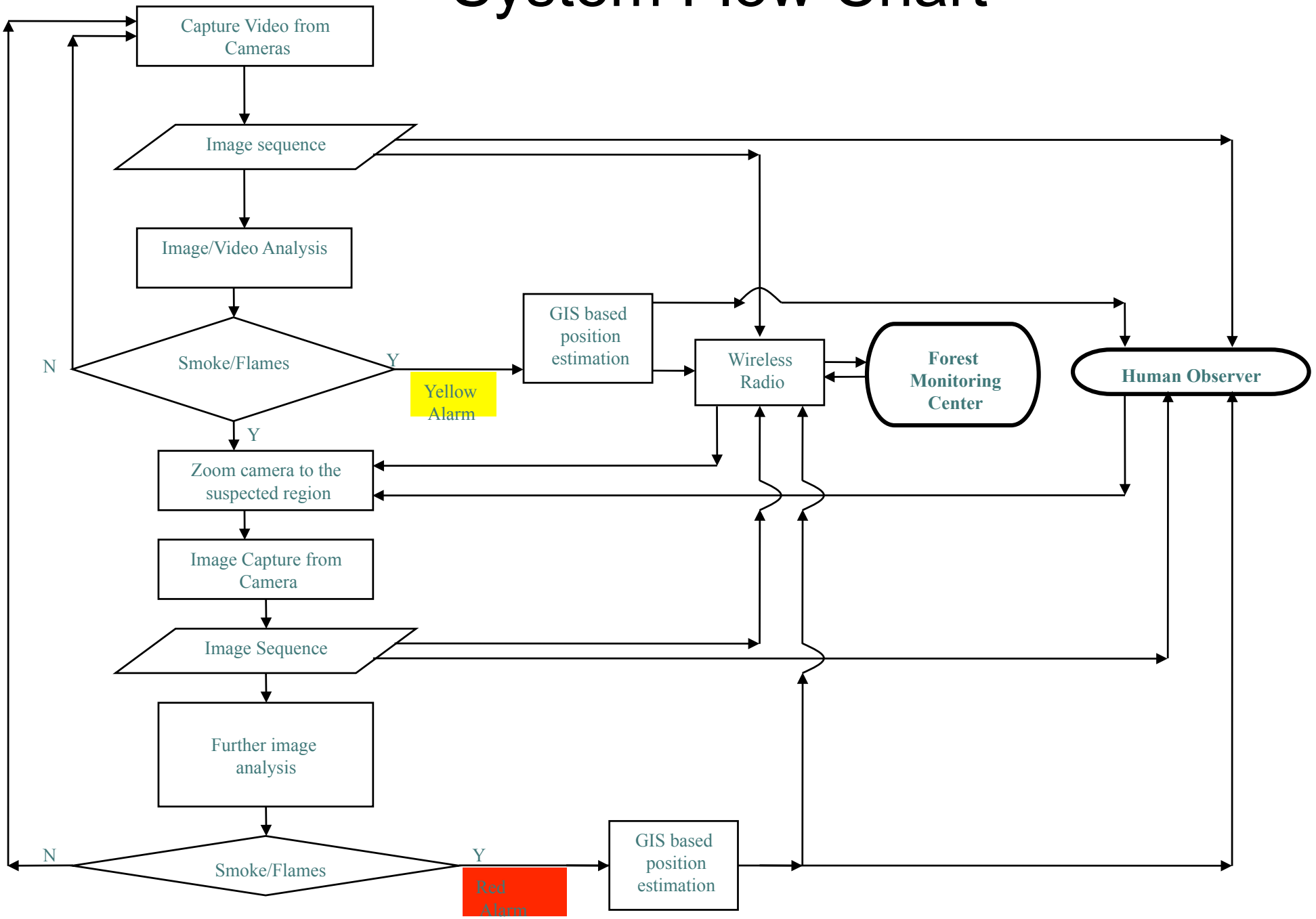
- A single PC can analyse the video captured by eight cameras in real-time and determine if there is smoke or not
- The video smoke detection software can be installed in ordinary CCTV systems
- Low false-alarm rate
- It alerts human operators using both sound and visual signals

Video Smoke Detection Algorithm

- Video processing uses,
  “wave
  let” technology and uses machine vision algorithms
- Software can be
  - used in both fixed and PTZ cameras and
  - based on Hidden Markov Modelling (HMM)



System Flow Chart



Live Demonstrations

- 2008 May:
- http://www.ogm.gov.tr/gyangin.htm
- http://www.youtube.com/watch?v=V-oVINrSU7c
- http://www.youtube.com/watch?v=rgoEB1yW5-A
- http://www.youtube.com/watch?v=0ObhJKEpHu0

Project Outputs

- Portable Video Smoke Detection software
- Manavgat and Marmaris regions are monitored by camera based system
  - Videos captured by cameras are transmitted to Antalya and Mugla head-quarters
  - New cameras will be installed in the summer of 2008