

## Project Results

# SPY

## Intelligent situation awareness

*Situational awareness is critical for law enforcement in complex, highly dynamic environments. Richer media resources can equip national and local authorities, particularly the police and fire brigades, with the kind of trustworthy, reliable information to help them in their day-to-day tasks. The ITEA 2 project SPY (Surveillance imProved sYstem) set out to address this security and safety challenge by creating an automated, intelligent surveillance and rescue framework adapted to the mobile environment.*

### EMBEDDED INTELLIGENT SOLUTIONS

Key to the mobile aspect was the definition of embedded intelligent solutions to minimise the amount of information to be transmitted over the wireless networks, offering discrimination in field services depending on the situation detected – such as stolen objects, behaviour, tracking and identification. This project adapted and extended existing PC-based state-of-the-art algorithms to mobile and unpredictable contexts. The addition of a rules engine and an ontology to these algorithms enabled the creation of a standalone software core able to detect, understand and act during events. SPY also produced a new protocol to ensure integrity, adaptive compression and encapsulation of metadata to provide the trusted and interoperable wireless media needed in such environments as well as a new adaptive interaction solution to present users with a comprehensive and intuitive picture of the incident adapted to their environment.

### COMMON SURVEILLANCE FRAMEWORK

The development of a common surveillance framework adapted to mobile environments must use of advanced video-analysis techniques designed for mobile and unpredictable situations. While context sources were intentionally restricted to video sensors embedded in a vehicle, the SPY framework that was developed allows extension to others kinds of sensors. The use of advanced adaptive-coding, compression, error-resilience and error-concealment techniques improved transmission and saved on bandwidth over wireless networks. Distributed intelligence and decision-making capabilities, including data fusion, analysis and ranking of alarms, were also important developments as was the enhancement of video/image transmission security.

The major innovations included the integration of different technologies to produce a full surveillance system, the event detection algorithms, adaptive video coding that provides optimum bandwidth use and smart mobile cameras. Beyond these innovative features in fields commonly associated with video surveillance, SPY also brings a technique that is a true first in this domain: the watermarking technologies were adapted for mobile surveillance purposes that are so essential to increasing speed and reducing complexity. SPY also made three new contributions to ISO MPEG standards (collaborative BiFS, MPEG user description, compact descriptors for video search) and helped to bridge existing standards (MPEG and W3C-HTML5). With four journal papers published and two others submitted, more than 25 conference papers and participation in over 25 professional trade fairs and exhibitions (including Milipol and the India-France Technology Summit 2013), the project outcomes were widely disseminated.

### REAL END-USER INVOLVEMENT

A central feature of SPY was the involvement of real end-users to demonstrate this mobile wireless surveillance solution in a real user urban environment. French and Turkish police and cities tested an integrated smart-camera – software prototype, embedded on a vehicle (e.g. a police car) and featuring:

- advanced video analysis, such as, object

## SPY

### (ITEA 2 ~ 09025)

#### Partners

ARC Informatique S.A.  
Aselsan  
C2Tech  
Cassidian  
CogVis  
ENSTA ParisTech  
Eolane  
Institut d'Electronique Fondamentale  
Institut Mines-Télécom SudParis  
Kilosoft  
PPSL Pôle Pilote de Sécurité Locale  
Roger-GPS Oy  
VTT Technical Research Centre of Finland

#### Countries involved

Austria  
Finland  
France  
Turkey

#### Project start

July 2010

#### Project end

December 2013

#### Contact

*Project Leader :*

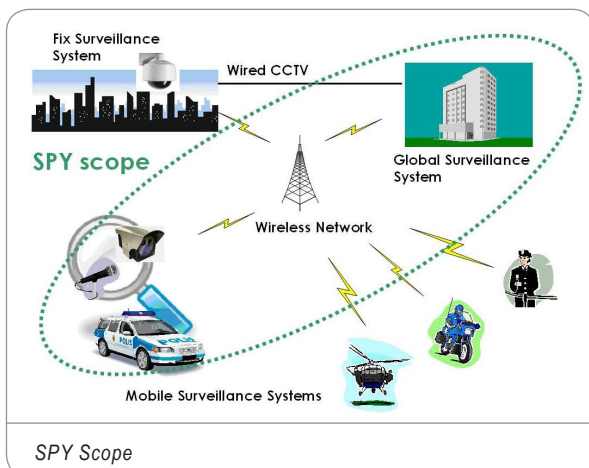
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## Project Results

recognition, movement recognition and understanding;

- new certification techniques that enable surveillance information to be used for evidence;
- advanced adaptive video-coding, error-resilience, error-concealment and transport techniques for bandwidth;
- versatile and virtually error-free video stream transfer to the control room, using either non real-time video streaming or a reliable transmission method such as file transfer;
- video transmission optimisation over WiMAX, long-term evolution (LTE) and other wireless IP networks;
- the incorporation in the vehicle of abnormal-situation detection in mobile and unpredictable contexts such as aggression, fire and crowd formation, something that can also be used to trigger alarms or live streaming to save network bandwidth when nothing important is happening;
- remote pan/tilt/zoom control for mobile cameras and to trigger and program specific behaviour or events – enabling users in the vehicle or control room to have full access to all camera data; and
- provision of a relevant operational picture to users by offering an adapted

man-machine interface in the mobile environment with rich and intuitive display at control-room level thanks to a smart integration with the SCADA system.

### SECURE AND SAFE ENVIRONMENT

The results of the project are already evident in the creation of one Austrian spin-off company to exploit the results and the application by consortium member Aselsan of three international and one national patent applications. Moreover, a spin-off partially exploiting the SPY results is currently under creation in the Institut Mines-Telecom ecosystem. An exploitation plan was presented for the key industrial partners and two of these, Cassidian and Aselsan, are already in discussion with potential customers. The concepts developed within the project could also apply to other markets such as traffic management and industrial safety management.

This project reveals how European industry is not only a pioneer as an 'inventor' of innovative solutions but is also, as demonstrated in the real-life tests, seizing the high ground in valorising the results. The benefits from such advances will be felt in terms of industry and employment as well as in a wider societal context with a more secure and safe environment for citizens.

## Major project outcomes

### DISSEMINATION

- 5 journal papers (Signal Processing: Image Communication, Journal of Real-time Image Processing, Multimedia Systems Journal)
- More than 25 conference publications (IEEE International Conference on Image Processing, the IST&SPIE Electronic Imaging)
- 25 presentations at conferences/fairs (Milipol 2013, Indian-France technology summit 2013)

### EXPLOITATION (SO FAR)

- 3 new products:
  - 2 smart cameras: SONEC and EOLCAM
  - 400MHz Broadband secured wireless modem
- 3 new services:
  - Semi-fragile watermarking solution
  - Video abnormal event detection algorithms (object detection, tracking and re-identification), one open source published: Video Extruder on GitHub
  - Feedback-based adaptive video encoder
- 1 new system: Fully integrated mobile video solution

### STANDARDISATION

- 3 contributions to ISO MPEG standards (collaborative BiFS, MPEG user description, compact descriptors for video search)
- Bridging existing standards (MPEG and W3C)

### PATENTS

- 4 patent applications filed

### SPIN-OFFS

- 2 spin-offs: Forlan GmBh (security for IP video) and uStart France (MGPEG/HTML5)

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■ ITEA 2 – Information Technology for European Advancement – is Europe's premier co-operative R&D programme driving pre-competitive research on embedded and distributed software-intensive systems and services. As a EUREKA strategic Cluster, we support co-ordinated national funding submissions and provide the link between those who provide finance, technology and software engineering. Our aim is to mobilise a total of 20,000 person-years over the full eight-year period of our programme from 2006 to 2013.

■ ITEA 2-labelled projects are industry-driven initiatives building vital middleware and preparing standards to lay the foundations for the next generation of products, systems, appliances and services. Our programme results in real product innovation that boosts European competitiveness in a wide range of industries. Specifically, we play a key role in crucial application domains where software dominates, such as aerospace, automotive, consumer electronics, healthcare/medical systems and telecommunications.

■ ITEA 2 projects involve complementary R&D from at least two companies in two countries. We issue annual Calls for Projects, evaluate projects and help bring research partners together. Our projects are open to partners from large industrial companies and small and medium-sized enterprises (SMEs) as well as public research institutes and universities.



**SPY**

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