

## Progress Report 1: 1<sup>st</sup> January 2009 – 31<sup>st</sup> October 2009



The Surveillance of Unattended Baggage and the Identification and Tracking of the Owner, (SUBITO), project is a research & development project funded by the European Commission Framework 7 programme. It is classified as an European Union capability project and has been designed to research and further develop novel

technology for automated, real-time detection of unattended baggage and the fast identification of the individual responsible (the 'Owner'), their subsequent path and current location. The project is guided by end-user driven requirements to ensure that security personnel receive the technologies they need in order to deliver improved threat security.

The project will culminate in a demonstration at an end user site, of semi-automated, human-in-the-loop data processing operating with existing closed circuit television technology and demonstrating:

- Fast detection of baggage that has been abandoned,
- Fast identification of the individual who left the baggage, and
- Fast determination of their location or path they followed.

The key project objectives for SUBITO are:

- To understand the threat scenarios involving unattended goods from a user perspective, identify alarm and non-alarm conditions related to these and the decision logic applied by human operators in taking proactive or reactive actions.
- To determine the key measures of performance which a fielded system should attain and produce test plans which demonstrate the function and performance expected of the SUBITO system in real applications.
- To undertake a Privacy Impact Assessment process as part of the system design, including consideration of general theoretical and practical aspects of the social, legal and ethical issues of surveillance.
- To analyse the benefits to system function and performance to be gained by the use of improved camera technology, additional sensors or distributed processing schemes.
- To support the operator with a set of tools to detect abandoned baggage, identify and track the person who left the baggage and provide corresponding warnings or alarms.
- To develop algorithms that provide the capability to robustly detect, segment, track and classify moving objects within the monitored scene.
- To develop threat analysis algorithms for classifying potentially critical situations, given positional and classification data about the objects and people within the sensed environment.
- To demonstrate an integrated system operating against realistic scenarios in a typical end user facility.

**CLASSIFICATION:**

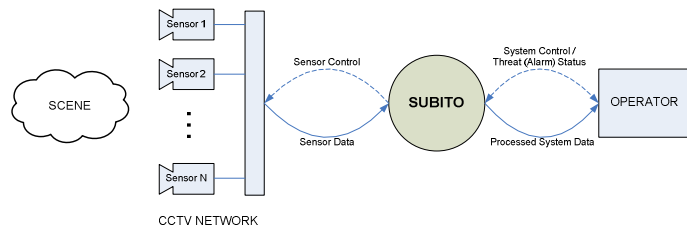
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The key requirements for the SUBITO system were derived from a series of discussions held with end-users, and from recommendations resulting from previous work in this area. Through these discussions a view on the decision logic applied by system operators to the problem of unattended baggage has been generated. The resulting Systems Requirement Document was delivered on schedule.

Building on the defined requirements, the system architecture design is proceeding with a preliminary outline of the main system components and primary interfaces. In addition a Privacy Impact Assessment form has been generated such that privacy issues, either legal or ethical, resulting from the design process are identified and can be addressed. Background work has been conducted on the current state of public opinion/regulation of closed circuit television systems. Work is ongoing on the data protection requirements for a potential demo site.



An analysis of the system requirements has been performed to develop a test methodology that will allow system function and performance to be tested and demonstrated in a cost effective manner. Testing will incorporate a range of scenarios designed to display realistic interaction and behaviour in a systematic and controllable way. A baseline test and demonstration plan has been delivered on schedule.



Work has started on developing algorithms with the capability to robustly detect and segment all moving objects within the monitored scene. Several detection schemes are being studied, using techniques such as facial detection, carried object detection, dual-background static object detection and detection using pan-zoom-tilt camera ‘tours’ to improve detection robustness.

The robustness of object tracking and classification is also being addressed. A motion based tracker is being implemented to track detected objects, while comprehensive track management will be provided

by a multiple hypothesis tracker. Robust classification of objects will be provided by algorithms designed to discriminate people and objects and to perform facial recognition.

To analyse the data produced by the detection, tracking and classification algorithms, an initial ontology has been defined for the spatial and temporal relationships between objects and places, allowing the algorithms to classify potentially critical situations.

Work is also being performed to enhance the threat assessment performance by inferring intentionality of moving persons in the monitored scene. For complex situations where individuals or crowds create dynamic obstacles and prevent pre-computation of likely paths, SUBITO is developing agent based pedestrian simulations to generate real-time predictions of likely paths for the tracked individual and aid the threat assessment.

The threat assessment itself will be produced by a rule-based system that is currently being implemented.

A user interface is being developed for the system that will enable the operator to view live video feeds, display analysis data provided by the SUBITO system, display video annotations and replay recorded video streams along with relevant annotations or analysis data.



A series of supporting studies is underway to investigate the potential performance benefits to be gained through the use of enhanced closed circuit television, other sensors (such as acoustic, chemical etc.) and distributed processing in the system. A study of the potential legal and ethical issues is also being performed. The results from these studies may be used to refine the system specification as system design progresses in order to enable demonstration of beneficial technologies.

Initial collection of demonstration requirements has commenced. Completion of the first phase of the hardware integration has been achieved with the installation and test of the network, cameras and recording equipment.

The output from the SUBITO project is expected to significantly improve the capability beyond the state of the art, robustly detecting an unattended bag and identifying and tracking its owner. This will offer security improvements that can be adopted by industry, integrating new surveillance software into existing and future closed circuit television, thereby benefiting the security of all European citizens.

SUBITO is also expected to generate technologies in the areas of closed circuit television image segmentation and analysis, facial recognition across multiple cameras, behavioural analysis and people tracking in crowded scenes. While primarily addressing civil security and surveillance, this work has a wider reaching application into world wide counter-terrorism and the military.

The emphasis of SUBITO is to develop and demonstrate the incremental improvements that can be achieved by adding layers of increasing sophistication to already existing technology and infrastructure, This approach recognises that a high level of investment in new technologies has been made in this area and yet the systems still fall considerably short of meeting the end users requirements. The output from the SUBITO project are designed to produce a robust yet scalable solution that can be built around an end users previous investment offering improved security at reduced cost.

For further information see the project website: [www.subito-project.eu](http://www.subito-project.eu), or contact the project coordinator:

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