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Airport detection and Tracking
Of dangerous Materials



Airport detection and Tracking Of dangerous Materials by passive and active sensors arrays (ATOM)



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Background/State of the art

Events such as 11 September 2001 or the hijacking of Air France flight 8969 (1994) and many others brought in the latest years to front the problem of air transport security. This has always been a priority for the EU aviation industry, since airports represent a natural target for terrorist acts. Nevertheless, the airport security measures haven't always been effective and we count many past tragedies which were the result of people being permitted to carry inside the airports explosive materials or weapons. Today, travellers are only quickly screened by walk-through metal detectors for entering the sterile area, while X-ray machines are used for screening carry-on and checked baggage.

The overall objective of ATOM project is to design and develop an innovative detection and surveillance system able to enhance the security level in the airport areas, by detecting hidden hazardous materials/tools and tracking people bringing these materials, without interfering with the normal airport operations; while directly enhancing the airport security, ATOM system will also indirectly contribute to protect aircraft (A/C) from terrorist or other criminal acts.

Objectives

The objective of ATOM project is to study, design and develop the functional prototype of an innovative multi-sensor based system integrating active and passive radar sensors, improving the security level also in the Terminal area of the airport. ATOM system will be a non-intrusive but pervasive security system. It won't require ad-hoc check points for passengers implying two important consequences:

1. ATOM system will not interfere with normal passengers flow;
 2. it will make more difficult for ill-intentioned people to identify where sensors are placed and to cheat controls.
- The pervasiveness of ATOM systems derives from the capability of ATOM sub-systems of monitoring wide airport areas and of detecting many kinds of hidden hazardous objects.

The technical approach to be followed foresees two separate and integrated controls: one at the Terminal accesses equipped with innovative active devices, able to detect and identify dangerous concealed tools; the other in the airport halls before the gate area equipped with new passive RF sensors able to track suspicious people/containers. The integrated controls information will be managed in a secure way within the airport information networks allowing security operators to face threats in the most suitable way, minimizing the risk for other people inside the Terminal area.

System Architecture & Features

The development of the advanced surveillance system will integrate innovative detection system and innovative tracking systems, as well as an innovative data management and distribution unit. A description of the innovative modules of ATOM system is detailed in the following.

- Imaging sensor at mm-wave frequency range module: an active distributed RF sensor system able to detect and track suspicious people concealing dangerous tools will be developed. It will consist of several active radar nodes in order to increase the accuracy and performance of the system. The processing techniques, including advanced tracking algorithms, will be designed and simulated in a realistic environment to support the performance analysis.
- Imaging sensor at W and/or terahertz frequency module: the objective is to detect, by multiple miniature radar sensors with subsequent SAR image generation, dangerous objects such as metallic weapons hidden under clothes, to localize and to identify them. The localization and identification are to be done by reconstruction of 3-D shape of a dangerous object in vicinity of human body.
- Passive Tracking System module: the development of a new passive radar sensor for the surveillance of the indoor public airport area, based on the best available electromagnetic source will be analyzed; besides, aiming at allowing the detection and localization of designated human beings, suitable signal processing techniques will be designed and implemented and a multiple networked system approach will be evaluated.
- Data management and Data distribution module: development of an opportune tracking filter exploiting data from different sensor's array in order to improve the accuracy of the dangerous toll localization. Data from the different sensors will convey in a unique data management block that will provide an opportune data fusion. Furthermore ad hoc networking techniques aiming at facilitating efficient communication and routing of information between the elements of the system installed in the terminal area will be examined.

Results

ATOM system, by developing an innovative and non-intrusive surveillance system, will enhance the security level in the gate areas and in the Terminal areas of airports.

A list of the main impacts to which ATOM project is likely to contribute will follow.

- Preventing hostile action of any kind to incur injury, loss, damage or disruption to travellers or citizens due to the effects of aircraft misuse.
- Ensuring enhanced security in air transport.
- Eliminating hazards of hostile actions in the air transport system.
- Focusing on the security aspects of airport operations by complementarity of the ATOM system to other security systems already in-use in airports.
- Application of a wide range of concepts, innovative solutions and technologies able to improve security aspects in airports.
- Securing and further developing the competitiveness attained by the European industries in the global market.
- Guarantee the security of European citizens by preventing acts of unlawful interference.

PROJECT DETAILS

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