AVITRACK

Aircraft Surroundings, Categorised Vehicles & Individuals Tracking for Apron's Activity Model Interpretation & Check

Funding: European (6th RTD Framework Programme)
Duration: Feb 2004 - Feb 2006
Status: Complete with results
Total project cost: €2,600,269
EU contribution: €1,557,163

Call for proposal: FP6-2002-AERO-1
CORDIS RCN: 72797

Background & policy context:
From the arrival to the departure of an aircraft, routing or specific operations have to respect rules. Airport apron operations are listed and scheduled in action plans. Positions and movements around the aircraft are analysed to survey normal activity and to detect special events. Access within sensitive zones of an apron is regulated by a provisional traffic plan of the apron area where, as a fundamental condition, each vehicle should be empowered for a special activity in the area.

AVITRACK addressed the need to increase the efficiency of airport apron operation (thus reducing delays and costs) and also to increase security.

Objectives:
The main objectives of the project were:
- Making air transport more competitive:
  Aircraft are dependent on the availability of airport bays and airport handling efficiency. Delays produce a knock-on effect, which impacts on all airport traffic and, ultimately, economic performance. Part of AVITRACK's mission was to create a new management system that can optimise platform availability and thus reduce aircraft servicing costs.
- Increasing capacity:
  It is now widely recognised within the air transport sector that major increases in operational capacity will only come through changes in the way air traffic services are provided. Helping airlines, handlers and airports to make the best use of available facilities was another goal of AVITRACK. The project has allowed better information sharing between airport service providers and aircraft operators, accelerating the throughput of traffic and optimising the entire range of airport activities.

Methodology:
AVITRACK used State-of-the-Art video systems and intelligent algorithms to track objects and persons, and to interpret normal aircraft servicing operations on the tarmac. The project automatically checked the sequence and timing of movements on airport aprons. An assembly of cameras captured images of the aircraft parking zone, in which individuals, objects and vehicles can be identified. Then a computer programme interpreted the real-time three-dimensional representation of activities and movements.

AVITRACK combined several innovative technologies:

Video tracking:
The assembly of cameras monitor the movements of individuals and vehicles around the aircraft. Image
processing software detects movement in the scene. Detected objects are then classified as individuals, vehicles or mobile objects, all actors around the aircraft are detected and tracked, and vehicles are categorised by functionality (e.g. loader, truck, tanker, etc). Multi-sensor data fusion is then used to create a real-time 3D representation map, which can be interpreted by the computer.

**Apron Activities:**

To achieve automatic recognition of the handling operations, the scene and the activities were modelled. A geometric model of the apron was formed, including the operational function of specific areas (like waiting area, ERA, tanker area, gateway evolution area, GPU area). The aircraft functional model, containing all potential contact points (like refuelling point, passenger doors, cargo doors, etc.) completed the 'apron scenes and actors database'. This static apron representation was then combined with dynamic scenarios. (A scenario is a scheduled arrangement of basic and combined events.) Each event is the result of the semantic description of activities in connection with multiple individuals and vehicles around the aircraft. Using a dedicated ontology, the 'apron activities model' database covered a large part of all the handling operations.

**Understanding Artificial Intelligence (AI):**

Ground handling operation recognition process:

- the video-tracking module captures the activities around the aircraft;
- the 3D generated current situation map (people, aircraft and vehicle location) is combined with the 3D models of the apron area;
- this observed apron situation is compared to the 'apron activities model', using artificial intelligence technologies;
- every operation and movement around the aircraft, from the simple to the more

**Parent Programmes:**

**FP6-AERO-1.4 - Increasing Operational Capacity and Safety of the Air Transport System**

**Institute type:** Public institution

**Institute name:** European Commission

**Funding type:** Public (EU)

**Lead Organisation:**

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Euro Inter Toulouse
Key Results:

The achievements of the project can be summarised as follows:

- operational test site on Toulouse-Blagnac airport; 8 video sensors are installed, on the echo-40 apron, viewing the aircraft;
- handling operations analysis allowed formalising a representation for each turnover activities;
- 3D numeric model of apron area and involved vehicles and aircraft;
- distributed architecture for video streaming, video tracking, event recognition and HCI;
- video tracking software for people and vehicle detection around the aircraft;
- real-time model based vehicle recognition;
- multi-view data fusion for 3D object location;
- artificial intelligent modules for events recognition close to the aircraft, in real time;
- efficient Beta prototype processing, in real time, video tracking, scene understanding and reporting;
- simultaneous video streaming and recording architecture.

The first finality of AVITRACK prototype was the optimisation of the supervision of the stopovers, by an information feedback, in real times, of all the operations in progress on the airport platform. The actors of each airport platform interested by this process of optimisation could be: airline companies, managers of airport, handlings, air traffic as well as the services of safety.

The objectives were:

- for the airline companies: to ensure the punctuality of the departures,
- for the airports: to optimise the exploitation of their capacity;
- for the people receiving benefits in load of the operations: to minimise times of stopover;
- for the air traffic: to ensure the fluidity of the traffic by improving management of the car parks.

Technical Implications

To answer to the increase in air traffic, airports seek to reinforce their capacity of reception. The improvement of the management of the existing means contributes directly to this objective. The interest of the establishment of such system of supervision is as beneficial as the traffic flow is more tended. The platform airports (‘Hub’) will withdraw a strong benefit by exploiting such supervision of the stopover operations (Lyon Saint Exupéry, Zurich, Munich, etc.).

The deployment of system AVITRACK on the airport platforms will also increase safety near planes. AVITRACK brings an additional control of the behaviour of people near the plane, and the detection of the approach of the vehicles and any objects.

The innovations of project AVITRACK interest many other applications. The automatic monitoring principle and recognition of complex events dedicated to the supervision of specific operations meet in many other transport activities (railway, subway, port, etc). The concept of AVITRACK can be declined to recognise the specific scenarios to each context and each metier.

The CO-FRIEND FP7 project is a successor of AVITRACK Project and it includes learning concepts.
STRIA Roadmaps: Network and traffic management systems
Transport mode: Air transport
Transport sectors: Passenger transport, Freight transport, Societal/Economic issues,
Transport policies: Safety/Security
Geo-spatial type: Other