

An application of Artificial Intelligence for the safety in the neighbourhood of airport runways.

Christophe Blaess

Cabinet Conseil Blaess, 10 rue Sainte Genevieve, 94 150 Rungis, France.
(+33) (1)-46-86-01-16.
ccb@club-internet.fr.

Claude Tsiampalidis

Aeroports de Paris, OA.Z.NA, Orly Sud 103, Bat. 651,
94 396 Orly Aerogares Cedex, France.
(+33) (1)-49-75-72-04.

Jean-Charles Vallée

Services Techniques de la Navigation Aeriennne 3RA,
1 ave. du Dr. Grynfogel, ZAC de Basso Cambo, BP 1084,
31035 Toulouse, France

This paper summarizes an experiment running at present at the Roissy-Charles-de-Gaulle and Orly airports (Paris, France). The aim of this project is the improvement of the safety during the approach, landing and takeoff phases, with the help of an expert system.

Some incidents, fortunately without any dramatic consequences, have taken place during the last few years, on several european airports, implying planes on the runway, taking off or landing, and other technical vehicles or other planes. These incidents led the Civil Aviation services of some countries to improve the safety in the neighbourhood of the runways.

The increase of the air traffic makes a total control over the runway and the taxiways, which however need to be perfectly secured, more and more difficult.

A study, begun in 1989, by the *Aeroports de Paris*, conjointly led by the *Services Techniques de la Navigation Aeriennne* set focus on the use of tools

deriving from Artificial Intelligence Science to support the air controllers and to warn them when potentially dangerous situations occur.

The initial goal of this project was to reduce risks of accidental incursions on runway, but it was extended to the detection of collision dangers between mobiles (vehicles or planes) duly authorized to enter these zones.

During the last three years a rule extraction has been done with the help of air controllers at the Roissy-Charles-de-Gaulle, Orly, and Toulouse airports , to draw up a list of potentially dangerous situations.

A first experiment has been done in 1994, based upon a simple version of an expert system built by *Cabinet Conseil Blaess*. This expert system has been compiled, for efficiency of real-time use, and received ideal information about the situation on the site, coming from a sensor simulator, which permits recording and visual displaying of scenarios. The expert system warns the controller of the occurrence of a dangerous situation by an alarm message, or a simple information warning in case of less imminent danger.

This first step allows us to have a rule base, validated on tests sets built by the controllers.

The next phase, now in progress, will give us an expert system working on real data, coming from radar analysis, radio-positionning systems,... Obviously the unavoidable noise from real data will have to be corrected by finer knowledge rules, in order to preserve the lowest possible false alarms ratio, with a sufficient sensitivity for really dangerous situations.

We would like to have really simple editing possibilities of the knowledge base, expressed in a clear language, and efficiency of a compiled expert system, in order to process the large set of informations incoming every second. So we are building a rule compiler, which translates the clearly expressed rules in efficient C procedures, ready to be linked with the kernel of the expert system.

The first experiments on real data are starting at present, and we heavily hope to have some first results, allowing the beginning of a real-world validation between now and September 1996.