Effective Automation in ATM: a new perspective on management and control of automated system

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About the PhD

This PhD thesis is developed in collaboration between the Interactive Critical Systems (ICS) team of the IRIT lab in Toulouse and the Deep Blue s.r.l. consulting & research in Roma and it was funded by HALA! Research Network – EUROCONTROL.

The objectives of this research activity are: to study the human behaviour and its changes in relation to the alterations of the system, to evaluate the descriptive capabilities of existing models and to try to suggest possible solutions for improving the Air Traffic Management (ATM).

The Real Time Simulation (RTS)

The ATM environment

The ATM system integrates many elements that coexist and interact with each other. Each of these elements incorporates some specific instrumentation and provides particular roles for controlling and supervision.

They all concur to achieve the same goal: a safe air traffic management as close as possible to the expected schedule.

To recreate a scenario as similar as possible to the reality it was decided to maintain the necessary structures, roles and connections.

The Arrival Manager (AMAN)

AMAN is a tool to assist the arrival management process in ATM system. It is a ground based planning tool, suggesting to the air traffic controller an optimal arrival sequence of aircraft and proving support in establishing the optimal aircraft approach routes.

AMAN integrates information about capability for a runway, creates and manages a sequence using ad hoc criteria, provides spacing between flights and finally displays outputs (in terms of the sequence list and advisories) on the Human Machine Interface (HMI) to allow controllers to implement the proposed sequence.

Scope of the FEDERATION of MODELS

The figure represents some of the information elements that will have to be captured in the models to assess the impact of degradation in the automation over the entire socio-technical system.

Such representation of information might require dedicated models while information from several elements could be captured with the same notation.

FEDERATING MODELS

This federation considers human in the loop input (or over the loop), dynamic planning algorithms and flexibility to determine the most adequate levels of control of autonomy.

The objective of this method is to guarantee that interaction between models have a common meaning both at conceptual and technical levels.

CONCLUSION

The originality of this approach lays both in its synergistic and comprehensive aspect, which are not currently widely used in designing interactive critical systems. In addition, the experimental plan and the possibility to test the levels of degradation and the consequences that they will have on the operators and their interaction with the system during the simulation, should allow us to produce original results of interest both for the scientific community and the ATM industry.

PUBLICATIONS
