Ph'D Subject:
Safety Evaluation of Aircraft Systems using Virtual Platforms

SAFE-Air 2017-2022 Project
Project funded by the Auvergne Rhône Alpes Region

Key words : *Safety, Fault tolerance, System-level Modelling, Fault injection, Virtual Platform*

Confronted with increasingly stringent requirements for certification in operational safety, companies in the field of transport are looking for new methods to assess the robustness of complex digital integrated systems. In particular, our industrial partners in this project, THALES Valence and AEDvices consulting, are interested in the robustness of flight systems used in aeronautics. Integrated systems, due to the evolution of technologies, are increasingly sensitive to disturbances caused, for example, by atmospheric particles. Beyond aeronautical systems and transport systems in general (automotive, railway, etc.), the results of this project concern all the integrated systems used in critical applications: energy generation systems (nuclear power plant), medical implants...

The aim of the thesis is to propose a new approach to allow a more precise evaluation of the level of robustness of critical complex digital systems very early in development.

Carrying out this evaluation very early in the development will avoid costly late corrections and will significantly improve time-to-market, leading to dramatically increase productivity. It will also make possible to design protections at "fair cost".

The proposed approach will be based on a multi-level analysis method, taking into account both the effect of disturbances on the hardware components and also the propagation of errors throughout the system. The methods and tools developed will make possible to better target the implementation of effective solutions or countermeasures. This approach aims to reduce the gap that exists today between the component level (circuit or integrated system) and the equipment level (overall product).

The approach will use a modeling of the equipment in the form of a so-called "virtual" platform, allowing to create an executable model of the complete system, including the component under development. This high-level modeling of the system (conjointly modeling of software and hardware) will allow to take into account the propagation of errors at the output of the component throughout the system.

The approach will use new system-level fault models generated from component simulations at the RTL level. These system-level fault models will increase the speed of fault simulations and will be more realistic than models generated directly at the system level. For this, the new model of faults at RTL level, recently proposed in the ANR LIESSE project, could be used. This fault model, although used at the RTL level, takes into account the locality properties of the disturbances.

This project is part of the AURA (Auvergne Rhône Alpes) region's "DIGITAL" and "MOBILITY, INTELLIGENT TRANSPORT SYSTEMS" areas of excellence. It is also part of the MINALOGIC competitiveness cluster.

The tools and methods developed in this thesis will be developed with two regional industrial partners: THALES Valence and AEDvices consulting.

The PhD student will be located within the LCIS laboratory in Valence (26). The thesis will be supervised by professors from three laboratories: LCIS, TIMA (Grenoble), and LHC (Saint Etienne).

How to Apply

Applicants must hold a Master (or equivalent) in Computer Science, Embedded System or Microelectronics.

Candidates must send a CV, a letter of motivation, details of the grades for each master courses and the classification in master years, and at least one letter of recommendation to:

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Beginning of the Ph'D thesis : after october 2017