



RESEARCH MASTER INTERNSHIP

Department of Complex Systems Engineering

Location : Toulouse, campus ISAE
: SUPAERO

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INTERNSHIP DESCRIPTION

Domain :

Computer Science **AUTOMATIC PROOF OF A SPARK CODE**

Title : **GENERATOR**

Keywords: proof-carrying code, code generation, SPARK programming language

ONERA, NASA Ames and ISAE-SUPAERO are developing a platform for code generation and validation for Simulink/Stateflow models named [CoCoSim](#). CoCoSim generates Lustre code from Simulink/Stateflow models and we are developing Lustrec, a compiler from [Lustre](#) with several backends, e.g. to low level languages such as C or [SPARK](#) or Horn clauses for formal verification. The overall objective of CoCoSim is to formally prove properties such as contracts or invariants of models or code artifacts. In order to do that, the first step is of course to ensure the correctness of the generated code.

The internship will focus on the SPARK backend of Lustrec compiler. The applicant should complete the following tasks:

1. discover the Lustrec compiler by completing the SPARK backend. For instance arrays are available in Lustre and are currently lacking in the SPARK backend. The C backend should serve as a guide for this implementation.
2. automatically generate assertions in the SPARK code to enable code correctness verification by external tools. These assertions should represent the exact behavioral semantics of the Lustre code. Assertions in SPARK code should be proven by the GNATProve tool or may require the use of the [Why3](#) language and platform.
3. verify the assertions generator on various use cases provided by ONERA and NASA.

Application: please send us by email a curriculum vitae.

Application deadline

Location: ISAE 1, Campus SUPAERO (Toulouse, France) ;Duration: 4-6 months

30 % Theoretical
Research

70 % Applied Research

0 % Experimental Research

Possibility to go on a Ph.D.:

Yes

No

APPLICANT PROFILE

Knowledge and required level:

Good knowledge in Computer Science, formal methods and compilers. Experience in Ocaml programming will be appreciated.

Applications should be sent by e-mail to the supervisor.