

RESEARCH MASTER INTERNSHIP

Department of Complex Systems Engineering

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INTERNSHIP DESCRIPTION

Domain :

Title :

EMBEDDED SYSTEMS Determinism Enhancement in Embedded Systems for Aeronautics and Space applications

Objective: This internship focuses on advancing the computational capabilities of embedded systems in the aeronautics and space sectors. With the increasing complexity of tasks such as recognition, control, and piloting, there is a pressing need for high-performance computing solutions that can handle a variety of demanding applications.

Challenge: The adoption of multi- and many-core processors, capable of parallel computation, offers a solution to these increased demands. However, their use introduces challenges like non-determinism due to interference among computing units, a critical issue for applications requiring high reliability and predictability.

Scope of Work:

- **Processor Exploration**: Investigate the Xilinx multi-core zcu102 processor, a key component in Metavonics' advanced avionics solutions. The focus will be on evaluating its performance under various operating conditions, particularly analyzing the impact of core interferences.
- **Interference Analysis and Mitigation**: Examine the interaction between the A53 and FPGA cores and the resulting interference effects. Utilize the CCI 400 bus's features to mitigate these interferences, aiming to optimize the Quality of Service (QoS) for diverse applications.
- **Practical Application**: Gain hands-on experience with the processor's architecture and programming tools, building upon existing research and methodologies developed at ONERA.

Collaboration and Location: The internship is a joint effort among ISAE-SUPAERO, ONERA, and Metavonics, with the primary activities taking place at ONERA facilities. At least one other intern will be part of the team, focusing on a project that complements yours. This will provide a collaborative environment where you can share ideas, learn from one another, and contribute to a significant project

Technical Details:

- **Processor Specifications**: The work will focus on the Xilinx zcu102 processor, which includes A53 and R5 cores and an FPGA, interconnected via a CCI 400 bus.
- **FPGA Functionality**: Metavonics will supply the FPGA bitstream, enabling crucial Ethernet exchanges between the processor and external environments. The CPU-FPGA interactions are based on a proprietary protocol, with a particular interest in analyzing the QoS in the context of the A53 cores and FPGA integration.

Expected Outcome:				
 Develop a comprehensive understanding of handling high-performance computing demands in embedded systems for aeronautics and space applications. Contribute to enhancing the reliability and efficiency of these systems in various complex applications. 				
Application: please send us by emai	l a curricul	um vitae.		
Application deadline: February 15th, 2023				
0 % Theoretical Research	20 %	Applied Research	80 %	Experimental Research
Possibility to go on a Ph.D.:	<u> </u>	o Yes	X No	
APPLICANT PROFILE				
 A background in Ember A keen interest in explored technology 	dded Sys oring adva	tems and Computer E anced computing solu	ngineering tions in aeroi	nautics and space

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