# Quentin **Brateau**

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**Tampere University**

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Kalevantie 4, 33100 Tampere

**Ph.D. Letter of Intent : Safe and resilient control of autonomous vessels in dynamic environments**

Dear Madam/Sir,

I am Quentin Brateau, a French engineer in robotics. I was graduated in 2021 ENSTA Bretagne, in Brest, a prominent French graduate, post-graduate school, Research Institute, and doctoral college, which trains engineers in various fields of engineering such as Robotics, which is my specialty. I also was graduated the same year with a master of science in dynamical systems and signals from the University of Angers in France.

My academic training has a strong emphasis on Science because I have completed a two-year intensive post-secondary school preparation for the competitive entrance examination for the French Graduate Engineering Schools. During my internships, I had the opportunity to discover various fields of mobile robotics such as agriculture robotics with Tecnoma, vineyard robotics with Exxact Robotics, and underwater robotics with Forssea Robotics. I am then very familiar with the industrial application of robotics.

During my studies, I learned the basics of robotics such as robot mechanical conception, hardware design, simulation, and low-level control. I was also able to build a solid foundation in information technology through courses on applied mathematics, image and signal processing, machine learning, embedded operating systems. Additionally, I was able to reinforce my knowledge in robotics by learning control theory, probabilistic and set methods for state estimation, navigation, and path planning.

Thanks for your time and consideration. I genuinely believe that my experience and education would make me a valuable asset to the mechatronics research group. I believe my skills and motivation make me a great potential asset. I can be reached by phone and email if you need any further information.

## Introduction

## Problem Statement

This thesis will allow to remove scientific locks in the fields of control and command of systems in a safe and guaranteed way.

- How the guarantee provided by interval analysis can help us to realize a safe command-control loop?
- How to ensure collision-free control of a system in a dynamic environment?
- How can we ensure the security and resilient control of a system that operates in degraded mode?

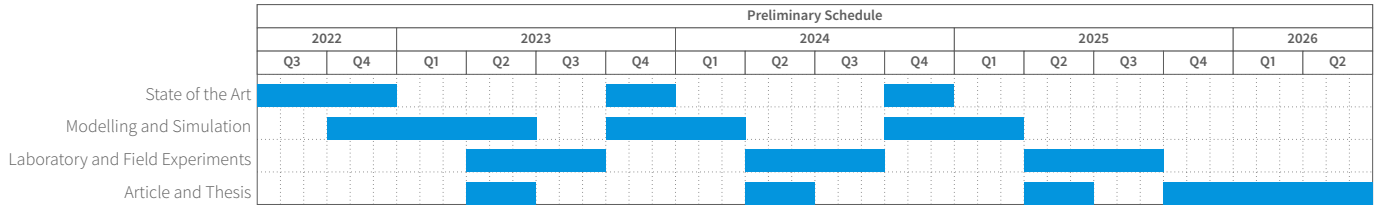
## Research Methods

## Preliminary Schedule

After a state of the art review in the field of guaranteed and resilient control of systems, as well as in the classical control of vessels, I will alternate between phases of modeling and simulation and phases of real tests to validate the theoretical tools implemented. The results of this theoretical work on the control of systems and their application to the control of vessels through trial results will be subject to publications.

As requested by the Ph.D. offer, at least four publications will be scheduled. The guaranteed control algorithms as well as those in degraded situations could be published in an international journal such as Oceanic Engineering or IEEE Transaction on Robotics. Two international conferences in robotics are also targeted ICRA and IROS for example.

Finally, the last year will be mainly devoted to the compilation of the results, the formalization of the implemented tools and the writing of my thesis as well as the preparation of my thesis defense.




## Conclusion

Veuillez agréer, Messieurs, l'assurance de ma considération distinguée,

**Quentin Brateau**