

UNIVERSITAT POLITÈCNICA DE CATALUNYA

A scalable distributed autonomy system for fractionated satellite missions

*A Degree Thesis Submitted to the Faculty of the **Escola Tècnica
d'Enginyeria de Telecomunicació de Barcelona** by*

Santiago RODRIGO MUÑOZ

*in partial fulfilment of the requirements
for the*

**Degree in Science and Telecommunication
Technologies Engineering**

Advisor:

Dr. Eduard ALARCÓN COT

January 12, 2016

For/Dedicated to/To my...

Acknowledgements

The acknowledgments and the people to thank go here, don't forget to include your project advisor...

UNIVERSITAT POLITÈCNICA DE CATALUNYA

Abstract

Escola Tècnica d'Enginyeria de Telecomunicació de Barcelona

Degree in Science and Telecommunication Technologies Engineering

**A scalable distributed autonomy system for fractionated satellite
missions**

by Santiago RODRIGO MUÑOZ

The Thesis Abstract is written here (and usually kept to just this page).
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above the title too...

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Chapter 1

Introduction

1.1 Scheduling tasks: a hard optimization problem

Welcome to this L^AT_EX Thesis Template, a beautiful and easy to use template for writing a thesis using the L^AT_EX typesetting system.

If you are writing a thesis (or will be in the future) and its subject is technical or mathematical (though it doesn't have to be), then creating it in L^AT_EX is highly recommended as a way to make sure you can just get down to the essential writing without having to worry over formatting or wasting time arguing with your word processor.

L^AT_EX is easily able to professionally typeset documents that run to hundreds or thousands of pages long. With simple mark-up commands, it automatically sets out the table of contents, margins, page headers and footers and keeps the formatting consistent and beautiful. One of its main strengths is the way it can easily typeset mathematics, even *heavy* mathematics. Even if those equations are the most horribly twisted and most difficult mathematical problems that can only be solved on a super-computer, you can at least count on L^AT_EX to make them look stunning.

1.2 The Android Beyond the Stratosphere Project

L^AT_EX is not a WYSIWYG (What You See is What You Get) program, unlike word processors such as Microsoft Word or Apple's Pages. Instead, a document written for L^AT_EX is actually a simple, plain text file that contains *no formatting*. You tell L^AT_EX how you want the formatting in the finished document by writing in simple commands amongst the text, for example, if I want to use *italic text for emphasis*, I write the `\emph{text}` command and put the text I want in italics in between the curly braces. This means that L^AT_EX is a "mark-up" language, very much like HTML.

1.3 Distributed systems

If you are familiar with L^AT_EX, then you should explore the directory structure of the template and then proceed to place your own information into the *THESIS INFORMATION* block of the `main.tex` file. You can then modify the rest of this file to your unique specifications based on your degree/university. Section ?? on page ?? will help you do this. Make sure you also read section ?? about thesis conventions to get the most out of this template.

If you are new to \LaTeX it is recommended that you carry on reading through the rest of the information in this document.

Before you begin using this template you should ensure that its style complies with the thesis style guidelines imposed by your institution. In most cases this template style and layout will be suitable. If it is not, it may only require a small change to bring the template in line with your institution's recommendations. These modifications will need to be done on the `MastersDoctoralThesis.cls` file.

1.3.1 Distributed algorithms

The \LaTeX distribution is available for many systems including Windows, Linux and Mac OS X. The package for OS X is called MacTeX and it contains all the applications you need – bundled together and pre-customized – for a fully working \LaTeX environment and work flow.

MacTeX includes a custom dedicated \LaTeX editor called TeXShop for writing your '`.tex`' files and BibDesk: a program to manage your references and create your bibliography section just as easily as managing songs and creating playlists in iTunes.

1.4 The Local-Global proposal

1.4.1 Previous work

This template comes as a single zip file that expands out to several files and folders. The folder names are mostly self-explanatory:

Appendices – this is the folder where you put the appendices. Each appendix should go into its own separate `.tex` file. An example and template are included in the directory.

Chapters – this is the folder where you put the thesis chapters. A thesis usually has about six chapters, though there is no hard rule on this. Each chapter should go in its own separate `.tex` file and they can be split as:

- Chapter 1: Introduction to the thesis topic
- Chapter 2: Background information and theory
- Chapter 3: (Laboratory) experimental setup
- Chapter 4: Details of experiment 1
- Chapter 5: Details of experiment 2
- Chapter 6: Discussion of the experimental results
- Chapter 7: Conclusion and future directions

This chapter layout is specialised for the experimental sciences.

Figures – this folder contains all figures for the thesis. These are the final images that will go into the thesis document.

Chapter 2

State of the art

2.1 Consensus: the key for a non-centralized distributed system

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2.2 Comparison: algorithms chosen to test the Local-Global

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2.2.1 A market-based approach

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2.2.2 [A pure consensus algorithm]

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Chapter 3

Project development

3.1 Local-Global implementation

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3.1.1 Reusing a ProLog local scheduler

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3.1.2 Optimizing the optimization: the Global algorithm

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3.2 The price-based adaptive Task Allocator

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3.2.1 Erlang: programming for distributed systems

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3.2.2 Modifications over the original proposal

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3.3 [Implementing a simple Ring consensus algorithm]

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Chapter 4

Results

4.1 Performance Tests

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4.1.1 Local-Global

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4.1.2 Price-based

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4.1.3 [Ring]

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4.1.4 The comparison

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4.2 Solutions quality: fine-grained descriptive tests

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4.3 Conclusions and future development

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Appendix A

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