Navigation and Control of an Unmanned Surface Vessel

Mechatronics Project 488

Final Report

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2022

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Abstract

Note that in Mechanical Project and in Mechatronic Project, this abstract is replaced by the prescribed executive summary table.

Acknowledgements

D

Table of contents

**Page**

[Plagiarism declaration i](#_Toc70342948)

[Abstract ii](#_Toc70342949)

[Acknowledgements iii](#_Toc70342950)

[List of figures v](#_Toc70342951)

[List of tables vi](#_Toc70342952)

[List of symbols vii](#_Toc70342953)

[1 Introduction 1](#_Toc70342954)

[1.1 Background 1](#_Toc70342955)

[1.2 Objectives 1](#_Toc70342956)

[1.3 Motivation 1](#_Toc70342957)

[2 Literature review 2](#_Toc70342958)

[2.1 Boats and ships 2](#_Toc70342959)

[3 Content chapter 3](#_Toc70342960)

[3.1 Heading level 2 3](#_Toc70342961)

[3.1.1 Heading level 3 3](#_Toc70342962)

[4 Conclusions 6](#_Toc70342963)

[5 References 7](#_Toc70342964)

[Appendix A Heading for this appendix 8](#_Toc70342965)

[Appendix B BlaBlaBla 9](#_Toc70342966)

List of figures

**Page**

[Figure 1: Water plants 3](#_Toc403660384)

List of tables

**Page**

[Table 1: Acceptable page layouts 2](#_Toc403660385)

List of symbols

*A* Wing area

*c* Chord length

** Angle of attack

# Introduction

## Background

Starting from the big picture, gradually narrow focus down to this project and where this report fits in.

## Objectives

The objectives of the project (in some cases the objectives of the report). If necessary describe limitations to the scope.

## Motivation

Why this specific project/report is worthwhile.

# Literature review

## GPS

### History of GPS

### Modern GPS

## Digital Compass

## Localization Method

### Kalman Filter

The Kalman Filter is an estimation algorithm that is popularly used in navigation systems, target tracking and terrain navigation and is often considered the most widely used prediction algorithm. The Kalman Filter can be considered a mostly simple algorithm and therefore it does not have a large computational cost associated with it (Norsuzila Ya’acob et al., 1989). The Kalman filter is named after Hungarian-born Professor and engineer, Rudolf E. Kálmán, who first published his paper describing the recursive algorithm in 1960. The problem that Kálmán set out to solve was to linearly filter discrete data. In real world situations there is often an uncertainty when trying to measure data from the situation, measurement noise. Furthermore, the situations rarely match exactly that of the dynamic model that has been created. This is due to most dynamic models making simplifying assumptions. This error between model and reality is called process noise. Due to these noises in either combination or individually, the estimations that any algorithm could calculate would be incorrect. The Kalman Filter takes this measurement noise and process noise into consideration when producing its estimates (Becker, 2022).

# Content chapter

Unless the chapter heading already makes it clear, an introductory paragraph that explains how this chapter contributes to the objectives of the report/project

## Heading level 2

### Heading level 3

#### Deepest heading, only if you cannot do without it

"Text 1" is for normal paragraphs. A blank line is automatically created before each paragraph.

1. "Text 1 Items" for a list that is not automatically numbered.

2. List that is not automatically numbered.

3. List that is not automatically numbered.

"Text 2" is for a paragraph that fits under "Text 1 items".

Waffle waffle

* "Text 1 bullet" for a bulleted list;
* Bullet list item 2;
* "Text 2 bullet" for sub-points
* "Text 2 bullet" for sub-points
* Bullet list item 3.

"Text 2" also fits under "Text 1 bullet".

Table 1: Acceptable page layouts (manually set "keep with next" in paragraph style for tables)

|  |  |  |
| --- | --- | --- |
| Paper | Margins | |
|  | Left/Right [mm] | Top/Bottom [mm] |
| A4 |  |  |
| A5 |  |  |

An equation must read like part of the text. Some or other strange parameter is given by the following expression (note the full stop after the equation to indicate the end of the sentence):

. (1)

In other cases the equation is in the middle of the sentence. Then the paragraph following the equation should start with a small letter. Another strange parameter is given by

, (2)

where *y* represents a physical property.

Symbols that represent values of properties should be printed in italics, but SI units and names of functions (e.g. sin, cos and tan) must not be printed in italics. There must be a hard space between a number and its unit, e.g. 120 km. This type of space can be created using "Crtl-Shift-Spacebar".

Create sketches and diagrams in PowerPoint or Visio. Then copy the figure and select "Paste special" to insert it as "Picture (enhanced metafile)". The paragraph containing the figure should use the "Figure" style. If you type "Enter" in the "Figure" style, the next style is automatically "Caption".



Figure 1: Water plants

# Conclusions

H

# References

Pompies, P, 1652, *My experiences on the Drommedaris*, 1st ed, Van Riebeeck Publishers, Cape Town.

Heading for this appendix

Bla bla

Note that for appendix headings use styles "Heading 7" and "Heading 8".

Note that all headings must have a title, just as a chapter has a heading

BlaBlaBla

SDCc

Dasqw