

TITLE OF BACHELOR THESIS, ENGLISH, CAPITAL LETTER AND *ALIGN LEFT*

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LIST OF ABBREVIATIONS

|  |  |  |
| --- | --- | --- |
| AHP | : | Analytical Hierarchy Process |
| AIS | : | Automatic Identification System |
| AUV | : | Autonomous Underwater Vehicles |
| CFD | : | Computational Fluid Dynamic |
| HSV | : | High Speed Vessel |
|  |  |  |
|  |  |  |
|  |  |  |

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LIST OF SYMBOLS

|  |  |  |
| --- | --- | --- |
| *m* | - | Mass |
| *g* | - | Gravity acceleration |
| *Vs* | - | Ship speed |
| *ρsw* | - | Seawater density |
| *η0* | - | Open water efficieny |
|  |  |  |
|  |  |  |
|  |  |  |

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# INTRODUCTION

## Research Background

The Research Background section provides a description that underlies the selection of a theme/topic/problem in the context of research as material for Bachelor Thesis study. The descriptions presented are in the form of an overview from the initial study on the selected theme/topic/ problem from an academic point of view. Typically, this section begins by describing the gaps in previous research, theoretical and practical, or real world problems that require academic solutions.

## Problem Statement

In the Problem Statement, the problems to be resolved in the Bachelor Thesis study are formulated in a clear, sharp and focused manner through a gap analysis from previous research or major theories that are relevant and new (recent) in the form of descriptions/statements and/or main topics to be explored in the research. In this section, the main focus of the research which includes the various questions that will be answered in the research is declared so that the description of what will be revealed in the research is clearly unraveled. If the problem statement is formulated from research questions, all the questions asked need to be supported by basic reasons obtained from the initial study or main theory. The definitions and assumptions and initial hypotheses taken in conducting the research can be explained in this section.

## Research Objectives

In the Research Objectives section, the objectives and targets to be achieved in the Bachelor Thesis study are briefly and clearly addressed in accordance with the research problems that have been formulated. The study can be designed to explore, describe, explain, prove or apply a concept/hypothesis. Furthermore, similar research can also be targeted at making/producing a product/prototype.

## Scope of Research

The Scope of Research section is required to limit the scope of the Bachelor Thesis study in terms of the depth and breadth of the problem and the research objectives. The limitations in question can also be addressed in the form of analysis, modeling and system physical limitations if the study discusses the implementation of methods in real applications/systems.

## Research Benefit

In the Research Benefits section, the interests, contributions or benefits of the results of the Bachelor Thesis study that are carried out related to the stated research objectives are clearly described.

# LITERATURE REVIEW

## Introduction

The Introduction section is an overview of the entire contents of the chapter presented. The contents of this section can be a summary of the other sections/ subsections. One full paragraph representing the entire content of the chapter is sufficient for an Introduction.

In general, the Literature Review chapter provides a comprehensive summary of all related materials contained in various references. The material presented is made from the latest references and original sources such as scientific papers from journals and seminars. References related to basic theories/concepts can be obtained from books, while other references such as magazines, reports, modules and/or other official documents can be used by including clear sources.

The descriptions in this chapter can be presented in a discussion or debate form between references regarding similar theme/topic/discussion. In addition, various techniques, equipment or technology that have been used in previous researches can also be explained. The descriptions presented are directed to develop a framework for the approach or concept to be used towards designing the research methodology.

## Related Studies

The Related Studies section contains a summary of the results of previous research conducted by other researchers and/or the author's own published research results; provided that it is not part of the ongoing study. This is done to analyse the extent to which other related research has been carried out so that it can clearly map the urgency of the research being carried out. This section can be arranged more than one based on the needs of the research literature and given a title according to the theme/topic discussed.

## Basic Theory

In the Literature Review chapter, the basic theory/concept behind and/or related to the research problem of the Bachelor Thesis study should also be explained. The concepts/theories described in this section are used as a guide for solving the research problems and carrying out research tasks arranged in the research methodology. This section can be designed in the form of qualitative descriptions, modeling or mathematical equations compiled from books or other justified sources as stated above.

### Takagi-Sugeno Fuzzy Model

In general, a nonlinear system can be written as $\dot{x}=f(x,u)$ where *x* is the state variable and *u* is the control input. To build the Takagi-Sugeno (T-S) fuzzy model, a linear model of the nonlinear system is obtained by linearizing the system with several operating points $x\_{i}^{\*}$. The linear model has the form shown in Equation 2.1 and Equation 2.2 (Tanaka & Sugeno, 1992).

 $\dot{x}\left(t\right)=A\_{i}x\left(t\right)+B\_{i}u\left(t\right);i=1,2,3,…,r$ (2.1)

where

 $A\_{i}=\left.\frac{∂f(x)}{∂x}\right|\_{x=x\_{i}^{\*}};B\_{i}=\left.\frac{∂f(x,u)}{∂u}\right|\_{x=x\_{i}^{\*}}$ (2.2)

### Fuzzy Observer

Fuzzy control methods can be differentiated based on the design method and… (so forth).

## Reference Citation and Other Formats

Reference is cited in APA style, where the author's last name and year of publication are included after the citation in parentheses; for example: *Literature review is an important part of the research process that can inspire, tell and teach something and provide enlightenment for new things (O'Leary, 2017)*. If the author is included as subject in the citation, the author's name is excluded and only the year of publication is placed in brackets; for example, *Cryer (2006)* *states that previous research and studies are very important to find out what other people have done and find gaps that can be filled with research to be carried ou*t. If there are two or more authors, the citations are written as *Ghose and Gokarn (2004)* or *(Ghose & Gokarn, 2004)* and *Roddy et al. (2006)* or *(Roddy et al., 2006)*. All references cited or referred in carrying out and reporting of the Bachelor Thesis study, either partially or completely, must be included in the Reference.

Figures and tables are placed in the center of the page (align center) as in Figure 2.1 by including the source of the citation; except those of self-created/generated. Figures and tables are presented in proportional size and clear/not blurry. Figure and table captions are written in a lower case except for the initial letter at the beginning of the sentence and must be cited in the paragraph before the figure/table displayed.

 

Figure 2.1 Processing literature for research (O'Leary, 2017)

The description/explanation of the contents of the figure/table presented is written after the display. For example, "*As shown in Figure 2.1, there are four steps of research work involving literature, namely finding the correct literature for the research being carried out, managing the literature properly, using the literature for research needs and reviewing the literature to design Literature Review. The four steps are sequential so that the earlier steps must be done and completed first for the next step to be carried out effectively.”*

Unlike figures, the table number and caption are written above the table as shown in Table 2.1. The contents of the table are written with a letter size smaller than the size of the letter in a normal paragraph but can be read by normal eyes easily in 1 (single) spacing.

Table 2.1 Criteria to evaluate the significance of confidence level (Kothari, 2004)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Significance level | Confidence level | Critical value | Sampling error | Confidence limit | Difference significant if | Difference insignificant if |
| 31.73% | 68.27% | 1 | 1*σ* | ± 1*σ* | ≥ 1*σ* | ≤ 1*σ* |
| 5% | 95.0% | 1.96 | 1.96*σ* | ± 1.96*σ* | ≥ 1.96*σ* | ≤ 1.96*σ* |
| 4.55% | 95.45% | 2 | 2*σ* | ± 2*σ* | ≥ 2*σ* | ≤ 2*σ* |
| 1% | 99% | 2.5758 | 2.5758*σ* | ± 2.5758*σ* | ≥ 2.5758*σ* | ≤ 2.5758*σ* |
| 0.27% | 99.73% | 3 | 3*σ* | ± 3*σ* | ≥ 3*σ* | ≤ 3*σ* |

Numbering of the figures, tables and mathematical equations use two digit numbers where the earlier number indicates the chapter number where the figure/table/equation is located while the latter number implies the sequence number. For example, Equation 2.3 below indicates that the equation is located in Chapter 2 and is the 3rd equation. Similar to the figures and tables, equations must be cited in paragraphs before displayed. If necessary, an explanation related to the equation can be put in the paragraph after the equation displayed.

 $Mathematical equations$ (2.3)

# RESEARCH METHODOLOGY

## Introduction

The Introduction section is an overview of the entire contents of the chapter presented. The contents of this section can be a summary of the other sections/ subsections. One full paragraph representing the entire content of the chapter is sufficient for an Introduction.

In general, the Research Methodology chapter describes the design, method, or approach used in answering research problems to achieve the research objectives. This chapter describes the activities/steps/stages of research carried out in detail, briefly and clearly. The description can include the determination of the research parameters/variables, the model used, the research design, the technique or method of data collection and analysis, error analysis and verification and validation (V&V) methods which refer to how to test the correctness of the methods used and how to test the validity of the results obtained.

## Research Flowchart

This section contains a flowchart of research steps or other illustration needed to clarify the research method of the Bachelor Thesis study. In the flowchart, all research activities needed to achieve the research objectives and the linkages and sequences of the activities are shown. A brief description of the research flow can be provided in this section. A more detailed explanation of each research activity is described in the following sections. If interview technique is used in data collection, a list of questions or questionnaires has to be attached in the Appendix and mentioned in the Table of Contents.

## Research Activity 1

Research Activity 1, Research Activity 2 and so forth until the Last Research Activity are arranged systematically based on the sequence in the flowchart. Verification can be executed by choosing other similar methods and comparing the results obtained. Meanwhile, the validation can be performed using real data, experimental results or data obtained from other published studies (validation against published data). By using the assumptions made from the error distribution as shown in Table 2.1, a confidence level of 95% is deemed sufficient (reliable) for verification and validation (Coleman & Steele, 2009). As such, the error (error) allowed for V&V is 5%.

## Research Activity 2

Text here.

### Sub-Research Activity 2-1

Text here.

### Sub- Research Activity 2-2

Text here.

## The Last Research Activity

Text here.

# RESEARCH PLANNING AND SCHEDULE

In this chapter, an introduction contains a plan for implementation of the Bachelor Thesis (BT) research activities is described. All activities designed in the Research Methodology chapter including administrative activities are planned on a weekly basis based on the academic calendar as shown in Table 4.1. RA refers to Research Activities that have been designed in the research methodology.

Tabel 4.1 Bachelor Thesis research schedule

|  |  |
| --- | --- |
| Research Activities | Week |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| RA 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| RA 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| RA 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Progress Evaluation (P2) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| RA 4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| … |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| The last RA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| BT report writing |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Final Evaluation (P3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

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