ETH zürich

Institute for Dynamic Systems and Control

Ngo Loi Tony

Short-term Strategy Optimization for the Bridgestone World Solar Challenge

Subtitle

Master's Thesis

Institute for Dynamic Systems and Control
Swiss Federal Institute of Technology Zurich

Supervision

Giona Fieni
Prof. Dr. Second Supervisor

January 2021

IDSC-XX-YY-ZZ

IDSC

Abstract

Abstract goes here

Keywords: First keyword, Second keyword.

Contents

Chapter 1

Introduction

This document is created with the document class IDSCreport [1]. This citation is defined in the plain-text file `bibliography.bib`, as shown in appendix A.

1.1 Motivation

1.2 Objective

1.3 Context

1.4 State of Research

1.5 Structure of the report

Chapter 2

System Modeling

This document is created with the document class IDSCreport [1]. This citation is defined in the plain-text file `bibliography.bib`, as shown in appendix A.

2.1 Overview

2.2 Vehicle Dynamics

2.3 Electric Motor Model

2.4 Battery Dynamics

2.5 Pv Model

2.6 Weather Data

2.6.1 Global Irradiance

2.6.2 Wind

2.6.3 Ambient Temperature

2.7 Route on Stuart Highway

Chapter 3

Optimal Control Problem

This document is created with the document class IDSCreport [1]. This citation is defined in the plain-text file `bibliography.bib`, as shown in appendix A.

3.1 Objective Function

3.2 Dynamic Programming and Battery Target

3.3 Constraints

3.3.1 State Constraints

3.3.2 Input Constraints

3.3.3 Battery Target Slack Variable

Chapter 4

Nonlinear Model Predictive Control

This document is created with the document class IDSCreport [1]. This citation is defined in the plain-text file `bibliography.bib`, as shown in appendix A.

4.1 From OCP to a NLP

4.1.1 Integration Method

4.1.2 Receding Horizon

4.1.3 Multiple Shooting

4.1.4 Numerical Implementation

4.2 Online Race Framework

Chapter 5

Case Studies and Results

This document is created with the document class IDSCreport [1]. This citation is defined in the plain-text file `bibliography.bib`, as shown in appendix A.

Appendix A

Example Appendix Chapter

The following code is the definition of the bibliography entry of the document class IDSCreport [1].

```
@manual{IDSCreportClass,
author = {Andreas Ritter and Philipp Elbert and Christopher Onder},
title = {How to Use the {IDSCreport} {\LaTeX{}} Class},
language = {english},
howpublished = {Version 1.7.0},
organization = {Institute for Dynamic Systems and Control ({IDSC})},
address = {ETH Z\"{u}rich, Switzerland},
month = jan,
year = 2021
}
```

Bibliography

[1] A. Ritter, P. Elbert, and C. Onder, *How to Use the IDSCreport LaTeX Class*, Version 1.7.0, Institute for Dynamic Systems and Control (IDSC), ETH Zürich, Switzerland, Jan. 2021.

ETH zürich

Institute for Dynamic Systems and Control

Prof. Dr. R. D'Andrea, Prof. Dr. E. Frazzoli, Prof. Dr. Lino Guzzella, Prof. Dr. C. Onder, Prof. Dr. M. Zeilinger

Title of work:

Short-term Strategy Optimization for the Bridgestone World Solar Challenge

Subtitle

Thesis type and date:

Master's Thesis, January 2021

Supervision:

Giona Fieni
Prof. Dr. Second Supervisor

Student:

Name:	Ngo Loi Tony
E-mail:	tongo@student.ethz.ch
Legi-Nr.:	19-915-958
Semester:	HS 2023

Statement regarding plagiarism:

By signing this statement, I affirm that I have read and signed the Declaration of Originality, independently produced this paper, and adhered to the general practice of source citation in this subject-area.

Declaration of Originality:

`https://www.ethz.ch/content/dam/ethz/main/education/rechtliches-abschluesse/leistungskontrollen/declaration-originality.pdf`

Zurich, 28.9.2023: _____