INSTITUTE FOR ELECTRICAL ENERGY SYSTEMS
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Modelling of tranformers with on-load tap-changers (OLTC) in Python

MASTER THESIS

by

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Contents

Chapter 1

Introduction

Some blibla as introduction. [1]

This leads to the following structure for the paper:

- **Chapter 2,**
  some description about chapter 2;
- **Chapter 3,**
  some description about chapter 3;
- **Chapter 4,**
  some description about chapter 4.

Chapter 2

Fundamentals

Some literature and fundamentals about transformers, control, stability assessment, fast-switching modules, and analysis in Python.

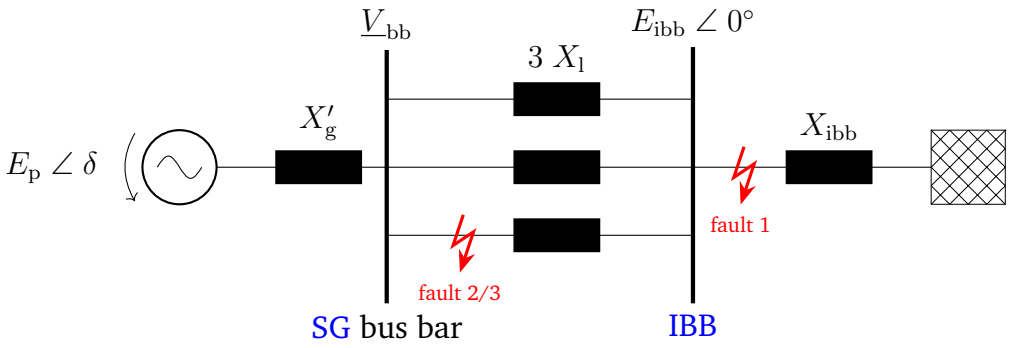

Figure 2.1: Representative circuit of a single machine infinite bus (SMIB) model with pole wheel voltage $E_{\mathrm{p}} \angle \delta$ and infinite bus bar (IBB) voltage $E_{\mathrm{ibb}} \angle 0°$; positions of considered faults 1 to 3 are marked with red lightning arrows

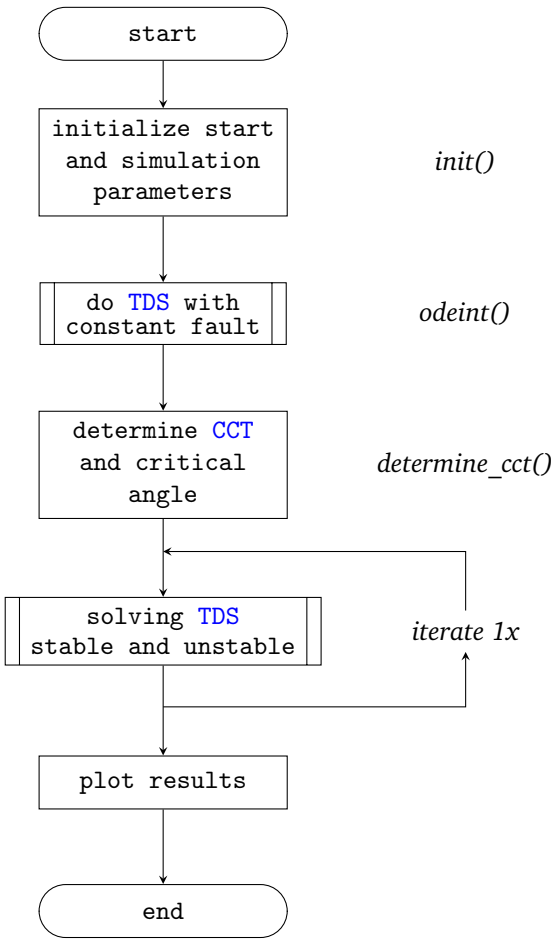

Figure 2.2: Program plan proposal for determining the critical clearing time (CCT) t_{cc}, critical power angle δ_{cc} and the time domain solution (TDS) of the single machine infinite bus (SMIB)-model; including the associated main function name

Chapter 3

Summary and outlook

Some conclusion.

Some outlook and nice blibla.

Acronyms

CCT	critical clearing time
IBB	infinite bus bar
SG	synchronous generator
SMIB	single machine infinite bus
TDS	time domain solution

Symbols

δ	$^\circ$ / deg	power angle (or power angle difference)
$\Delta\omega$	$\frac{1}{\mathrm{s}}$	change of rotor angular speed
A	-	acceleration or deceleration area
E	V	voltage of SG or IBB
H_{gen}	s	inertia constant of a synchronous generator (SG)
I	A	current
P	W	Power; electrical or mechanical
V	V	voltage
X	Ω	reactance
Y	$\frac{1}{\Omega}$ / S	admittance

In the simulations and calculations the per unit system is preferred, thus using all values as per reference unit ($\mathrm{p.u.}$). Where necessary indices are used to differentiate between similar symbols with different values.

Bibliography

[1] S. Batchu, Y. Raghuvamsi, and K. Teeparthi, "A Comparative Study on Equal Area Criterion Based Methods for Transient Stability Assessment in Power Systems," in *2022 22nd National Power Systems Conference (NPSC)*, New Delhi, India: IEEE, Dec. 17, 2022, pp. 124–129, ISBN: 978-1-66546-202-0. DOI: 10.1109/NPSC57038.2022.10069303. [Online]. Available: https://ieeexplore.ieee.org/document/10069303/ (visited on 12/14/2023).

Appendix

A Python modelling

A.1 Mathematical equations

B OLTC control

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C Verification

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