Abstarct

(max 8-10 sor) This Thesis is consisted about optimal control of power converters. The firs part is consisting of a constrained optimal control of a current source rectifier (CSR) is presented, based on a mathematical model developed in Park's frame. To comply with the system constraints an explicit model-based predictive controller was established. To simplify the control design, a disjointed model was utilised due to the significant time constant differences between the AC and DC side dynamics. As a result, active damping was used on the AC side, and explicit Model Predictive Control (MPC) on the DC side. The results are compared by simulation with the performance of a state feedback control. This is followed by developing a cost function for mitigating voltage asymmetry on a domestic network, which requires only measuring the voltage whist only current interventions are required. Lastly an asymmetric inverter structure was developed to serve the const function minimizing compensational needs. Results were implemented and validated with Matlab simulations.

1. Introduction
1.1. Motivation
1.2. Thesis structure

2. Basic notions
2.1. Inverter
2.2 Asymmetry
2.3. Literature review

List of contets

Ez egybe vonható

nem lenne célszerű a könnyedebb témával kezdeni?

egy fejezetbe

Chapter 3

Literature overview

3.1 Basic notions

Stuff you need to know!

Ide a két téma közös része kerüljön, pl általában az inverterekről, az áramminőség-normákról, stb.

Chapter 4

Constrained, explicit predictive control for current source buck-type rectifiers

4.1 Explicit predictive control for current source buck-type rectifiers.

First half with MPC goodies!

4.1.1 Mathematical Modeling of the CSR

The structure of the classical three phase buck-type current source rectifier (CSR) is presented in 4.1. In continuous current mode, the differential equations corresponding to the CRS's inductor currents and capacitor voltages are the following:

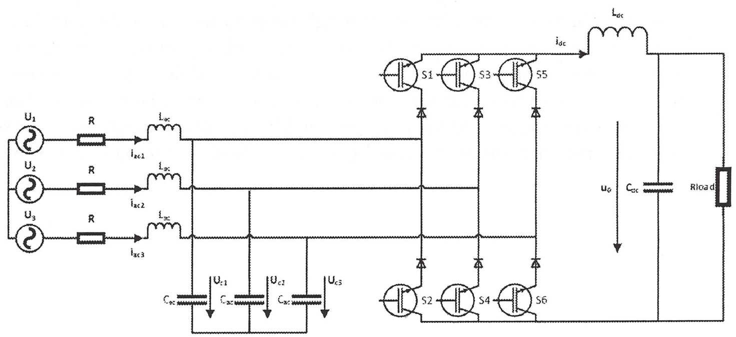

Figure 4.1: Circuit diagram of the three-phase buck-type rectifier with insulated gate bipolar transistors (IGBTs).

Chapter 7

Summary

Chapter 8

Thesis

/ proposed ...

/ suggested ...

/ developed ...

8.1 Playground

E/1-ben Fogalmazd meg a téziseket!

1. Thesis: Thesis: Constrained, explicit predictive control for current source buck-type rectifiers.
   The proposed CSR model has been examined from the design and implementation points of view with the purpose of explicit model-based predictive control, and It proved to be that regular set of differential equations of the CSR appears to be too complex for such a design approach. To address this issue the usage of separated AC and DC equation sets was implemented. This solution eliminates bilinearity and enables the application of linear control design techniques, and enables different solutions on AC and DC side. For the modulation, Current-based SVPWM has been used with an emphasis on the reduction of switching losses. For DC side control explicit model predictive control method is described and the method's effectiveness was compared to conventional state feedback control. The implementation was carried out in a Matlab/Simulink environment and the proposed control structure has been tested by simulation. Additionally, the proper implementation of the system in a modern DSP chip would result in real-time operation.

2. Thesis: Geometrical indicator for voltage unbalance in three phase networks.
   The currently used measures of voltage unbalance has been extended with a norm candidate. It is more demanding from the computational point of view but has a new feature namely it checks electrical asymmetry, i.e. the norm of a ±120 degree rotated version of the ideal three phase phasor is zero in the geometrical sense. The defined norm is applied as a cost function in the asymmetry reducing controller structure also presented in the paper. Simulations show that the geometrical based unbalance indicator can serve as a basis of further research.

3. Thesis: Voltage unbalance compensation with optimization based control algorithm and asymmetrical inverter structure.
   The suggested controller structure enables the residential users owning a