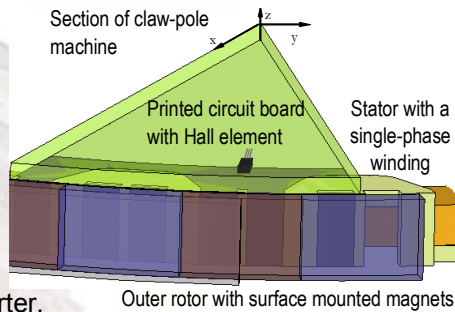# Control of a Single-Phase Claw-Pole Machine

Alexandre Grandremy

Motivation

- A power electronic speed controlled **driver** for a single-phase claw-pole machine is needed.
- The **goal** of this masters thesis is **to design**
  - the power electronic converter,
  - the signal electronics and
  - the code for a possible micro processor .

Section of claw-pole machine

Printed circuit board with Hall element

Stator with a single-phase winding

Outer rotor with surface mounted magnets

Static characteristics

- Measurement of **torque** as a function of **position** and **current**
- Analysis of **starting capability**
  - Friction, cogging, etc
  - Resting positions
 - Starting torque and energy
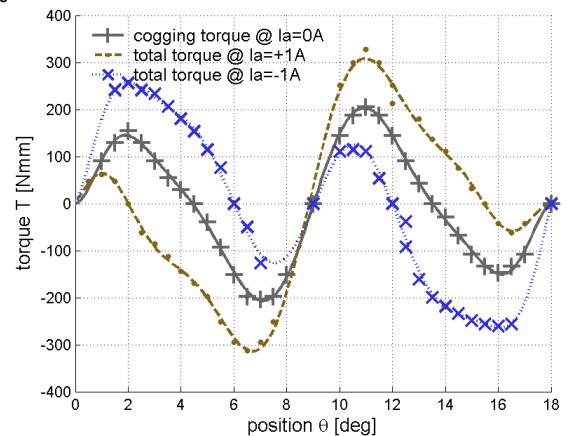
Development of control strategy and circuitry

- Selection and implementation of **position detection**
- Selection and development of **starting sequence**
- Control routine for the **high speed operation**
  - **Delay compensation**
  - Shaping of **current waveform**
- Simulation models are made in **Simulink** and partly tested in **dSpace**
- Practical control algorithm written in **C-code**


Block diagram of the drive system

Simulations

- Development of **machine model**
- Development of **drive system**
  - Brushless DC-drive (**BLDC**) with maximum current observation
  - Sampled current controll (**SCC**) with PE regulator and PWM
  - Direct current control (**DCC**) with hysteresis regulator
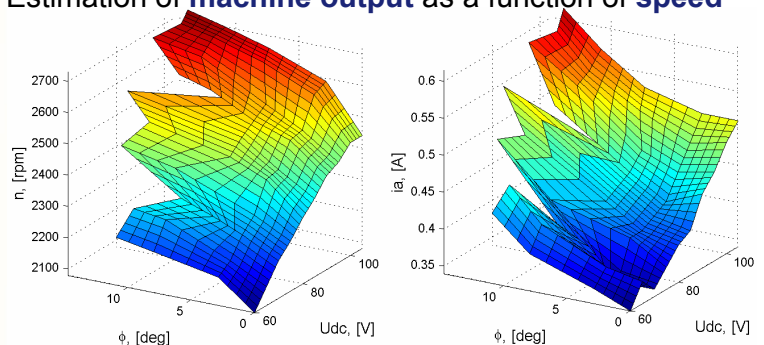- Theoretical evaluation of **control strategies**
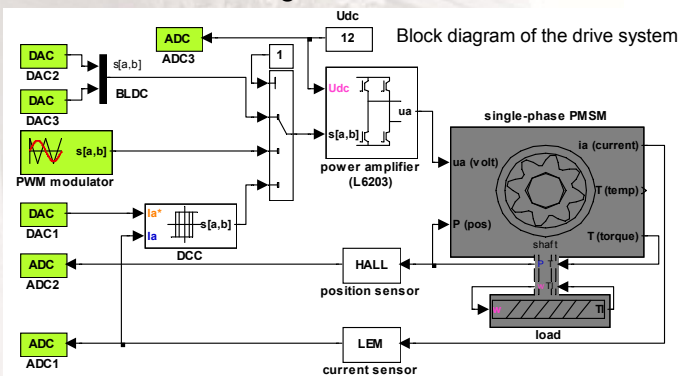
Experimental work

- Development and testing of **electronic circuitry**
- Verification of **control strategies**
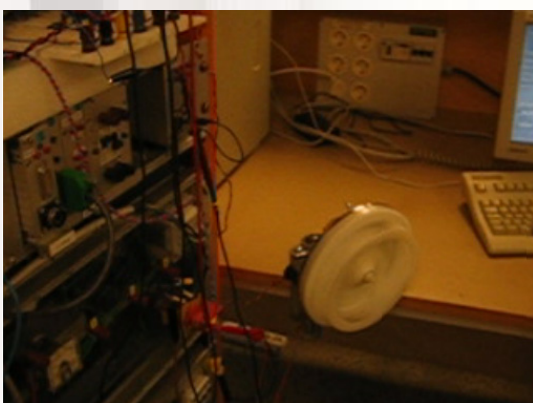
Dynamic characteristics

- Estimation of **machine output** as a function of **speed**

Accomplishments

- Developed and verified control strategy for **starting** and **running** the motor in a controlled **direction** and at a controlled **speed**