

HitMat 2021 E-bike project

High torque regenerative motor for e-Bikes
Fontys University of Applied Sciences



Holland High Tech
Global Challenges, Smart Solutions

HitMat 2021 E-bike project

- More energy-efficient E-bike motor
- Designed by bachelor students of Fontys University of Applied Sciences
- Prototype phase

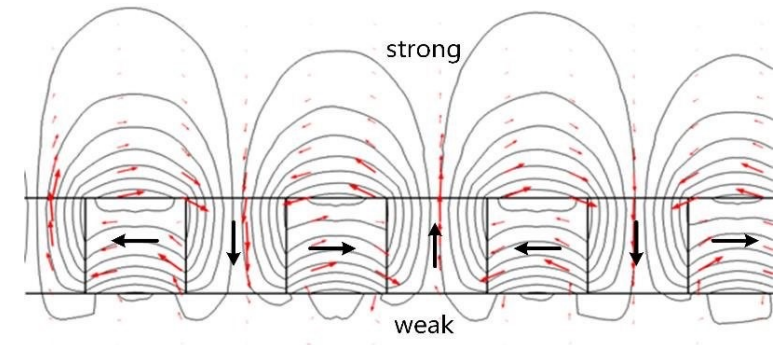
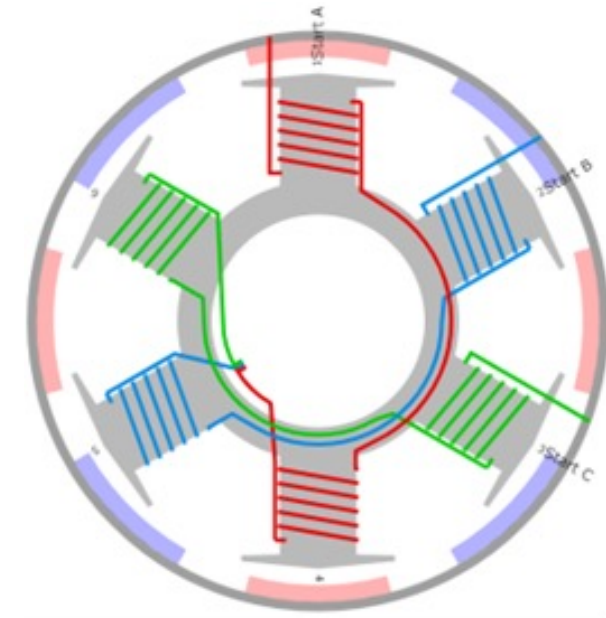


Goal of the project

- Optimise e-Bike drive
 - Increase efficiency
 - Reduce peak current loads on batteries
- Rim motor
 - Increases the effective radius of the motor
 - Less force needed to get same amount of torque as a hub motor
 - Smaller power consumption of the motor

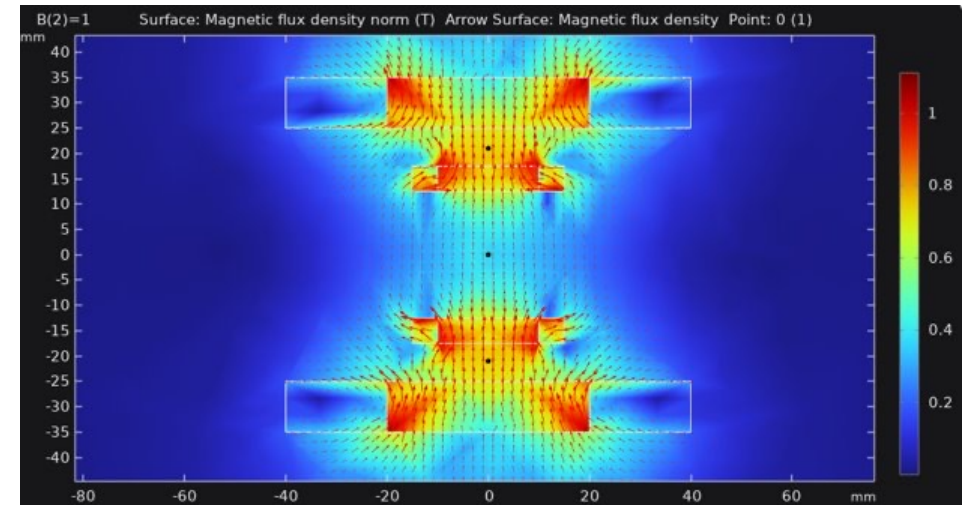
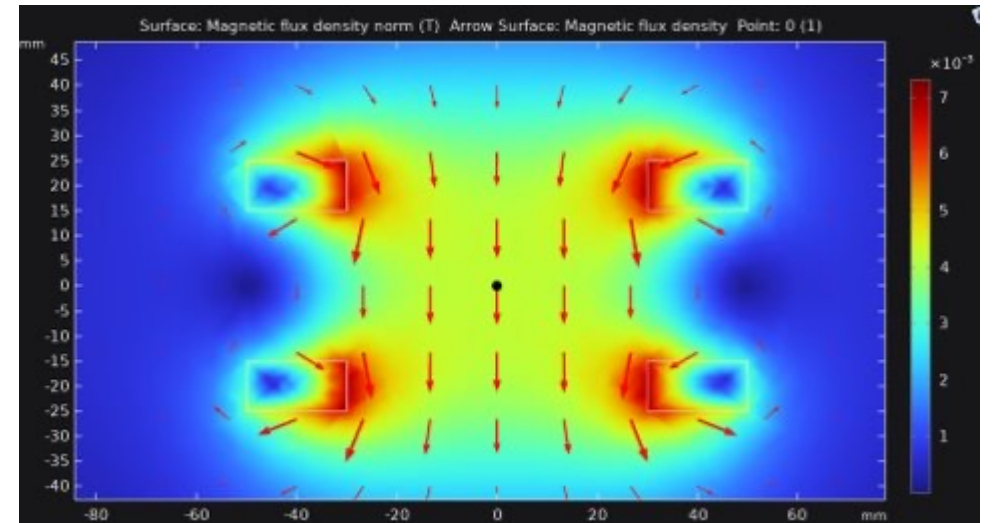
Research

- Motor topology
 - Pole slot combination
 - Coil design
 - Halbach array
 - Linear motor design vs synchronous motor design



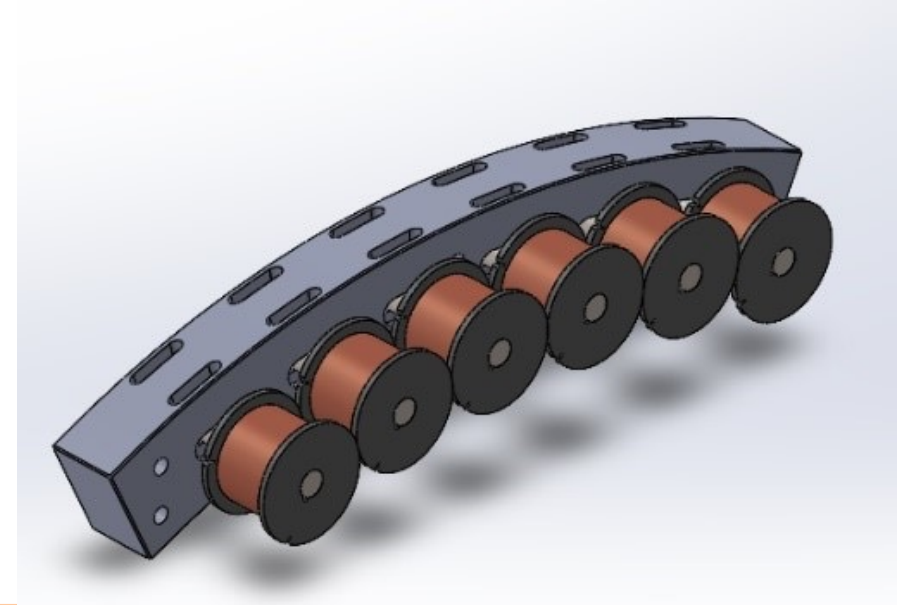
Simulations

- 2D and 3D numerical models
 - Optimise topology of magnetic fields and estimate electromagnetic forces
 - Improve efficiency



Design

- Mechanical
 - Magnet placement
 - Coil spacing and size
- Electrical
 - VESC implementation
 - Coil energization



Testing

- 2 Prototypes created
- Speed and torque measurements completed

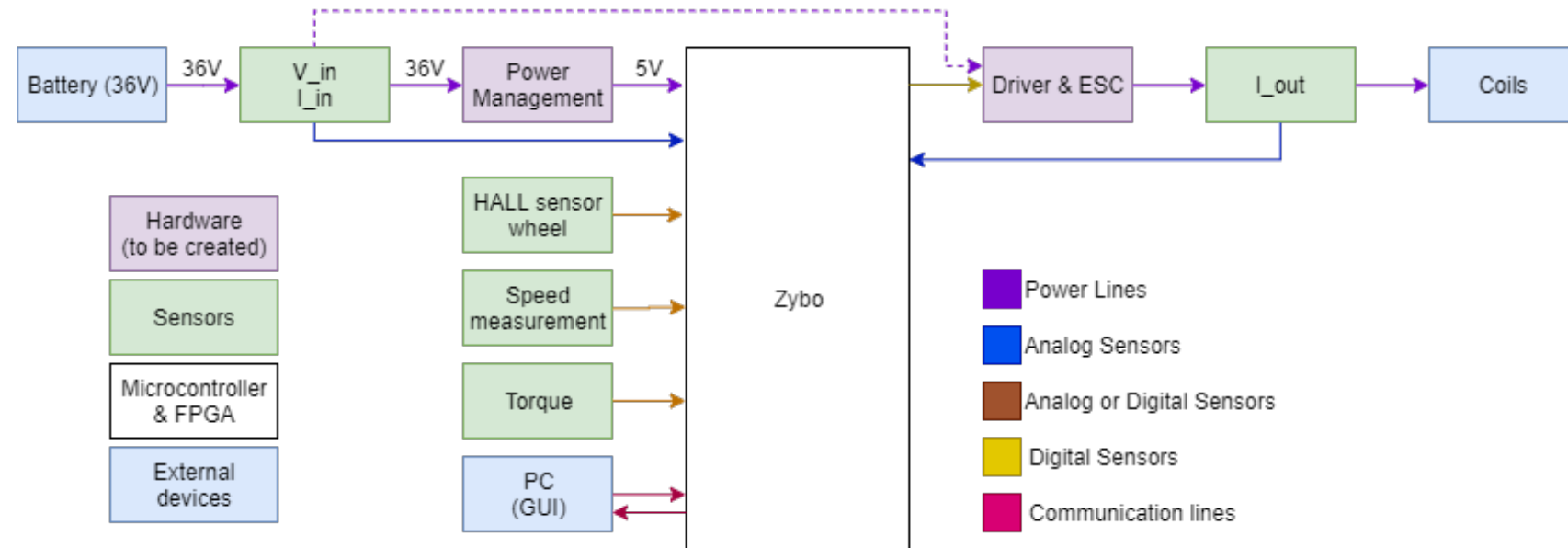


Future plans

- Motor Controller Design (ongoing)
- Improved Mechanical design of motor & wheel
- Integration in E-bike
- Testing and optimizing

Motor Controller Design (Ongoing)

- SoC FPGA development using MATLAB/Simulink
- Precise timing management
- Debug interface
- External communication



Thanks for your attention

Chris Lee

Teun van der Aalst

Beau Wilmink

 c.lee@fontys.nl

 www.hollandhightech.nl



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