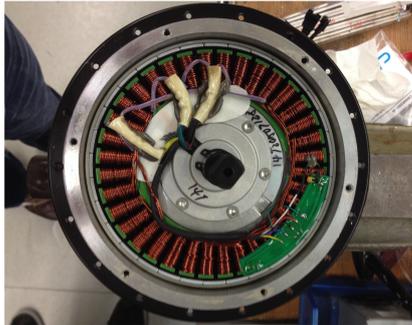


Roland Peterer

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Design of an Electric Brake System for an E-Bike

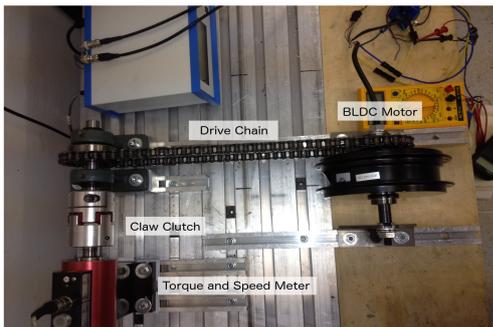
Term Project 2



BLDC Motor

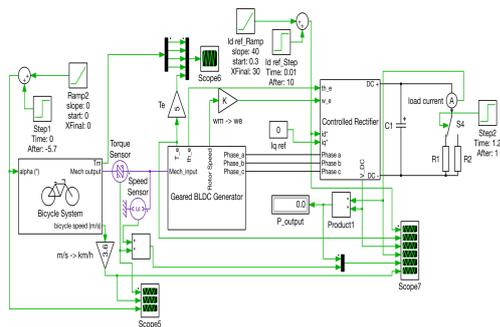
Introduction: An e-bike is an electric bicycle with an electro motor as engine. The power supply is usually accomplished by a battery system. A lot of different concepts exist on the market. To widen the operation range of such an e-bike, one possibility is to develop an electric brake system that is capable to feed back energy to the electrical supply. The aim of this term project was to design an electric brake system for an e-bike to recuperate energy. It was fundamental to first choose an appropriate electro motor. The choice felt on a brushless direct current motor, short BLDC motor. Further a PLECS simulation model for the whole system had to be developed and a parameter study was performed to check the concept on a simulation base.

Approach/Technologies: For a profound understanding of the system, the mathematical models were deployed for the mechanical and electrical part of the employed BLDC motor. Afterwards the important parameters were determined by different experiments on a motor test bench. The identified parameters were used to represent an accurate simulation model of the employed BLDC motor in PLECS. The whole brake system, including the bicycle was implemented as three sub blocks in PLECS; Bicycle System, Geared BLDC Motor and Controlled Rectifier.



Motor Test Bench

Result: With the developed simulation model it is possible to simulate a bicycle riding down a hill with various steepness. Changeable parameters enable a simulation of different circumstances. The controlled rectifier controls the brake torque according to a set value and supplies an intermediate direct current link. It is possible to simulate different loads, attached to the DC-link.



PLECS Simulation Model