Electrical motors to mimic real-world scenarios

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The control of electrical motors has emerged as a interesting endeavor. This pursuit finds its purpose in the world of hardware-in-the-loop (HIL) rigs, where the goal is to create realistic simulations of systems. The key innovation lies in utilizing electrical motors to mimic real-world scenarios.

Introduction

Imagine having a miniature model of a real system to understand how it works without needing the actual equipment. This is the essence of Hardware-in-the-Loop (HIL) simulations. Electrical motors play a crucial role in this, known for their ability to rapidly generate torque, as anyone who has felt the exhilarating acceleration of an electric car can attest. This feature is utilized in this research with the idea to make a small rotating cog behave as a large revolving door using electrical motors.

The exploration delves into which components are needed to operate a brushed DC motor and how to dynamically control the resulting torque, revealing that it is the same as regulating the current flowing through the motor. The motor can be used to realize a breaking force or the stored energy - which are the two key components needed to make a small rotating cog behave as a large revolving door.

In projects building the final real systems is often a daunting and time consuming task - and often only possible towards the end of a project. If realistic scenarios can be simulated early in the project, then early feedback and faults can be found - which can speed up the development process and produce products of higher quality. Further extending the realism of a Hardware-in-the-Loop simulations can also justify the use of them in a third party certification process. Scenarios that are hard or costly to realize in a real system can easily be simulated. Product innovation can also benefit - by simulating and testing different configurations.

A prototype used to control the torque of a DC-motor was built and tested and showed exciting results such that a constant breaking force could be realized. Key concepts were explored and some ideas of how to solve encountered problems related to the control of the motor current were proposed and solved. A key part of controlling the current was to take accurate and fast current measurements and then act on them - which can be a challenging task.

The work can be a stepping stone to further extend the realism of Hardware-in-the-Loop simulations by utilizing brushed DC-motors. Where realism is key to motivate the use and effectiveness of these simulations - which can used to save time, produce products of higher quality and ultimately lead to cost savings, or potentially prevent fatalities or injuries.