

Controller Design for a Magnetic Levitation Kit using OpenModelica's Integration with the Julia Language

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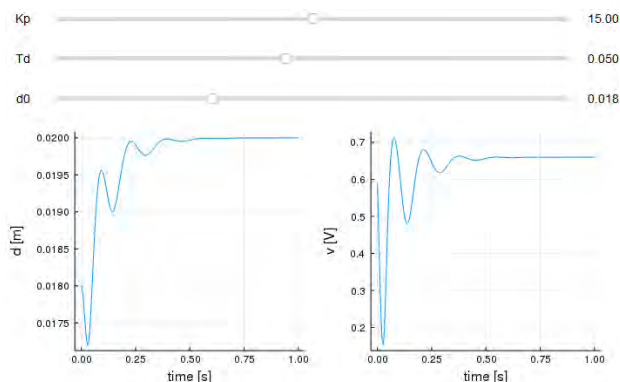
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Abstract

This paper presents a practical application of computer aided control systems design using a new OpenModelica API (OMJulia) which allows to conveniently operate on Modelica models from the Julia language. Julia is a rather young language (Julia 1.0 was released in August 2018) designed to address the needs of numerical analysis and computational science, in particular it already has decent support for the control community. The magnetic levitation application at hand demonstrates how control system design can benefit from a suitable integration between Julia and Modelica. It is based on a commercially available control education kit in which the original controller is replaced by our own digital controller developed in this work. There exists an accompanying but independent paper which introduces the complete OMJulia API. Figure 1a depicts a simple web technology based GUI created in a few lines of Julia code which allows interactive experimentation with a closed-loop nonlinear magnetic levitation Modelica model using the OMJulia interface. Figure 1b shows the magnetic levitation system which uses the Arduino Uno as electronics prototyping platform for the presented digital controller.

Keywords: OpenModelica, OMJulia, control, magnetic levitation, Arduino, Julia, Modelica



(a) Simple interactive GUI with sliders for setting parameters of the closed-loop nonlinear magnetic levitation Modelica model using the OMJulia interface. Changing a slider will immediately trigger a new simulation and update the plots.



(b) Arduino controlled electromagnetic levitation system.

Figure 1. Magnetic levitation control design case study leveraging the OMJulia bridge to OpenModelica.