

A Computational Investigation of Pole-Zero Cancellation for a Double Inverted Pendulum

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Abstract

Modern symbolic computational systems which perform automated manipulation of algebraic variables offer insights into a variety of mathematical problems. This work uses the symbolic manipulation toolbox available in MATLAB to investigate pole-zero cancellation of the uncontrollable double inverted pendulum algebraically following exploratory numerical computation. The ability of the software to factorise complicated multi-variate polynomials is exploited to identify, in algebraic form, the anticipated pole-zero term cancelling throughout the transfer functions of the uncontrollable pendulum system. This problem has been considered with respect to the force on the trolley, for which it is a conditionally uncontrollable problem, and with respect to each of the torques on the arms, which are unconditionally uncontrollable problems. Pole-zero cancellation for the triple inverted pendulum system is currently under consideration.