

Dynamic Model of a Suspended Cable Driven Parallel Robot with a Point Mass of the End Effector

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Abstract:

Cable driven parallel robot (CDPR)s are a type of parallel robot that use cables instead of rigid links. If all drive cables in a CDPR are above the end effector (EE), and gravity acts as a virtual cable to maintain equilibrium, then such a CDPR is called a cable suspended parallel robot (CSPR). Of particular interest is CSPR with point mass EE, in which all cables are attached to a single point on the EE. For brevity, we will call it CPRS. CSPRs are well suited for lifting and handling applications. A dynamic model of a CSPR is necessary for design verification and optimization prior to prototyping. In this study, a dynamic model of a CSPR was developed using SimulationX software. This model allows for the analysis of its dynamics, taking into account the stiffness and damping of its cables, the mass of the sheaves, and the slippage between the cable and sheave. The validity of the dynamic model of a CSPR in SimulationX was verified using a prototype. Experimental studies of a prototype CSPR were conducted, confirming the feasibility of using the dynamic model of a CSPR in SimulationX, for practical calculations.

Keywords:

Cable suspended parallel robot, SimulationX, dynamics, model.