Trajectory Control and Sway Suppression of a Rotary Crane System

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ABSTRACT

This paper presents investigations into the development of hybrid control schemes for input tracking and anti-swaying control of a rotary crane system. A lab-scaled rotary crane is considered and the dynamic model of the system is derived using Euler-Lagrange formulation. To study the effectiveness of the controllers, initially a collocated proportional-derivative (PD) control is developed for horizontal angle position control of rotary crane. This is then extended to incorporate input shaper control schemes for anti-swaying control of the system. The positive input shapers with the derivative effects are designed based on the properties of the system. Implementation results of the response of the rotary crane with the controllers are presented in time and frequency domains. The performances of hybrid control schemes are examined in terms of the level of input tracking capability, swing angle reduction, and time response specifications in comparison to PD control. Finally a comparative assessment of the control techniques is discussed and presented.

KEYWORDS: Control; Robotics; Mechatronics; Image Processing and Computer Vision

DOI: 10.1007/978-3-662-45514-2_14