Optimal Web Guiding

Article

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Abstract

This paper presents an optimal web guiding strategy based on the dynamic analysis of the lateral web behavior and a new fiber optic lateral web position measurement sensor. First, a lateral dynamic model of a moving web is revisited with an emphasis on correct application of appropriate boundary conditions. Then the dynamic models of two common intermediate guides (remotely pivoted guide and offset-pivot guide) are investigated. The effect of various model parameters on lateral web behavior is analyzed and discussions on proper selection of the parameters are given. Based on the model analysis, we discuss the design of a linear quadratic optimal controller that is capable of accommodating structured parametric uncertainties in the lateral dynamic model. The optimal guide control system is evaluated by a series of experiments on a web platform with different web materials under various operating conditions. Implementation of the controller with a new fiber optic lateral sensor for different scenarios is discussed. Results show good guiding performance in the presence of disturbances and with uncertainties in the model parameters.

Link to the Article