

H_∞ ROBUST CONTROLLER DESIGN OF MEDIA ADVANCE SYSTEMS WITH TIME DOMAIN SPECIFICATIONS

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ABSTRACT. *An inkjet printer is a popular media advance system which can offer an attractive feature set that fits well to the consumer's needs at the low-end color hard-copy market. Better performance at lower cost is and will always be the ultimate goal developing high-profit products successfully. In this paper, an approach of H_∞ analysis and synthesis is proposed to design the robust controller of the media advance system to extend its allowance uncertainty bound with respect to the specifications of the positioning performance as well as constraints of control effort and input disturbance. This allowable maximum uncertainty can be served as an additional design factor for the product designer in order to further reduce the total cost of the developing control system. The experimental results of the positioning control of inkjet printer validate the effectiveness of the proposed approach integrating design and control.*

Keywords: Printer control, Position control, Inkjet printer, Robust controller design

1. Introduction. A unique characteristic of thermal inkjet technology is the low cost color reproduction. The expansion of personal computing and the ever-popular multi-medialization of personal computers is facilitating the increased demand for affordable printing solutions for a variety of applications. Inkjet printers offer an attractive feature set that fits well to the consumer's needs at the low-end printer market. Better performance at lower cost is and will always be the driving force for future product development. For product development, the compromise between performance and cost is an important issue that will have crucial implication to the product success. The design decisions are usually based on static engineering analysis at the earlier phase of development; however, the system dynamics and interactions are often an important engineering issue that requires additional resource to address in the later phase of the development. These "unforeseen" issues are often the main reasons for schedule delay and cost increase. In this paper, we will use a robust control procedure by H_∞ approach to integrate the design and control of the media advance system for thermal inkjet printers. The procedure identifies the worst-case system uncertainty a class of controller can compensate for while it still achieves the desired system performance. The worst-case system uncertainty can then be used to make critical trade-offs on system design. The benefit of this procedure is that if the system uncertainty can be managed to be less than the worst-case scenario, the overall system performance is always guaranteed.