Approaches for Minimizing Tracking and Vibratory Errors in High-Bandwidth Beam Steering

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Abstract

Parallel advancements in the field of controls engineering have been commercialized that have application to the fields of active optics and high-bandwidth beam steering:

- Cost effective, industrial-class implementations of momentum compensation (also known as Frahm damping) provide low-order cancellation of inertial inputs to supporting structures and is of particular applicability to structures with low natural resonance frequencies;
- Input Shaping®, a patented controls technique developed at the Massachusetts Institute of Technology, provides effective cancellation of structural resonances in arbitrary actuation;
- Input Preshaping™, a technique realized in both *a priori* and self-learning implementations, substantially eliminates following errors in repetitive actuation.

The author reviews applications of each of these, alone and together, in a comprehensive overview of the state of the art of high-bandwidth active optic positioning techniques.

Keywords: active optics, positioning techniques, beam steering, Frahm damping

Presentation: Poster