Thursday, January 13, 2022

PHOTONICS spectra®

WHITE PAPERS & APPLICATION NOTES

AEROTECH

Estimating Combined Servo and Galvo Motion Accuracy

By: William Land II, Business Development Manager;
Scott Schmidt, Applications Group Manager

In modern motion control systems, the primary figure of merit is often the global accuracy that may be achieved on the workpiece surface. However, when configuring the motion control architecture for more advanced features, such as Infinite Field of View (IFOV), characterizing each element of the systemic errors can be very challenging, because such complex system have not only primary error contributors, but also secondary errors which result from using a combination of stages and galvanometers together. This white paper details how to characterize the constituent error elements and suggests a means of predicting overall system errors for IFOV-enabled motion control platforms.

In assessing the errors, they may be segregated into 3 bins:

1. Errors from the underlying servo stages
2. Errors from the galvanometer (excluding those errors caused by incoming laser beam misalignment)
3. Systemic errors resulting from using a combined system of stages and galvos together

Before the experimental data shown below was gathered, the underlying linear motor servo stages were calibrated using a 2D correction (i.e., plane mirror and dual laser interferometer). This optimizes their static error performance by removing not only "straight line" errors from the stage encoders, but also correcting for errors induced by yawing motion of the stages and by non-orthogonal alignment of the stages to one another. The work point for this calibration was selected to be underneath the center of the galvanometer's field of view. Resulting errors from the stages alone were less than 18 microns, with a vector sum of 5.26 microns (see Figure 1, below), and X / Y direction errors were noted explicitly in the data sets shown later in this paper.

aerotech.com ■ 1

Estimating Combined Galvo and Servo Motion Accuracy

To achieve global workpiece surface accuracy in motion control systems, the motion control architecture must be configured properly. For more advanced features, such as Infinite Field of View (IFOV), characterizing each element of the systemic errors can be very challenging. Complex systems have primary error contributors as well as secondary errors, which result from combining stages and galvanometers. This white paper details how to characterize the constituent error elements and suggests a means of predicting overall system errors for IFOV-enabled motion control platforms.

DOWNLOAD WHITE PAPER

AEROTECH

More White Papers from This Sponsor

- How to Select Optimal Positioning Equipment for Laser Direct-Write Processes

Visit **Photonics Media** to download other white papers and learn more about the latest developments in lasers, imaging, optics, biophotonics, machine vision, spectroscopy, microscopy, photovoltaics and more.

www.photonics.com/WhitePapers.aspx