Texas Tech University - Department of Mathematics and Statistics
Seminar in Applied Mathematics

Error Analysis for Harmonic Tracking Algorithm (HTA) Using Geometric Control

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ABSTRACT. Geometric Control Theory was initiated in the beginning of the 1970's and has now became a well established approach in addressing problems of tracking and disturbance rejections of time independent and dependent signals. The main goal of our research is to analyze the error for harmonic signal tracking for a SISO (single-input single-output) plant with bounded input and output operators and we assume that the plant is stable. Here we show that in a particular straightforward approach the regulator equations are not solvable by the most direct method. However by introducing a regularization of the problem (by inserting a properly selected $\beta \in (0,1)$) the resulting system can be solved. However the resulting solution is only close to the desired solution. Therefore we introduce a harmonic tracking algorithm (HTA) to obtain a sequence of controls that converge to the desired controls. To reach our main goal, we describe a particular method of writing the error of HTA, $e_n(t)$, as a combination of matrices and show that when the number of iterations increases the error will decrease geometrically. Also two numerical examples are presented to illustrate the geometric convergence of $e_n(t)$.