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Nicholas P. Nurre* (nnp0010@auburn.edu), Auburn, AL 36832, and **Ehsan Taheri** (ezt0028@auburn.edu), Auburn, AL 36832. *Application of Finite Fourier Series for Spacecraft Trajectory Design with Multiple Gravity-Assist Maneuvers.*

In this paper, application of the finite Fourier series (FFS) shape-based method is demonstrated for designing spacecraft trajectories using multiple gravity-assist maneuvers. The finite Fourier series shape-based method is capable of incorporating thrust-level and other types of constraints. In addition, it is possible to generate three-dimensional approximate fuel- and time-optimal trajectories using the FFS method. A dual-level hybrid optimization framework is proposed that uses FFS method as an inner-level solver for rapid feasibility of spacecraft trajectories with multiple segments. Application of the proposed framework is demonstrated through solving spacecraft low-thrust trajectories with multiple gravity-assist maneuvers. (Received January 18, 2021)