Optimization Of The Variable Inertia Flywheel Using Machine Learning

Anika SARKAR, Nicholas WIERSCHEM

Rotational inertial mechanisms can produce mass amplification effects with only a small physical mass by converting translation to rotation of a flywheel, which makes them attractive for structural control applications. A variable inertia flywheel (VIF) is a nonlinear rotational inertial mechanism in which masses in the flywheel can move radially, causing variable inertia. The performance of the VIF depends on its parameters and the objectives considered. This paper presents the optimum parameters of the VIF in a single-degree-of-freedom (SDOF) system using an artificial neural network (ANN) model. Optimum VIF values of several sets of SDOF systems are used to train the ANN model. These values are determined using numerical simulations, and the maximum transfer function amplitude is considered as the optimization objective. Numerical simulations of VIF systems are presented to demonstrate the effectiveness and examine the ANN-based machine learning optimization process's performance.