Optimal Design of Transmission Shafts Using a Vortex Search Algorithm

Abstract

This paper analyzes the problem of optimally sizing a transmission shaft via the vortex search algorithm (VSA) optimizer. The objective function was to minimize the shaft weight through an adequate selection of the diameters of each section of the device, and the constraints were the physical conditions that should be met to design safe, fatigue-proof shafts. The solution and the mathematical model were validated using Autodesk Inventor. In addition, the performance of the VSA was compared to that of the continuous genetic algorithm . The numerical results show that the programmed model has the physical and methodological characteristics needed to produce a better output than conventional design techniques. Therefore, this model can be a powerful tool to solve nonlinear non-convex optimization problems such as the case investigated here.