Computational inverse method of fatigue dissipated energy parameters under fatigue dynamic damage

†Yuan LI[1,2], *Jiehong YUAN[1], Jingwei GAO[1] and Yubo SHEN[1]

[1] College of Basic Education，National University and Defence Technology, China

[2] State Key Laboratory of Advanced Design and Manufacturing for Vehicle Body，College of Mechanical and Vehicle Engineering, Hunan University, China

*Presenting author: yjh2008@163.com

†Corresponding author: yuanli83@hotmail.com

Abstract

Fatigue dissipated energy method can be used to real-time monitor fatigue damage evolution, rapidly determine fatigue parameters of metal material and study the fatigue failure mechanism, which is a hot research point in fatigue field at present. The effectiveness of this method depends on the computational accuracy of fatigue dissipated energy, but fatigue is a process of accumulating damage, which leads to the dynamic change of thermal physical parameters such as conductivity coefficient, heat transfer coefficient and specific heat capacity, and the bottleneck problem in calculating dissipated energy is to accurately identify those key parameters.

To this end, this paper will propose a computational inverse method for multi-parameter identification during dynamic fatigue damage process, to obtain reliable thermal physical parameters and achieve accurate calculation of fatigue dissipated energy. This paper will preliminary focus the research on the following three key issues: experimental technique and numerical modeling method of temperature-strain full-field coupling, analysis of relativity and sensitivity of dissipated energy and thermal physical parameters with dynamic fatigue damage, and multi-parameter computational inverse technique based on improved regularization method and self-adaptive agent, then conduct system integration and experimental verification on the relevant models and computational techniques.

Keywords: Computational inverse method, fatigue dissipated energy, inverse problem, multi-parameter identification.