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A yield criterion through coupling of quadratic and non-quadratic functions for anisotropic hardening with non-associated flow rule

Eun-Ho Lee[1,2], Thomas B. Stoughton[2,3*], Jeong Whan Yoon[1,3*]

1. Department of Mechanical Engineering, KAIST, Science Town, Daejeon 305-701, Republic of Korea
2. Manufacturing Systems Research Lab, General Motors R&D Center, Warren, MI, USA
3. School of Engineering, Deakin University, Geelong Waurn Ponds, VIC 3220, Australia

Abstract

This paper proposes a simple coupling of quadratic and non-quadratic yield functions with a non-associated flow rule to describe the evolution of yield surface (or anisotropic hardening). The non-quadratic part is an isotropic function and is supposed to control curvature of the whole model. The quadratic part takes a role to describe anisotropic hardening throughout a deformation history by employing the hardening functions of different loading conditions. The new yield model just multiplies a quadratic and non-quadratic parts, and it does need neither any interpolation nor optimization at a discrete level of equivalent plastic strain. The new model is compared with several material models with four different material data in order to validate advantages of the new model in capturing anisotropic hardening and controlling its curvature of yield surface. In addition, artificial material cases are applied to the new model to study sensitivity of the model.

Keywords : Yield surface, Quadratic yield function, Non-quadratic yield function, Anisotropic hardening, Non-associated flow rule