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## Application of high performance computing for numerical simulation of fracture of fiber reinforced composite materials

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In recent years, the capability of computers has been extensively improved and the detailed numerical simulations are conducted for various phenomena in scientific and engineering fields. In the problem of fracture of composite materials, the detail numerical simulation using the high performance computing potentially enables us to clarify and visualize the stress and strain distribution as well as distribution of yield state and damage state in the inside of the material during the fracture process. This study investigates the application of high performance computing for the numerical simulation of fracture of fiber reinforced composite materials. The numerical simulation is based on finite element analysis and parallel computing is executed by applying the domain decomposition method. Fourteen computers having six cores and twelve threads are connected and a total of 168 logical processors are unified and calculation has been conducted continuously in 1200 hours. The numerical simulation is conducted for the material fracture in the longitudinal and transverse compressive failure in unidirectional composite materials and the compressive failure in quasi-isotropic laminates. Extensive and vivid pictures of microbuckling of fibers and fiber kinking as well as shear band in transverse compressive failure and fiber kinking appearing in the laminate are observed in the results of the simulation, and the fracture process is well understandable with the comprehension of stress distribution at each step of the fracture process. It is indicated that the material strength is strongly associated with the internal stress distribution and deformation of the material.

### Biography

Takeaki Nadabe received BS in Engineering Science from Kyoto University and MS in Advanced Energy from the University of Tokyo. He is currently working on his PhD in the field of experimental micromechanics and computational science of composite materials. Current research includes microscopic fracture process of fiber reinforced composite materials in compressive loading using experimental micromechanics and computational analysis approaches.

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