

The in-plane geometric stiffness matrix is a first-order linearization of the perturbed nodal force vector in local coordinates; the out-of-plane stiffness matrix is a first-order correction stemming from the change in the nodal force vector caused by small rigid-body rotations. This approach is thus first-order complete especially because Newton's method is used for analysis. Although this approach depends on an a priori chosen linear elastic finite element, it is independent of large strain formulations.

### References

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## Errata

### Effect of Surface Roughness on Unseparated Shock-Wave/Turbulent Boundary-Layer Interactions

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[AIAA Journal, 40(8), pp. 1567–1573 (2002)]

THE authors would like to thank Angela D. McConnell for providing all of the original data as part of her M.Phil. research at Cambridge University (Thesis title: "Roughness Effects on Impinging Shock Wave/Turbulent Boundary Layer Interactions"). Further details can be found in Ref. 6 of our original paper:

Babinsky, H., Inger, G. R., and McConnell, A. D., "A Basic Experimental/Theoretical Study of Rough Wall Turbulent Shock/Boundary Layer Interaction," *Proceedings of the 22nd International Symposium on Shock Waves*, London, 1999, pp. 885–889.

The authors apologize for failing to appropriately acknowledge Miss McConnell's contribution in the original paper.