World Academy of Science, Engineering and Technology
International Journal of Civil and Architectural Engineering
Vol:17, No:08, 2023

Modelling of Structures by Advanced Finites Elements Based on the Strain Approach

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Abstract : The finite element method is the most practical tool for the analysis of structures, whatever the geometrical shape and behavior. It is extensively used in many high-tech industries, such as civil or military engineering, for the modeling of bridges, motor bodies, fuselages, and airplane wings. Additionally, experience demonstrates that engineers like modeling their structures using the most basic finite elements. Numerous models of finite elements may be utilized in the numerical analysis depending on the interpolation field that is selected, and it is generally known that convergence to the proper value will occur considerably more quickly with a good displacement pattern than with a poor pattern, saving computation time. The method for creating finite elements using the strain approach (S.B.A.) is presented in this presentation. When the results are compared with those provided by equivalent displacement-based elements, having the same total number of degrees of freedom, an excellent convergence can be obtained through some application and validation tests using recently developed membrane elements, plate bending elements, and flat shell elements. The effectiveness and performance of the strain-based finite elements in modeling structures are proven by the findings for deflections and stresses.

Keywords : finite elements, plate bending, strain approach, displacement formulation, shell element
Conference Title : ICCMCSE 2023 : International Conference on Computational Mechanics in Civil and Structural Engineering
Conference Location : Paris, France
Conference Dates : August 24-25, 2023