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PERFORMANCE-BASED ADAPTIVE STEP-LENGTH CONTROL OF PATH-FOLLOWING METHODS FOR SOLVING QUASI-STATIC PROBLEMS

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In a quasi-static nonlinear structural problem, the complete solution curve with all snap-backs and snap-throughs is usually of interest. Path-following methods are powerful and widely used numerical tools to robustly find this curve. Essentially, the method adds an extra equation, called a constraint function, to the system of equilibrium equations in order to control the solution procedure. This function needs a step-length to be specified once before an analysis starts or in each analysis increment. The latter one is called an adaptive step-length which requires a law for its evolution. Conventionally, the ratio between a desired number of iterations per increment over a previously converged one is used for the adaptation [1, 2]. We have firstly defined criteria to assess the performance of the path-following method and secondly proposed an adaptation law based on them. Two example problems of damage analysis of structures are solved by the new as well as the mentioned conventional law. The results show that the proposed adaptation law performs better than the conventional one in terms of the performance criteria.

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