INVERSE ESTIMATES OF FRACTURE MODEL PARAMETERS

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ABSTRACT

A study to the parameters identification problem of continuum damage models is presented. For this approach it is assumed that the model describes the fracture phenomena in a proper way. Model parameters may not all be directly measurable in the laboratory. Therefore procedures are required in the framework of the Inverse Problems Theory. The estimated solution corresponds to the minimum error between computational and experimental data. For this purpose different types of experimental tests are considered for the calibration of the gradient-enhanced continuum damage model. In particular, the results of uniaxial tensile size effect tests on dog-bone shaped specimens (van Vliet and van Mier [7]) and three point bending tests on concrete notched beams (Feist [8]) are examined.

The results show that two model parameters, the internal length scale and the slope of the softening branch of the stress-strain curve, defined at the material point level, are correlated. The uniqueness of the solution is not guaranteed if the comparison between numerical and experimental data only involves *global* information such as load-displacement curves. However, the well-posedness of the parameters identification problem can be preserved using additional *local* experimental information, related to the width of the area where deformation and damage localize during the failure process. Moreover, the solution of the inverse problem results to be a powerful tool in emphasizing the limits of the adopted computational model. In particular, the gradient-enhanced damage model seems to incorrectly reproduce the experimental size effect curve of the dog-bone specimens tests, using only one parameters set. In the examined experiments, the statistical distribution of the weak spots in the different sizes plays an important role, which cannot be properly captured by the adopted deterministic model.

Further work is needed to better investigate the influence of structural effects in extracting objective model parameters. For this purpose (local and global) experimental data concerning the same material, but for specimens of different sizes and geometry (uniaxial tensile tests and three point bending tests), need to be considered.

REFERENCES

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