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Advanced Model of Eddy-Current NDE Inverse Problem with Sparse Grid Algorithm

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In model-based inverse problem, some unknown parameters need to be estimated. These parameters are used not only to characterize the physical properties of cracks, but also to describe the position of the probes (such as lift off and angles) in the calibration. After considering the effect of the position of the probes in the inverse problem, the accuracy of the inverse result will be improved. With increasing the number of the parameters in the inverse problems, the burden of calculations will increase exponentially in the traditional full grid method. The sparse grid algorithm which introduced by Sergey A. Smolyak was used in our work. With this algorithm, we obtain a powerful interpolation method that requires significantly fewer support nodes than conventional interpolation on a full grid. In this work, we combined sparse grid toolbox TASMANIAN which is produced by Oak Ridge National Laboratory and professional eddy-current NDE software **VIC-3D®** to solve a specific inverse problem. An advanced model based on our previous one is used to estimate depth and width of the crack, lift off and two angles of the position of probes. Considering the calibration process, pseudorandom noise is considered in the model and statistics behavior is discussed.