HYBRID CONJUGATE GRADIENT USING EXACT LINE SEARCH IN PHOTOVOLTAIC SYSTEM

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ABSTRACT

Unconstrained optimization is the process of determining the maximum or minimum value among all potential values of the variable in the absence of any constraints. The conjugate gradient (CG) method is widely recognised as one of the most efficient numerical methods for solving unconstrained optimization problems. Various studies have been undertaken by implementing the CG method in image restoration, optimal rocket landing guidance and motion control field. There are a few classifications of CG method such as classical, hybrid, three-term and parametric CG methods. This research focuses on the performance of hybrid CG method under exact line search and the implementation of this method in photovoltaic system. There are four hybrid CG coefficients used in this study, which are PRPLAMR, PRPRMIL, PRPLS and PRPHS. Fifteen test functions with different initial points and variables ranged from 2 to 10,000 variables are chosen. The numerical results are assessed based on number of iteration (NOI) and CPU time. In order to evaluate the efficiency and robustness of these methods, the results are visualized in graphical form. PRPLS, PRPLAMR and PRPRMIL successfully solved all 15 test functions while PRPHS solved 99.72% of the test functions. At last, PRPLS is implemented in photovoltaic system, specifically in the maximum power point tracking (MPPT) algorithm. This study shows the effectiveness of PRPLS in solving problem of maximizing the power output generated by the photovoltaic system.

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