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Delta-Bar-Delta Neural Network (NN) Based Control Approach for Power Quality Improvement of Solar PV Interfaced Distribution System

Miss. Chitkote Akshata Ashok[1], Prof. Kulkarni N.G.[2], Prof. Bagale L.V.[3]
M.Tech, Student , Department of Electrical Engineering (Control System)[1]
Professor, Department of Electrical Engineering (Control System)[2]
HOD, Department of Electrical Engineering (Control System)[3]
College of Engineering, Ambajogai, Maharashtra, India

Abstract: *A serious concern regarding deterioration in power quality, has emerged with the increasing integration of solar photovoltaic (PV) energy sources to the utility primarily in the scenario of weak distribution grid. Therefore, power quality improvement of the grid tied solar energy conversion system is paramount by implementation of a robust control technique. This work deals with a delta-bar-delta neural network (NN) control for operating optimally by feeding active power to the loads and remaining power to the grid as a function of distribution static compensator (DSTATCOM) capabilities such as mitigating harmonics, balancing of load and improving power factor. The control algorithm provides the ability to adjust weights adaptively in an independent manner and hence it offers alleviation in model complexity predominant during abnormal grid conditions along with reduction in computational time. Moreover, the neural network based control technique offers enhanced accuracy due to the combinational neural structure in the estimation process. In addition, the system performance according to the IEEE-519 standard, has been verified hence, it is proficient in maintaining the power quality. The solar PV array efficient utilization is accomplished through an incremental conductance (INC) based maximum power point tracking (MPPT) technique. For validating the behavior of proposed system, its performance is studied using simulation results. Moreover, a prototype is developed for validation and experimental results corroborate reliable operation under non-ideal grid conditions comprising of wide range of load variations, voltage sag and varying solar insolation conditions.*

Keywords: Incremental conductance (INC) maximum power point tracking (MPPT) algorithm,neural network (NN) etc.

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