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A High Efficiency Reduced Rules Neuro-Fuzzy Based Maximum Power Point Tracking Controller for Photovoltaic Array Connected to Grid

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Abstract : This paper achieves a maximum power point tracking (MPPT) controller using a high-efficiency reduced rules neuro-fuzzy inference system (HE2RNF) for a 100 kW stand-alone photovoltaic (PV) system connected to the grid. The suggested HE2RNF based MPPT seeks the optimal duty cycle for the boost DC-DC converter, making the designed PV system working at the maximum power point (MPP), then transferring this power to the grid via a three levels voltage source converter (VSC). PV current variation and voltage variation are chosen as HE2RNF-based MPPT controller inputs. By using these inputs with the duty cycle as the only single output, a six rules ANFIS is generated. The high performance of the proposed HE2RNF numerically in the MATLAB/Simulink environment is shown. The 0.006% steady-state error, 0.006s of tracking time, and 0.088s of starting time prove the robustness of this six reduced rules against the widely used twenty-five ones.

Keywords : PV, MPPT, ANFIS, HE2RNF-based MPPT controller, VSC, grid connection
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