

Abstract

This paper describes the design process of an FPGA-based sensor-driven intelligent controller applied to a dual-axis sun tracking system. The real-time controller determines when and how much to tune the driving motors to minimize the misalignment of the solar panel with the sun's incident rays in order to maximize power extraction from the panel. To achieve such a digital controller, we developed an FPGA-based heterogeneous system made up of two subsystems: (1) a PD-like fuzzy logic controller implemented on the programmable logic elements fabric of the FPGA using VHDL, and (2) a Nios® II-based data acquisition, processing and monitoring system using the system-on-a-programmable-chip approach. Altera's Quartus II software tools are used to develop and generate the controller. Embedding this controller in a single device reduces chip count, cost and development time while improving system reliability. The controller is simulated and realized on a Cyclone II EP2C35 FPGA platform to verify its feasibility and functionality