University of Central Florida

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Increase PV Power Output with Fine-Tuned Solar Tracking

Introduction

To capture the most energy possible every day, a photovoltaic (PV) panel must follow the sun through the sky. This movement is complicated by atmospheric scattering from cloud cover, altering the maximum point of power production, and must also account for the sun's gradually shifting position through seasons. Conventional automation requires sensors to determine the location of the sun, or a pre-programmed tracking path to predict the position of the sun—systems that can be expensive and inaccurate.

Technical Details

In contrast to angular adjustments using constant step size, this iterative adaptive solar tracking technology developed by UCF researchers uses variable step size. An iterative adaptive control (IAC) algorithm improves solar tracking for maximum energy capture when applied as the system controller to a PV system. The variable step sizes allow for superior convergence speed, accuracy, and stability compared to fixed-step methods.

The IAC algorithm includes an iterative relation that increases the output power from the PV panel by iteratively adjusting its elevation angle (cycling daily), and optionally also the azimuthal angle (cycling annually) to track the position of the sun. The output power is used as the performance function in the IAC algorithm, which is maximized using an adaptive gradient ascent approach. The system controller includes a computing device with memory providing motor control signals determined by the IAC algorithm, stored in the memory, for adjusting an angle of the PV panel.

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Benefits

- Maximized energy capture
- Accuracy

Applications

- Solar power production

Tech Fields

Solar, Thermal

Keywords

PV, photovoltaic, iterative solar tracking, variable step size

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