

Optimization of Solar Tracking Systems

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Abstract : In this paper, an intelligent approach is proposed to optimize the orientation of continuous solar tracking systems on cloudy days. Considering the weather case, the direct sunlight is more important than the diffuse radiation in case of clear sky. Thus, the panel is always pointed towards the sun. In case of an overcast sky, the solar beam is close to zero, and the panel is placed horizontally to receive the maximum of diffuse radiation. Under partly covered conditions, the panel must be pointed towards the source that emits the maximum of solar energy and it may be anywhere in the sky dome. Thus, the idea of our approach is to analyze the images, captured by ground-based sky camera system, in order to detect the zone in the sky dome which is considered as the optimal source of energy under cloudy conditions. The proposed approach is implemented using experimental setup developed at PROMES-CNRS laboratory in Perpignan city (France). Under overcast conditions, the results were very satisfactory, and the intelligent approach has provided efficiency gains of up to 9% relative to conventional continuous sun tracking systems.

Keywords : clouds detection, fuzzy inference systems, images processing, sun trackers

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