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4-BAR GEARED LINKAGE USED FOR PHOTOVOLTAIC AZIMUTH ORIENTATION

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Abstract

In order to capture as much solar energy as possible, the photovoltaic converter has to follow the sun movement during a day; this can be achieved by a tracking system. Most tracking systems have complex and costly structures that can provide wide angle variations. This paper presents a geared linkage that is build up by a planetary system of gears fitted on a linkage, and thus helps in reaching wide angles. Starting from a patented linkage, which reaches ≈200˚ angular strokes, by adding a differential planetary gear pair the possible angular stroke, is amplified; although the resulted geared linkage complexity increases, the linkage transmission angles are more favourable and so the jamming is avoided. By using a geared linkage (driven by a linear actuator) as tracking system, technical and economic problems related to other complex tracking systems (like slew drives) are simplified. The paper presents the kinematic modelling of the proposed tracking linkage and, based on the analysis results, a synthesis algorithm is proposed. An application of the proposed algorithm is exemplified on an azimuth tracking case of a mono-axial PV platform. Considering a certain step motion law of the PV platform for a known location, are determined trough numerical simulations the necessary step motion law of the geared linkage and the tracking efficiency of the tracked PV system.

Key words: azimuth tracking system, geared linkage, large angular strokes, tracking efficiency

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