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Model for Simplified Solar Tracking

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Description

These days, fossil fuels including coal, natural gas, and oil as well as nuclear power are usually used to generate electricity. World power production, which relies heavily on the usage of non-renewable resources, is a contributing factor in some of the most critical environmental issues we face today. One answer to the current problem of one-third of the world's population without access to electricity and being cut off from the national grid is renewable energy, namely photovoltaic (PV) systems. PV systems are still an effective solution for rural areas despite their high capital cost. According to studies, there is a good likelihood that fossil fuel reserves will run out by the end of this century at the current rate of consumption [1].

Sunlight must always impinge on the solar panel at a perpendicular angle in order for PV cells to produce their optimum amount of power. This necessitates continuous monitoring of the sun's apparent daylight motion, leading to the development of an automated sun tracking system that transports the solar panel and places it such that the PV cells are always exposed to direct sunlight. For each degree of freedom, two light dependent resistors (LDR) are utilised. LDRs are essentially light-sensitive photocells. Software will be created that will enable the PIC to find the two LDRs, collect its data from them, and compare the resistance [2].

The cadmium sulphide (CdS) photocell is used in this sun tracker device to detect light. The resistance of this photocell, a passive component, is inversely proportional to the amount of light intensity shining on it. It is linked to a capacitor in series. Based on its dark resistance and light saturation resistance, the photocell to be utilised for the tracker is selected. Light saturation is a situation in which increasing the light intensity to the CdS cells does not result in additional reductions in their resistance. The illumination of sunshine is around 30,000 lux, and a typical light-dependent resistor behaves in terms of resistance with variations in light intensity. Light intensity is measured in Lux. It is evident that the resistance of the LDR decreases as light intensity increases, which indicates that the relationship between the resistance and light intensity is inverse [3].

A scarcity of suitable transient experiments is observed even though various steady-state experiments are publicly available. Such data are crucial for both identifying control-oriented models based on lumped techniques and enabling further validation of model-based intuitions. As a result, developing aim-oriented modelling approaches is necessary for the creation of dependable and affordable SOFC-based energy systems. In order to conduct SOFC transient tests, specialised experimental facilities must be put up as well as strategies for the design of the experiments. The modelling, scaling, and control of the SOFC stack and its ancillaries have also received some contributions. With the use of this model, they were able to mimic the dynamic behaviour of SOFC during a load transient and examine the heat-up phase, offering some helpful suggestions for thermal control [4].

Two CDS photocells, a form of light-dependent resistor, will supply the solar tracker system with its data. Fuzzy logic will be used to underpin the photocell data collecting system, negating the necessity for A/D conversion in the circuit. High resistance semiconductor is the substance used in CDS photocells. Therefore, when light strikes the semiconductor's surface, photons that are absorbed by it will give bound electrons sufficient energy to go into the conduction band. As a result, the resistance is reduced due to the liberated electrons' ability to carry electricity. The photocell will create the least resistance when there is a lot of light present; in total darkness, the converse will happen [5].

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Conflict of Interest

The authors reported no potential conflict of interest.

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