

MECHATRONICS

BOOK SERIES

SYSTEM DESIGN AND SIGNAL PROCESSING

VOLUME 2

Editors

Md. Raisuddin Khan

Md. Mozasser Rahman

Muhammad Mahbubur Rashid

Shahrul Na'im Sidek



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CHAPTER 3

SELF-POWERED SOLAR TRACKING SYSTEM

PART 2: SYSTEM DESIGN

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3.1 Introduction

A solar tracker is a term used to describe devices that orient toward the sun. The devices attached with solar relatives items such as photovoltaic panels, reflectors, lenses or other optical devices. In standard photovoltaic (PV) applications, trackers are used to minimize the angle of incidence between the incoming light and the normal of a photovoltaic panel. This increases the amount of energy produced from a fixed amount of installed power generating capacity. Concentrated photovoltaic (CPV) and concentrated solar thermal (CSP) applications trackers are used to enable the optical components in the CPV and CSP systems. The optics in concentrated solar applications accepts the direct component of sunlight light and therefore must be oriented appropriately to collect energy. Tracking systems are found in all concentrator applications because systems do not produce energy unless oriented toward the sun [1]. The main issue regarding conventional solar panel is about its efficiencies of power absorption. Researches had been conducted and found out that the maximum power absorption happen when the panel is normal to the solar rays [2]. To orient the solar panel according to the sun's position can be achieved by using motors and actuators in the system. The implementation of motors and actuators will create a mechanism to control the orientation of the panel. This angle differs with its location. For accommodating this matter, dual axis solar tracking system should be more appropriate [3,5] which is discussed in chapter 2 while this chapter is the continuation of the previous chapter of solar tracking system.

The design of the tracking system consists of both mechanical and electrical parts. For mechanical part, we need to control the tilt angle of the panel according to the elevation angle of the sun. The movement of the panel controlled by the actuators must be accurate according to the sun position. There are several types of actuators and motors those are commonly used for tracking system.

For the electrical part, we need to affix the functions of autonomous using electronics components such as Arduino microcontroller [6], motor driver. The self-powered feature need electrical component that can integrate between photovoltaic panel, batteries and load supply. In this chapter of Solar Tracking System the system design is discussed.

3.1 Solar Tracking System Design

3.1.1 Mechanical Design. The mechanical design of the solar tracking system is developed and tested using CATIA CAD software. We designed our platform to have a frame with two limbs and a base. The limbs will hold the panel and linear actuator will control the tilt angel of the panel. Fig. 3.1 and Fig. 3.2 shows the mechanical design using the design software.