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 4

SELF-POWERED SOLAR TRACKING SYSTEM
PART 3: SYSTEM INTEGRATION AND TESTING

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4.1 Introduction

Solar energy is the least polluting and most inexhaustible of all known energy sources. The sun bathers the earth with more energy each minute then the world consumes in one year. In Malaysia, the sun intensity does not vary with season. It is a suitable place to develop the solar cell system. To make solar energy more efficient, the solar panel system must be optimized. This project is regarding the development of a sun tracking solar system [1, 2]. This system is a simple tracking solar system using linear actuator, motor and light sensor. The solar tracking system used in this method could increase the power collection efficiency by developing a device that can track the sun to keep the panel at normal to its rays. To utilize the power, this system is made self-powered using the mechanism of battery charging.

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 [3-5]. 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. The system modelling is discussed in chapter 2 and system design is discussed in chapter 3. This chapter discusses the system integration and testing with a discussion on results.

4.2 System Integration

4.2.1 Integration of Mechanical Components. Basically, we need to design the mechanical parts of the system with the ability to integrate with the electrical components. The mechanical parts was basically a frame to hold the solar panel and with 2 Degree of freedom. The shape that we used is a simple rectangular plate with a link support between each limb frame to make it strong. The material that we used is aluminum alloy.

4.2.2 Integration of DC Motor. In order to integrate the dc motor to the base of the frame, a hole needs to be drilled at the center bottom of the frame. The distance of the hole to both ends must be equally measured so that it is aligned with the axis of rotation of the system. After the drilling process is done, the dc motor is attached under the platform by using screws provided. The rotating rod of the motor is fixed at the hole by using stopper and screws as in Fig. 4.1.