CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
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Project Number
J0921

Project Title
Self-Optimizing Solar Tracking System

Abstract

Objectives/Goals
For my experiment, I asked myself this question: Can a self-optimizing solar tracking system produce more energy output over a fixed period of time than a stationary solar panel system? I predicted that if a self-optimizing solar tracking system efficiently tracks the movement of the sun, it will produce greater energy output than a stationary panel over a fixed period of time.

Methods/Materials
To test my hypothesis, I created a self-optimizing solar tracking system that automatically tracked the sun. Key to the development of this system was the creation of a microprocessor driven algorithm that was designed to command multiple servo motors and a light sensor. To conduct my experiment, I measured the power output (watts) of the Self-Optimizing Solar Tracking System that I created, and compared that to the output of a stationary panel over the course of a day, and then plotted these results for analysis.

Results
From analysis of my experimental results, my hypothesis proved to be correct. After several months of development(design, programming, tuning) of the self-optimizing solar tracking system, I was able to demonstrate that a solar panel that autonomously tracks the sun produces greater power output over the course of a day than a stationary solar panel. Power measurements for multiple stationary panel starting light angles were analyzed to simulate the sun#s movement over the course of a year. Experimental results indicated that both the tracking and stationary solar panels produced similar power output until the solar angle became too large and the stationary panel power output dropped dramatically. Unexpectedly, the experimental outcome demonstrated that the stationary solar panel performed remarkably well over a wide range of solar light angles.

Conclusions/Discussion
As result of my experiment, I was able to confirm my hypothesis that if a self-optimizing solar tracking system efficiently tracks the movement of the sun, it will produce greater energy output than a stationary panel over a fixed period of time. Although the experimental conclusions seem obvious, the difficulty in development of the self-optimized solar tracking system and the countless days spent tuning the test environment and taking power performance measurements, proved to be challenging

Summary Statement
My science project verifies that a Self-Optimizing Solar Tracking System will produce greater power output over fixed period of time than a stationary panel.

Help Received
Over the course of my experiment I received assistance from my father, my mother, and my science teacher. My Father helped me with difficulties that I had in the C++ code, my mother helped me layout my board, and my science teacher provided insight throughout the entire project.