AN AUTOMATED SOLAR TRACKER FOR PHOTOVOLTAIC (PV) APPLICATIONS

BY

BARASA MWANZA JOHN

BED (TECH. ED) HONS (MOI UNIVERSITY)

A thesis submitted in partial fulfilment of the requirement for the degree

of

MASTER OF PHILOSOPHY IN TECHNOLOGY EDUCATION

(ELECTRICAL AND ELECTRONIC TECHNOLOGY)

of the

DEPARTMENT OF TECHNOLOGY EDUCATION

SCHOOL OF EDUCATION

MOI UNIVERSITY

OCTOBER 2010

Abstract

The research focused on developing a computerized solar tracking system that automatically moves a parabolic trough along east-west axis. The aim was to track the sun in order to reduce the angle of incidence of the beam radiation on a PV module surface. By so doing, the beam radiation is kept normal to the surface thus ensuring that maximum power is drawn from the solar array.

To achieve this objective, the system was modelled to obtain the optimum operating points and characteristics. The interface circuits were designed, constructed and tested. A program was written using Lab View program that calculates the expected angular position of the sun and reads angular position of the PV module. The program compares the two and an error signal generated. The error signal is then amplified and is used to drive a stepper motor, which turns the module accordingly. The hardware and software were integrated and test measurements taken.

The program effectively controls the motion of motor thus turning the module forward and backward depending on the generated error signal. Results show that the output power remains at an approximate constant maximum value of about 16.54W. This represents an efficiency of 85% compared to the panel's maximum rated value of 19.45W. The power generated can be used directly as dc power or inverted to ac for ac applications. It can be used to power electronic communication equipment as well as for lighting in homes and schools located in rural areas not served by mains supply or as an emergency source of power. Besides, the power can be used for charging batteries to be used as backups in cases of power failure.