

MICROCONTROLLER BASED MAXIMUM POWER POINT TRACKING

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PURPOSE

Advantages of Microcontroller connected to PV panels:

- Controls voltage to get maximum power possible.
- Fast Simulations of algorithm implemented in microcontroller.
- Automatic tracking.
- Using techniques of Incremental Conductance to enhance tracking.

Applications:

- To feed different kinds of loads.
- Charging batteries.

METHODOLOGY

General view of methods and designs used :

- Having photovoltaic panels to collect radiations coming from the sun to convert it to current and voltage.
- Design of Buck Boost Converter to boost voltage or reduce which is controlled by microcontroller.
- Construction of MPPT algorithm using Incremental Conductance method to track the maximum power using four values as inputs (I, V, T, R) to simulate.

- Running the code on microcontroller to calculate duty cycle and send it to the gate of the transistor for boosting or reducing the voltage value.

$Duty\ Cycle = V / (V + V_i)$

Where V is the output voltage of simulation.

Design Segment

Buck Boost Converter:

- Connecting BJT transistor to input of PV panel, duty cycle pin (From microcontroller) and inductor. Positive potential of diode is connected to positive of inductor and negative potential to capacitor. See Fig. 1.

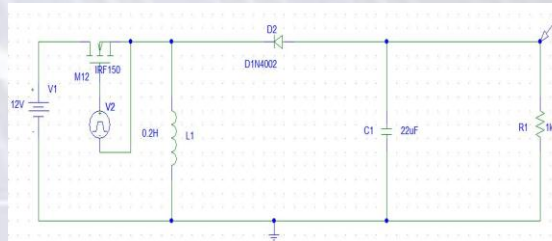


Fig. 1: Buck Boost Converter

- Using voltages divider method to limit maximum voltage coming from PV should be less than 5V in order for microcontroller to accept it.

Algorithm Implantation:

- Using C++ program for microcontroller (PIC16F778A) and Incremental Conductance. Also, Matlab code to MPPT to observe the outputs. The structure of microcontroller is shown in Fig. 2 and Inc Conductance in Fig. 3.

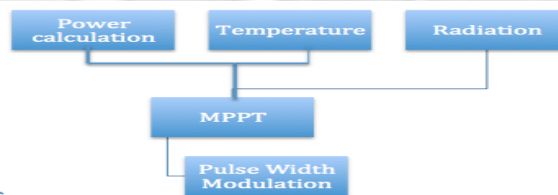


Fig. 2: Microcontroller Code Structure

Design Segment(CONT..)

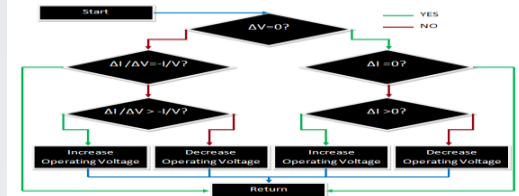


Fig. 3: Incremental Conductance method

- Fabricate a wooden to contain microcontroller and buck boost.

Results

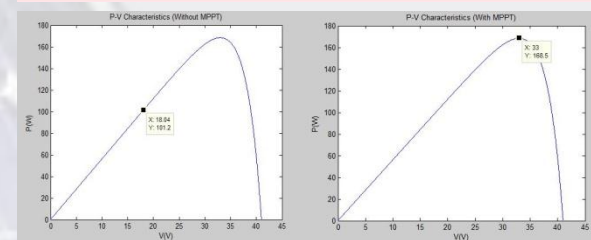


Fig. 8: power comparison with and without MPPT

- In left graph, power coming from PV panel is 100W.
- In right graph, power output coming from microcontroller is 160W.

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