Minimax Optimization of PV Panel Specifications for Different Temperatures

Tamilarasu Viswanathan, R Rajesh

Abstract: ***Mini-max optimization scheme used for identify the PV Panel parameters for different temperatures is presented. PV panel parameters such as output current and voltage with temperatures ideal data taken into account for optimization.Analysis done for both normal and abnormal temperatures.Initially, the data sheet parameters use for setting default values for settingthe optimizationriteria. This values are developed from Short circuit current and corresponding resistances. After the optimization,the value minimize the maximum values responsible for deviation in the optimization produce improved results. Error in the optimization produce improved results. Error calculation done or showing the accuracy of the proposed method and optimization curve match with presented data.***

Key Words: PV panel specification, Mini-max Optimization, Temperature variation, Data Extraction

I. INTRODUCTION

In last two decades, PV panel usage getting increased by means of development in power electronics converters. For wide range environmental operating conditions, PV panel tends to operate in different temperature region. In order to identify the optimal operating point of PV panel irrespective of data sheet so many optimization methods are proposed. The general procedure followed in parameter design is shown in Fig.1. But the problem is to solve Nonlinear functions periodically match with data sheet parameters [1] - [5].Ideally,this step leads to unwanted iteration and error producing and greatly affect theaccuracy.

The main objectives of this work is

• To use min-max optimization for identifying the PV Panel parameters with minimum effort (Avoid non-linear strategy).

• To find the optimal operating point match with data sheet prescribed value for different temperature variations. Innovation of this proposed novel technique is

• To use min max optimization considering the data sheet value as initial criteria for improving the PV panel

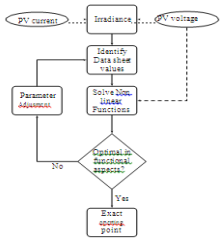

Fig. 1. General Optimization flow of PV parameters Adjustment

II. PV PANEL PARAMETERS

General PV Panel parameters are Voltage, Current and Temperature (which is the base of all other functions). The entire operating point depends on starts with Temperature variance and impact on irradiance.

A. IdealSpecification

The ideal specification of any PV panel given as (are

Parameter selection.

• To data prescribe for operating PV panel under different

(Equ.1) and its data sheet ideal values are

Is = f(Isc,Voc) (1)

R =−dV@V

di(2)

temperature conditions are match with data sheet suggest values.

R =−dV@I

dI(3)

PV - Parameters	Values
I_S	30 µA
I_{SC}	4 A
R_S	40 mΩ
R_P	10Ω

Table1. Ideal Datasheet Values - Pv Panel

A. Controlling Temperature Dependence - Optimum Value

Non-linear relationship shows in i-v curve of any PV panel makes complication for identifying the optimal values fortemperature variation shown in Fig.2.

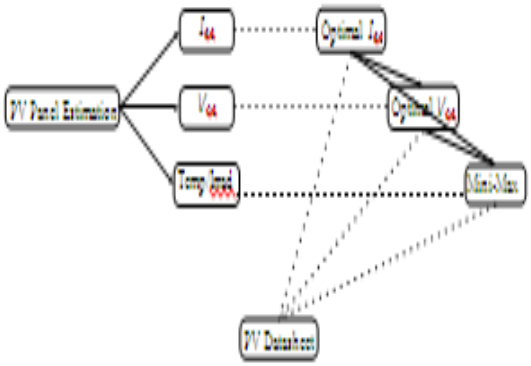

Fig 2. Optimal Value Identification

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III. MINI-MAX OPTIMIZATION FOR PARAMETERS

A. Initial Setting and Design

One of the popular optimization technique is Mini-Max with minimum specific parameter with number of co-efficient similar to order of non-linear equation the data taken fromTable 1.

B. Boundary of Parameter and Rule out -Co-efficient

Next essential step to remove the negative co-efficient with negative and positive maximum values. Otherwise, remaining values are taken in account with scaling factor either up or down as per Fig.3

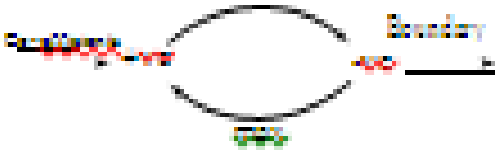

Fig. 3. Identification of Boundary Limit and scaling

C. Optimization for Minimize the Max Values

A key feature of minimax decision making is being non-probabilistic: in contrast to decisions using expected value or expected utility, it makes no assumptions about the probabil- ities of various outcomes, just scenario analysis of what the possible outcomes are. To find the better value of optimiza- tion iterate until the value nearest integer value match with optimization.

IV. RESULTS AND DISCUSSION

A. Room Temperature and Non-Room Temperature

Comparison of Room Temperature andNon-roomtemper-ature for actual data with data sheet is shown in Fig 5. At high temperatures, the estimate values not match with exacted values but low temperaturevice-versa.

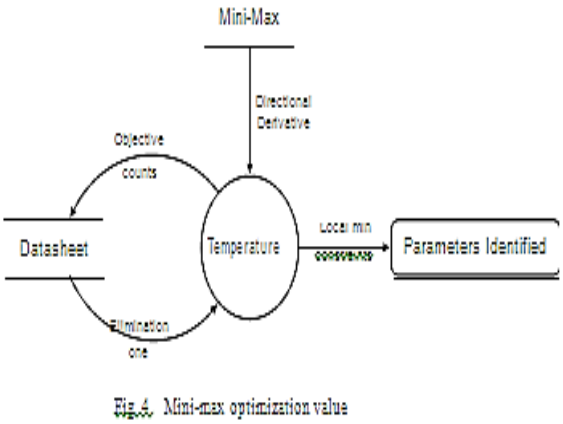

Fig.4. Mini-max optimization value

Fig. 5. Temperature Variation for Extracted data vs Estimated Data

V. CONCLUSION

A novel Mini-max optimization scheme proposed for identify the PV Panel parameters for different temperatures Output current and voltage with temperature optimized for PV panel Estimation. Normal and abnormal temperature analyzed for the data sheet parameters setting the optimization criteria and result show the same.

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