User's Guide

Overview

The aim of this project is provide the I-V characteristic of a simulated photovoltaic generator under mismatched conditions. The final goal is to help understand how mismatched conditions can affect the power production performance and how the implementation of bypass diodes modify the electrical behaviour of the panel. This is a hands-on guide with the recommended procedures to use this project. This section is focused on the proper usage and understanding of the functions and objects contained in the project. For any concept-related question refer to the **Theoretical Documentation** section.

Usage of the project

Since there are no possible options for the user, the main() function of the project does all the necessary steps. All the possible configuration of the parameters is written inside the code (hardcoded). The only external data that a user can introduce is the input file. This file completely describes the structure of the PV panel to be simulated. It specifies the number of strings, the number of cells in every string and the state of every diode. It also contains the values of irradiance and temperature of every cell. For more information about the input file check the **Input file format section**. Without further modifications, the code uses all the reference values, specified in the documentation of the project's classes. The output containing the I-V characteristic ("prova_2y.dat") can be found in the same location as the project. This file contains the voltage applied to the panel, the total current, the sum of voltages of every cell in the first string of the panel, the current through the cells of the first string and the current through the bypass diode of the first string, correspondingly.

Input file format

This section specifies the format and structure for the input file required to provide the physical information of a solar panel. This file contains the following information:

- Number of strings.
- State of the bypass diode (0-broken / 1-ok).
- Number of cells in every string.
- Irradiance [W/m^2] and temperature [ºC] of every cell.

Attention

The format recommended for the file is a **.csv** file. Other file formats may not being reconized by this library.

The structure to introduce the information in this file must follow these rules:

- Every string is composed by:
  - The first line refers to the bypass diode. It only contais 1 value: 1 if the diode is present and ok, 0 if there is no diode or it is broken.
  - The following lines represent the cells in the string. Each line represent one cell and they are sorted following their physical order. Cell lines contain two double values: the first one belongs to the irradiance [W/m^2] and the second one to the cell temperature [ºC].

    - The string ends when it finds the next bypass diode line (next string) or an empty line (end of the file).
- The library interpretates the file order (of cells and strings) as their corresponding physical order.
- There can only be bypass diode lines (1 value) and cell lines (2 values).
- Bypass diode lines can only contain a boolean value.
- Cell lines can only contain two consecutive double values.
- The first empty line will be interpreted as the end of the file and the rest of the file won't be taken into account.

The following example represents a panel made out with 2 strings with 3 and 5 cells correspondingly. The first string doesn't have bypass diode and the second one is partialy shaded.

```
0
1000.0;25.0
1000.0;25.0
1000.0;25.0
1
1000.0;25.0
250.5;23.6
213.4;20.7
250.5;23.6
1000.0;25.0
```

Please, consider that the ';' represents the division symbol of the .csv file used. Adapt this symbol according to your .csv editing software configuration.