Lisa software – tutorial

Warning: this is a draft version, may contain mistakes. If you spot a mistake, please contact me.

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Requirements

To run Lisa, one needs:

1. Python, version 2.7 (usually preinstalled on Linux distributions and OS, can be installed on Windows).
2. Numerical python – numpy. To install it on Ubuntu Linux, type:

```
sudo apt-get install python-numpy
```

3. Matplotlib library to plot the results. To install it on Ubuntu Linux, type:

```
sudo apt-get install python-matplotlib
```

4. Scipy library. To install on it Ubuntu Linux, type:

```
sudo apt-get install python-scipy
```

Example run – single simulation

1 Adjust the parameters in the parameters.py file

In particular, set the output flags to "True" for a single calculation.

Comment
If `jv_flag` is set to `true`, Lisa calculates the full JV characteristic and saves it to the file. This can take much longer than standard simulations. When this flag is set to `false`, Lisa uses algorithms to find maximum of the power density curve and Voc, and therefore needs much less voltage points to calculate the solar cell performance. The calculations are much faster (the calculation time depends linearly on the number of voltage points).

2 Run the solver

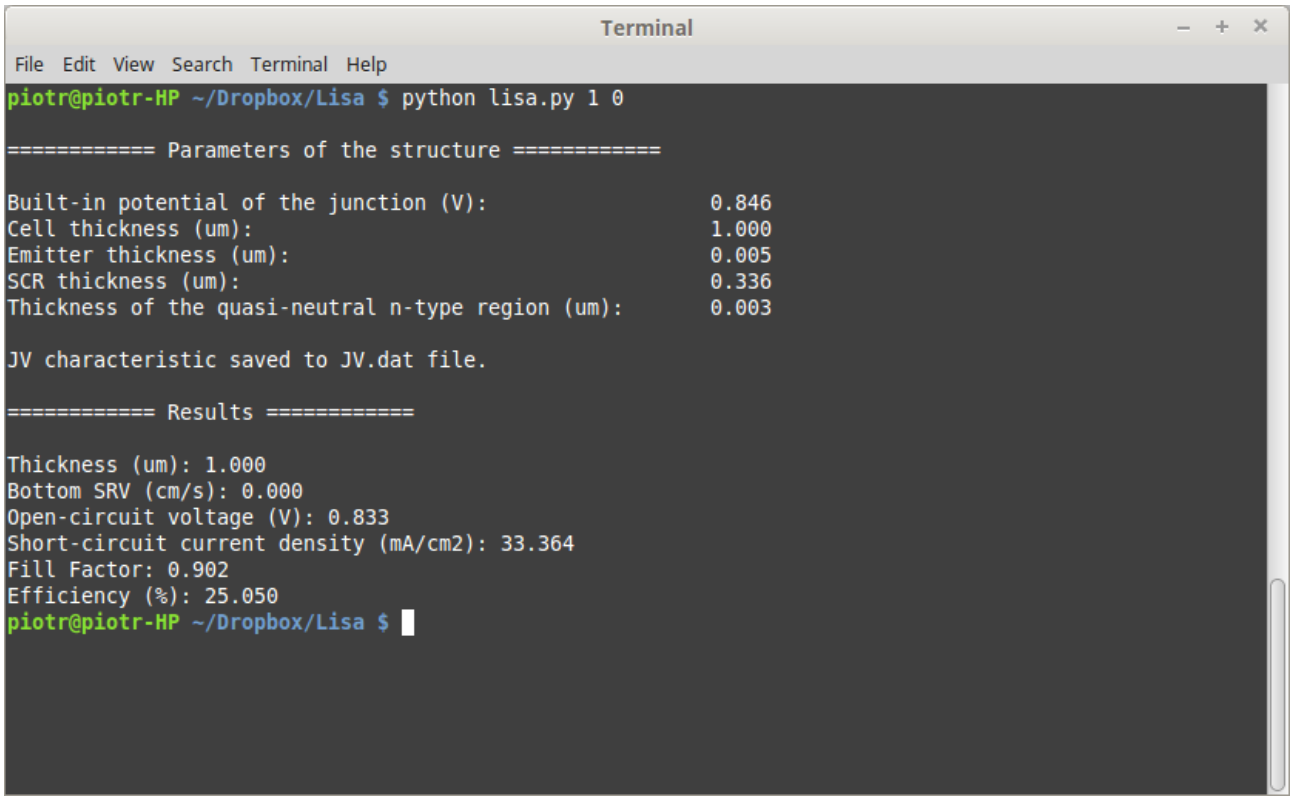
In the console type:

```
python lisa.py [thickness in um] [SRV in cm/s]
```

For example:

```
python lisa.py 1 0
```

3 The results are printed in the console



4 Plot JV curve

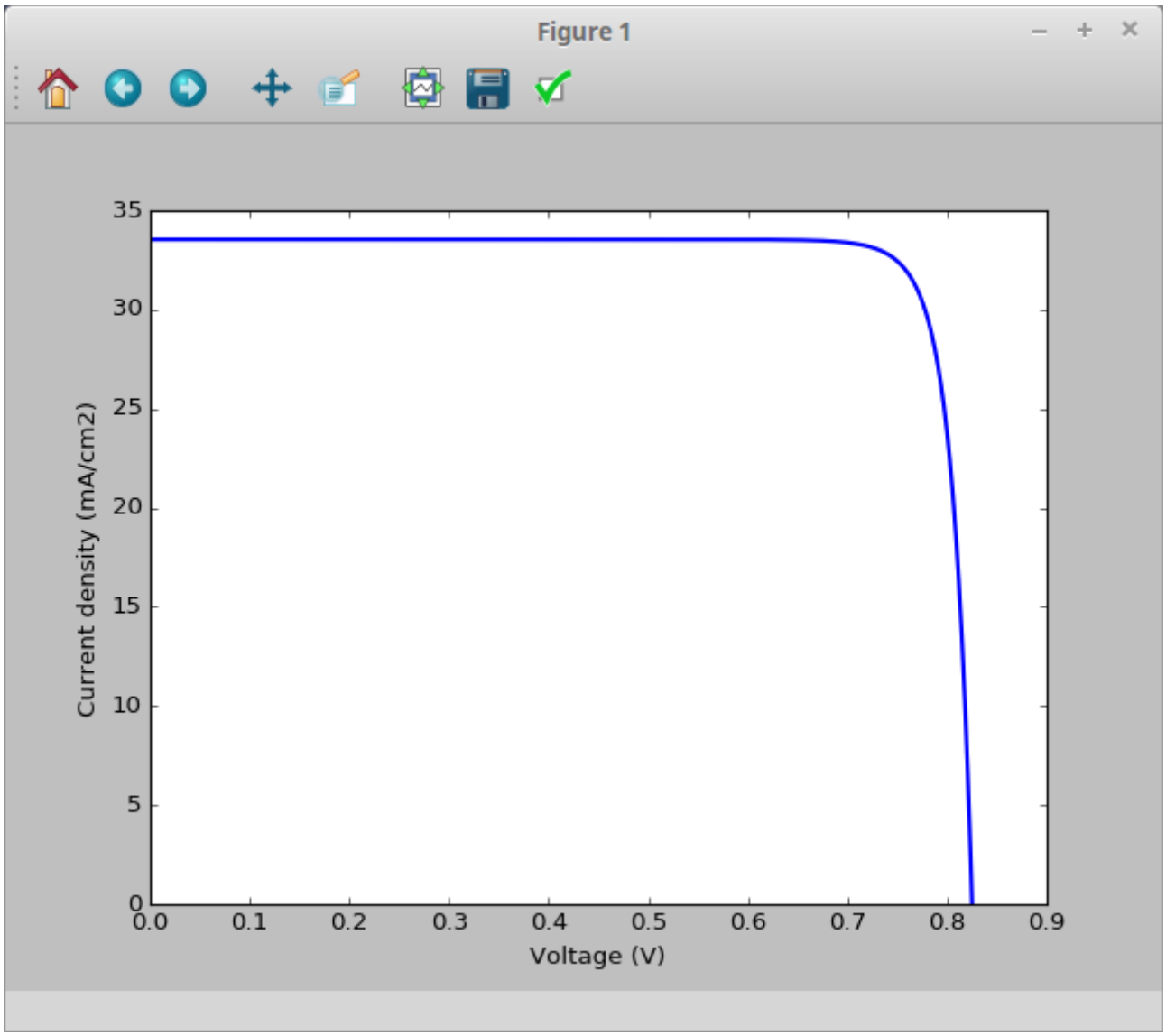
In the console type

```
python plots.py jv [filename]
```

The file should be in the `Results/` directory. For example:

```
python plots.py jv JV.dat
```

You should get plot similar to this one:



The axis of the plot should be automatically adjusted to the value of Voc.

Example run – batch simulation

For example, we want to calculate efficiency limits in a given thickness range.

1 Adjust the parameters in the parameters.py file

In particular, set all output flags to "False" for a single calculation.

2 Prepare loop

Edit loop.py file. E.g., set thickness range. Then run it:

```
python loop.py
```

File loop.sh will appear, execute it:

```
sh loop.sh
```

The calculations will start, and the results will be printed on a screen. If you want to save the results to file, instead of the command above, you type:

```
sh loop.sh >> [filename]
```

The output will be saved to the given file. If later you want to plot the results with Lisa, the best is to save the file in the ./Results folder.

3 Plot the results

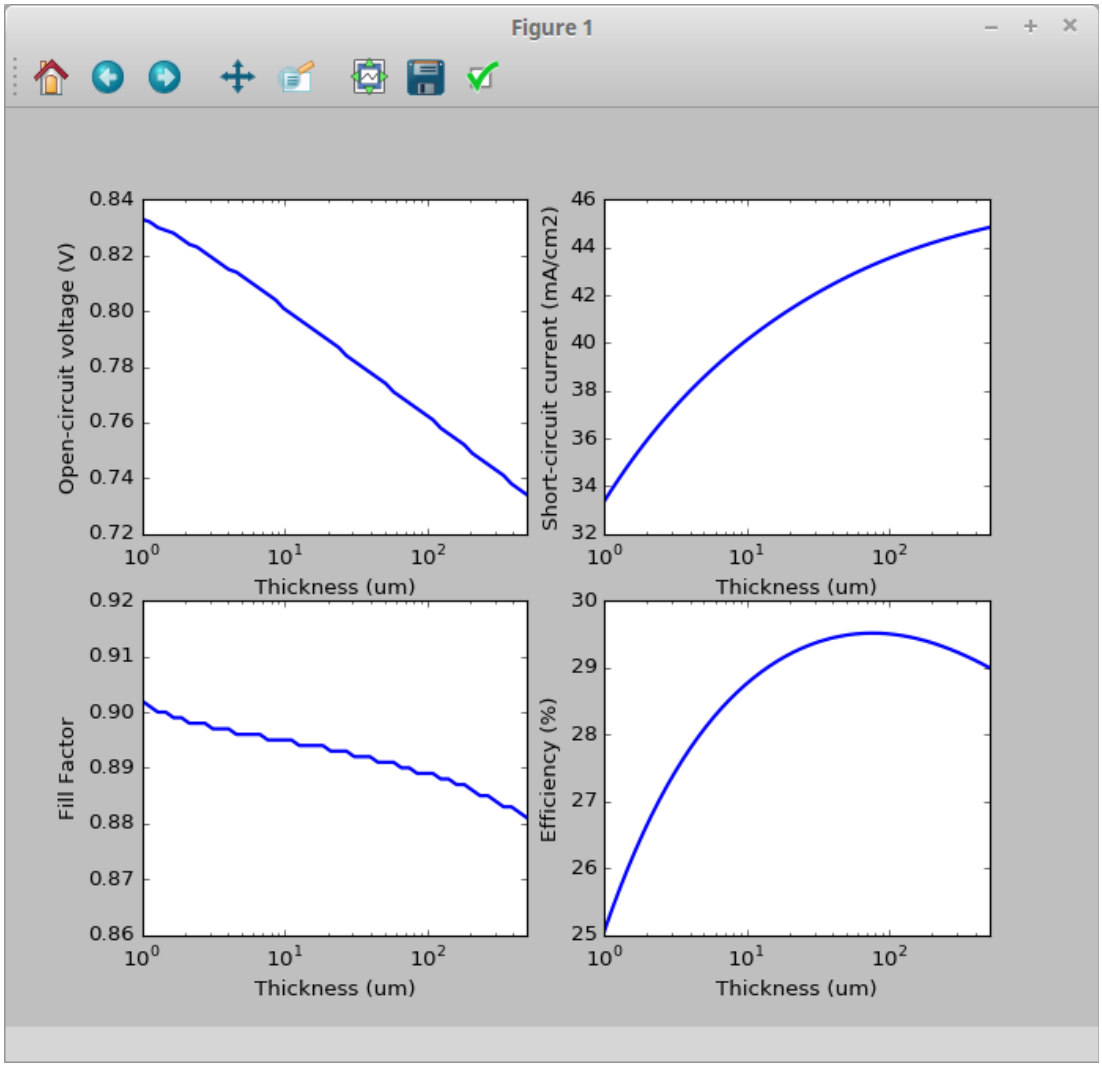
Now you can plot characteristics of the cells. Type:

```
python plots.py panel [filename]
```

For example:

```
python plots.py panel loop.dat
```

You should get plot similar to this one:



4 Plot the results – comparison

It is often useful to compare our results with a different data set. For example, we want to compare the results obtained using the Hovel model with the results obtained using the diode equation. To do so, type:

```
python plots.py panel_comparison [filename 1] [filename 2]
```

For example:

```
python plots.py panel_comparison loop.dat loop_diode.dat
```

You should get a plot similar to this one: