

Environmental data monitoring DataGUI v1.0

User guide

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Contents

1	Introduction.....	3
1.1	Irradiance measurement	3
1.2	Wind speed measurement	3
1.3	Ambient temperature.....	3
1.4	Module temperature	3
2	Installation.....	4
2.1	Matlab 2012b, 32-bit.....	4
2.2	Matlab 2012b, 64-bit.....	4
2.3	Matlab pre-2012b, or no Matlab.....	4
3	Operation of the graphical user interface.....	6
3.1	Input fields.....	6
3.1.1	Interval selection (brown)	6
3.1.2	Data reading (blue).....	6
3.1.3	Data verification (orange).....	7
3.2	Main control panel (green).....	7
3.2.1	Plot.....	7
3.2.2	Export	7
3.2.3	Close	7
3.3	Display fields.....	7
3.3.1	Plot area.....	7
3.3.2	The MinMax panel (red).....	8

1 Introduction

This software can be used to access, visualize, plot and export the environmental data measurements of the high sampling rate data acquisition system (Irradiance, Wind Speed, Ambient Temperature and PV Module Temperature) implemented in the Photovoltaic Systems Laboratory in PON 109. There are measurements available with 200ms sampling rate starting from 16.06.2011. The data logging is on-going.

The meteorology measurements visualization software is a Matlab GUI that establishes a connection to the DAQ2DB database that contains all the measured data, currently located on a computer in the lab.

The software has three main functionalities:

1. Data visualization: Retrieves the measured values from different tables in the database
2. Plot or export them in various formats (.xml or .mat)
3. Data binning: Counts the number of available data in the specific time interval, based on the bin size and plot it for the user (this is useful for the user to see if any data is missing, and to give an idea of the amount of data that will be transferred)

The software has been tested under Windows 7 and Windows XP.

The measurement and data acquisition system has the parameters as described below:

1.1 Irradiance measurement

The irradiance is measured using the Si-RS485-TC-2T-v, digital Silicon Irradiance Sensor with RS485 port. It is able to measure in the range of 0 - 1400 W/m².

The datasheet can be downloaded from: http://ib-mut.de/data/files_downloads_en/Si-Sensoren_RS485_E.pdf

1.2 Wind speed measurement

The wind speed is measured using a small wind sensor with 0-40m/s range, and an accuracy of ± 0.5 m/s.

More information can be found here (product code: 4.3515.51.100):

http://www.thiesclima.com/Small_Wind_Sensor.html

1.3 Ambient temperature

The ambient temperature is measured with a Pt1000 sensor, with accuracy of $\pm 1\%$ of FSV.

Its datasheet can be downloaded from: http://ib-mut.de/data/files_downloads_en/Tamb420_E.pdf

1.4 Module temperature

The module temperature is measured using a built-in temperature sensor in the Si-RS485-TC-2T irradiance sensor, with an accuracy of $\pm 1^\circ\text{C}$.

The data is collected in digital form using serial communication, with MODBUS protocol.

2 Installation

The GUI has been compiled and deployed on the **2012b** version of Matlab, both 32 bit and 64 bit architectures.

2.1 Matlab 2012b, 32-bit

If you have this version of Matlab, no installation is required. Download the DataGUI_32.exe from http://homes.et.aau.dk/des/MeteoGUI/DataGUI_32.exe and run it.

2.2 Matlab 2012b, 64-bit

If you have this version of Matlab, no installation is required. Download the DataGUI_64.exe from http://homes.et.aau.dk/des/MeteoGUI/DataGUI_64.exe, and run it.

2.3 Matlab pre-2012b, or no Matlab

If you have an older version of Matlab or no Matlab installed, you can download the installer package that works standalone:

32-bit version: download and install DataGUI_32_MCR_pkg.exe from http://homes.et.aau.dk/des/MeteoGUI/DataGUI_32_MCR_pkg.exe

64 bits version: download and install DataGUI_64_MCR_pkg.exe from http://homes.et.aau.dk/des/MeteoGUI/DataGUI_64_MCR_pkg.exe

The installation has the following main steps for both the 32- and 64-bit versions:

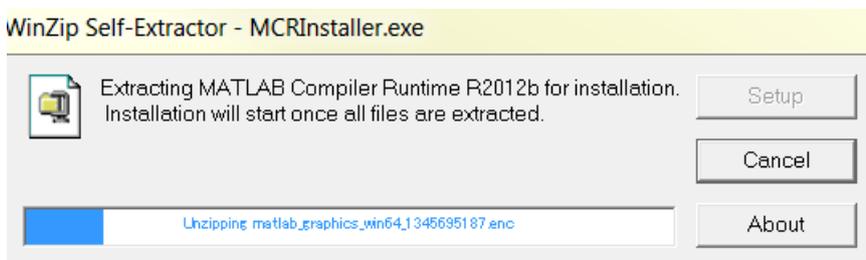
1. After executing the downloaded .exe file, a command window appears, similar to the image below.

```
MMUnZipSFX 6.00 of 20 April 2009, by Info-ZIP. Modified by The MathWorks, Inc.
Send bug reports to support@mathworks.com.
  inflating: _install.bat
replace MCRInstaller.exe? [y]es, [n]o, [A]ll, [N]one, [r]ename: A
  inflating: MCRInstaller.exe
CreateFile() error 32 when trying set file time

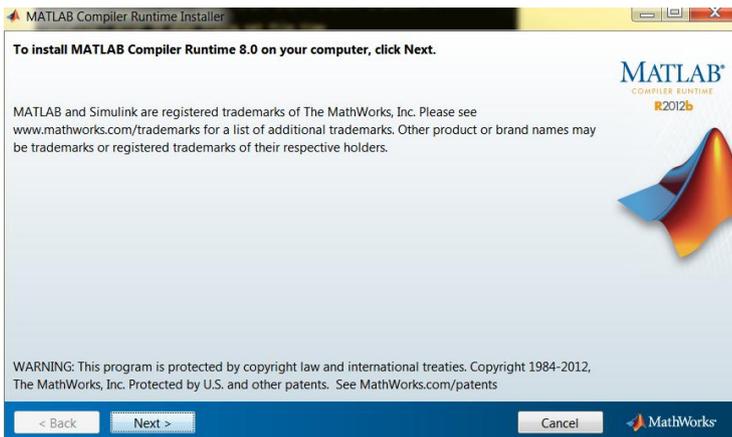
  inflating: readme.txt
  inflating: MeteoDataGUI_64.exe
```

This first stage of extracting can take a few minutes.

2. After the above process is done, the WinZip Self-Extractor window appears



3. In the next step the installer for the Matlab Compiler Runtime will appear, as below:



After the installation is done, run 'MeteoDataGUI_32.exe' or 'MeteoDataGUI_64.exe'

Note: in order to have access to the database, you must be on the local DET wired network in PON 101, or on the laboratory network. The database cannot be accessed from the AAU wireless network.

3 Operation of the graphical user interface

The graphical user interface is presented on Figure 1.

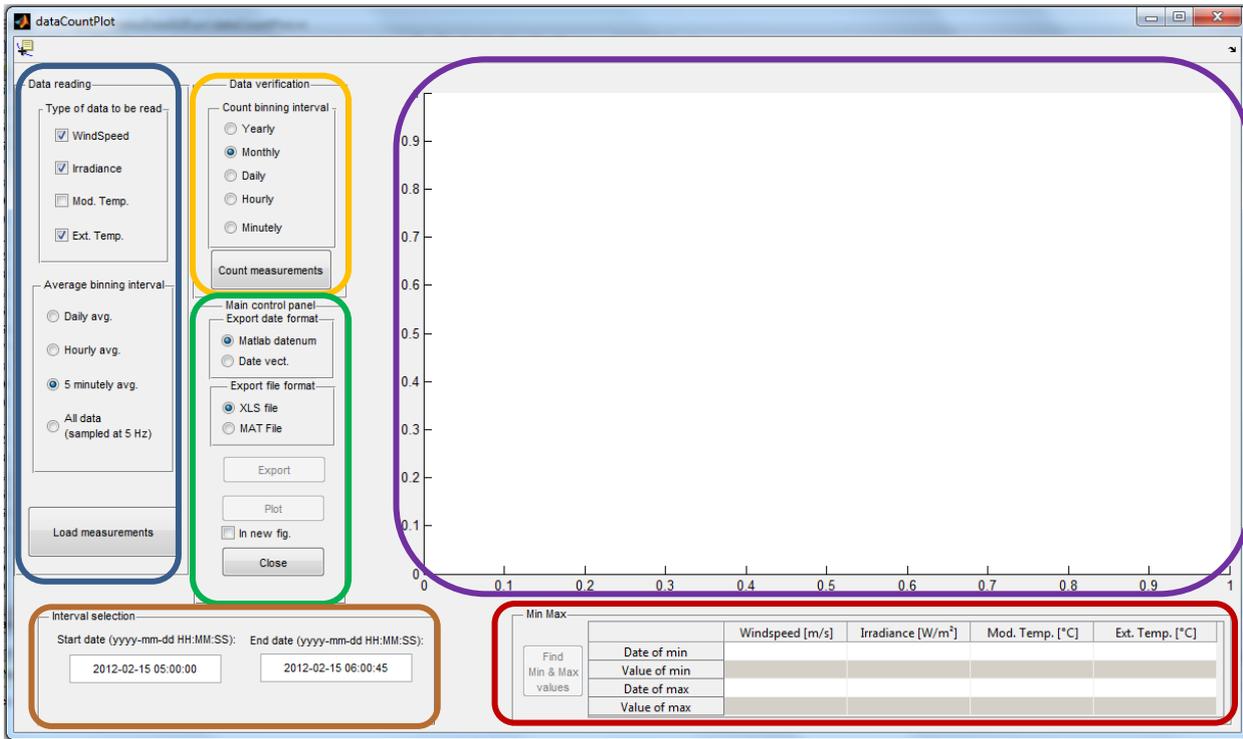


Figure 1 Graphical user interface

It consists of two main parts: control fields (3.1) and display fields (0). The process of working with the software should follow the sequence presented below.

3.1 Input fields

The fields on the left of the GUI, marked with **blue**, **orange**, and **brown** represent the input fields.

3.1.1 Interval selection (**brown**)

Firstly, the user has to select the interval which needs to be analysed. It has to be typed in the boxes called “Start date” and “End date” in the format “yyyy-mm-dd HH:MM:SS”, but it does not need to be complete. If the date is not complete, the software tries to complete it (starting from the greater time unit – year, to the smallest one – second) with the lowest possible date value. A default value is given (as an example) when the program starts.

3.1.2 Data reading (**blue**)

The data reading panel contains the data type, the bin selection for the averaged values and the “Load measurements” button. In the data type, the boxes have to be checked, depending on which data the user wants to load. The bin size also has to be selected. Besides the case when all data is loaded (“All data (sampled at 5 Hz)” radio button), the average values are taken for the specific bin (Daily, Hourly, Five minutes). After all the above mentioned settings are made, the measurement values can be loaded by pushing the “Load measurements” button.

Note: The loading process can be cancelled by pressing the cancel button on the window that popped up.

3.1.3 Data verification (orange)

By using this panel, the user can input the bin size of the data availability check. By doing so, the software will count the available data in each bin (minute, hour, day, month, year) in the period set in the “Interval selection” field.

Notes:

- the “Export” and “Plot” buttons are inactive if no data is loaded.
- The query may take a long time, if the interval is wide. Warning messages are displayed if it is the case.

3.2 Main control panel

After the desired data has been loaded using the above mentioned process, the next step is to visualize or save the result. The three buttons present on this panel (green) are described below:

3.2.1 Plot

By pressing this button, the loaded data will be plotted on the field marked with purple. If further plotting tools are needed, the “Plot in new figure” checkbox may be checked. Now, after plotting, Matlab opens a new figure with further tools, allowing the user to edit and save the figure.

3.2.2 Export

This button is used for saving the loaded data on the hard drive. Before pressing this button, the user should choose a file type and format for the date.

There are two possibilities of file type to export to:

XLS – Microsoft Excel worksheet

MAT – MATLAB formatted binary file

The format of the date and time stamps, can also be chosen using the “Export date format” panel. After the export button is pushed a window pops up asking for a filename and a path for the file. Note that a filename is suggested containing the date interval selected by the user.

3.2.3 Close

Use this button to close the GUI.

3.3 Display fields

The fields marked with purple and red are the panels used for displaying the loaded data.

3.3.1 Plot area

The field encircled with purple is the place where the data is plotted.

- If further plotting tools are needed, the “Plot in new figure” checkbox may be checked. Now, after plotting, Matlab opens a new figure with further tools, allowing the user to edit and save the figure.
- The x axis displays the date and time in the “MM-DD hh:mm” format.
- In the upper left corner, a cursor button is available (Figure 2, encircled with grey). After enabling it, the user can click on the plot points to view their exact values.

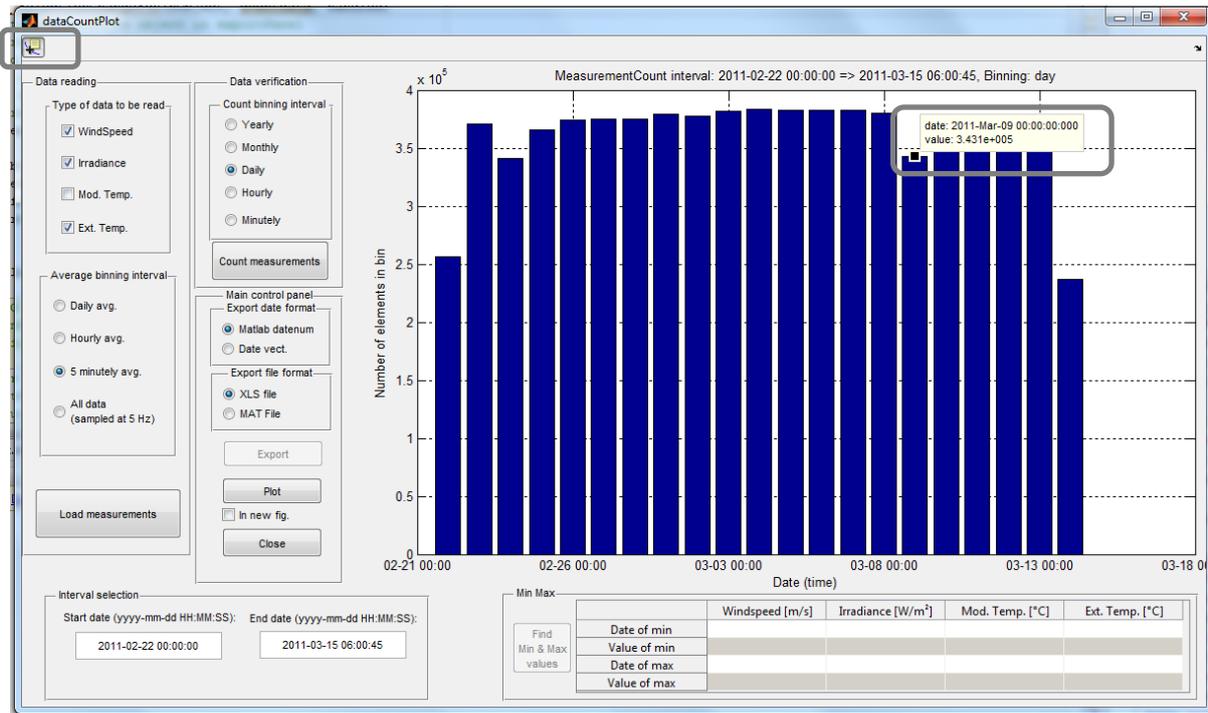


Figure 2 Cursor placement

3.3.2 The MinMax panel (red)

The MinMax panel displays the minimum and maximum values of the loaded data (in case of measurements' values). After the data reading is done, the "Find MinMax values" button may be pressed. The values will be displayed in the fields of the panel, stating the minimum and the maximum values and the exact date and time they were measured. For the fields where no data has been loaded a "-" sign is displayed.

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