A GUI for plate reader results analysis

A. Overview:

This GUI enables to analyze plate reader results:

1. Automatic calculation of the average of a few wells (repetitions)
2. Plotting of the average + standard deviation of OD, reporter, or reporter to OD ratio, with ability to control the color and line properties of each group, which group to display, the limits of the plot, and an option to display each well separately
3. Defining a blank group or subtracting a constant value
4. Load settings from previously saved sessions

B. The Excel input file:

See in the .zip file a template for the Excel input file and use it, it will be simpler than creating a new one as the spelling and latter case of the sheet names are important (in any case, the input Excel file has to have the following sheets inside: 'od' and 'reporter'– it is OK to have more sheets, but those three are mandatory).

The 'od' and 'reporter' sheets will include the reads from the plate reader – the header line should be as in the template file – time, temperature (not mandatory) and a list of all the wells (it is necessary to keep the marking as is, i.e. 'A1', 'A2', 'A3',…,'A12','B1', etc. but the order is not important, only the first column has to be the time in a 'hh:mm:ss' format). It is OK to leave one of them empty if you don't have the measurement of the OD or of the reporter, but keep the sheet and the headers!

MAKE SURE THERE IS NO OTHER TEXT/NUMBERS IN THE SHEETS – IN THE 'od'/'reporter' SHEETS – YOU DON'T HAVE ANY EXTRA ROWS BELOW THE LAST TIME POINT.

(The sheet 'layout' in the input file example file contains a table as should be used if you want to define the input in Excel, see section E for more details.)

This   is   how   the   GUI   window   looks   like   before   loading   any   file.
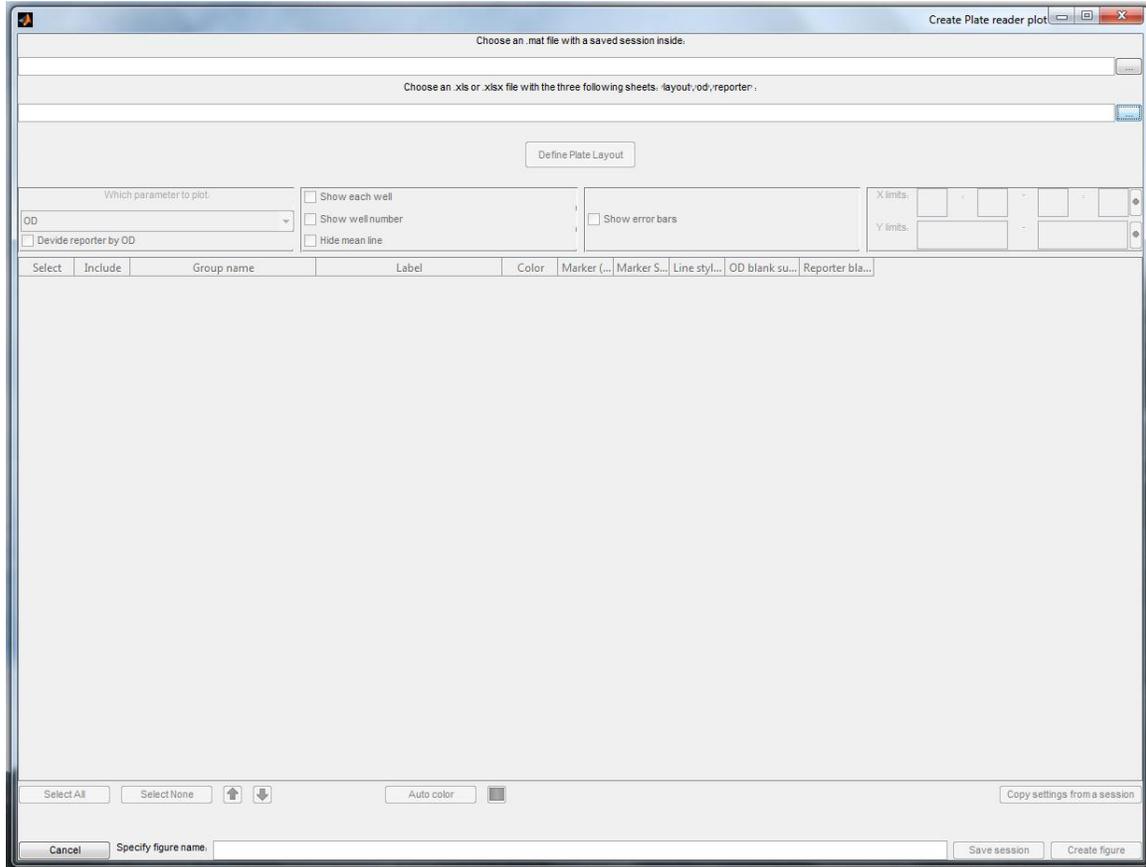
After loading a file this is how it becomes (depending of course on the file being loaded, in this case it is the 'inputFileExample.xlsx' that is included in the .zip file):
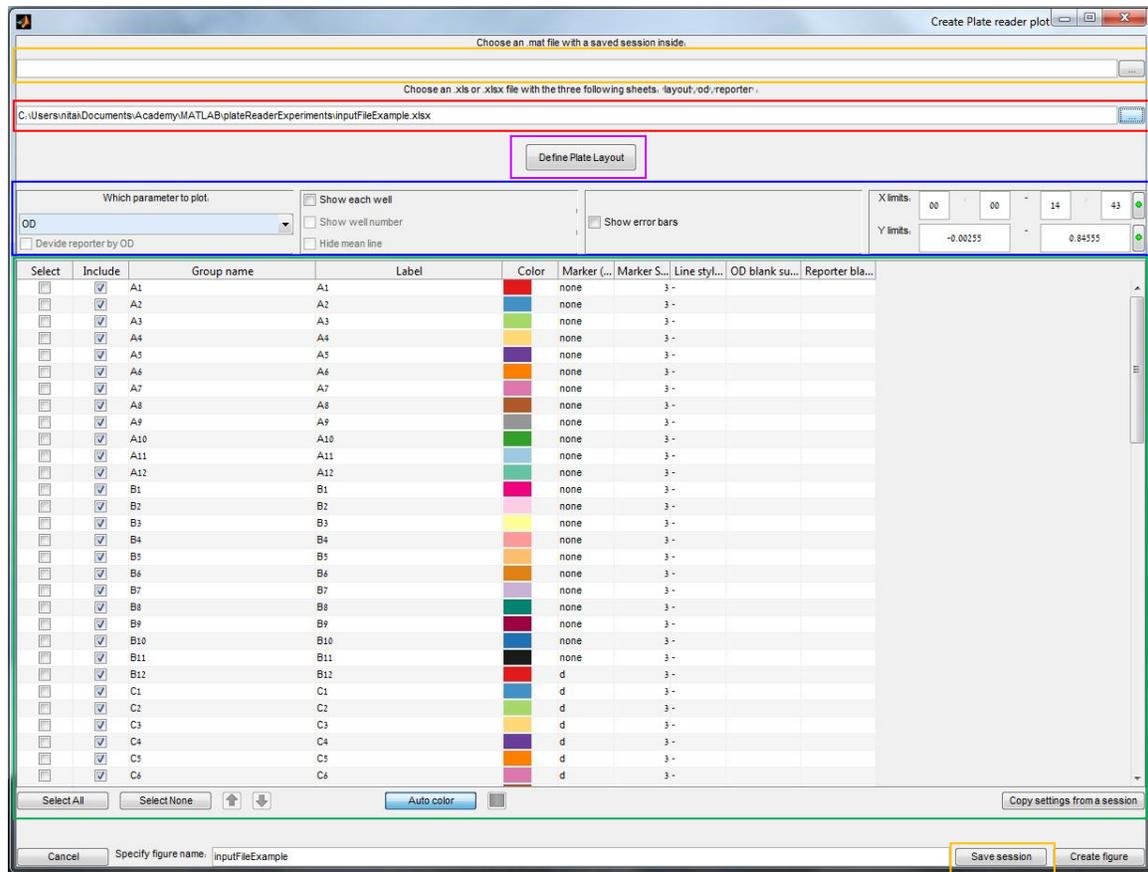
In the red frame you define the Excel input file you want to load - see section D.

In the orange frame you define the session file you want to load (up) or save the current session (down) – see section H.

In the purple frame you have the button to go to the definition of the plate layout – see section E.

In the blue frame you define general plot options – see section F.

In the green frame you have the table displaying all the groups defined in the Excel input file (see section B), and you can define the specific plotting properties of each of the groups – see section G.

D. Loading an Excel input file
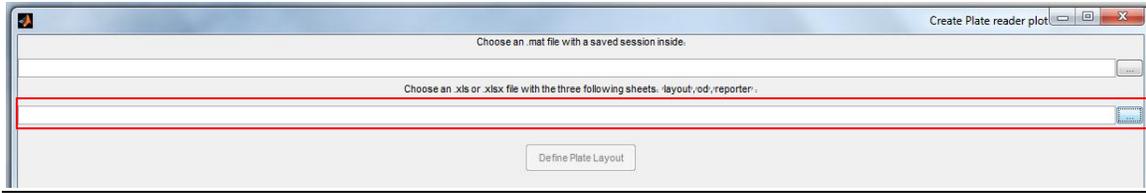
In order to define which Excel input file you want to load you can either click on the three dots button and it will open a dialog box to choose the file, or you can type it in the text box on the left side of it.

After loading the file the GUI window will change its appearance as was shown in section C.

E. Defining the plate layout

Once you press on the [Define Plate Layout] button you make the main GUI window deactivated and a new window pops up:
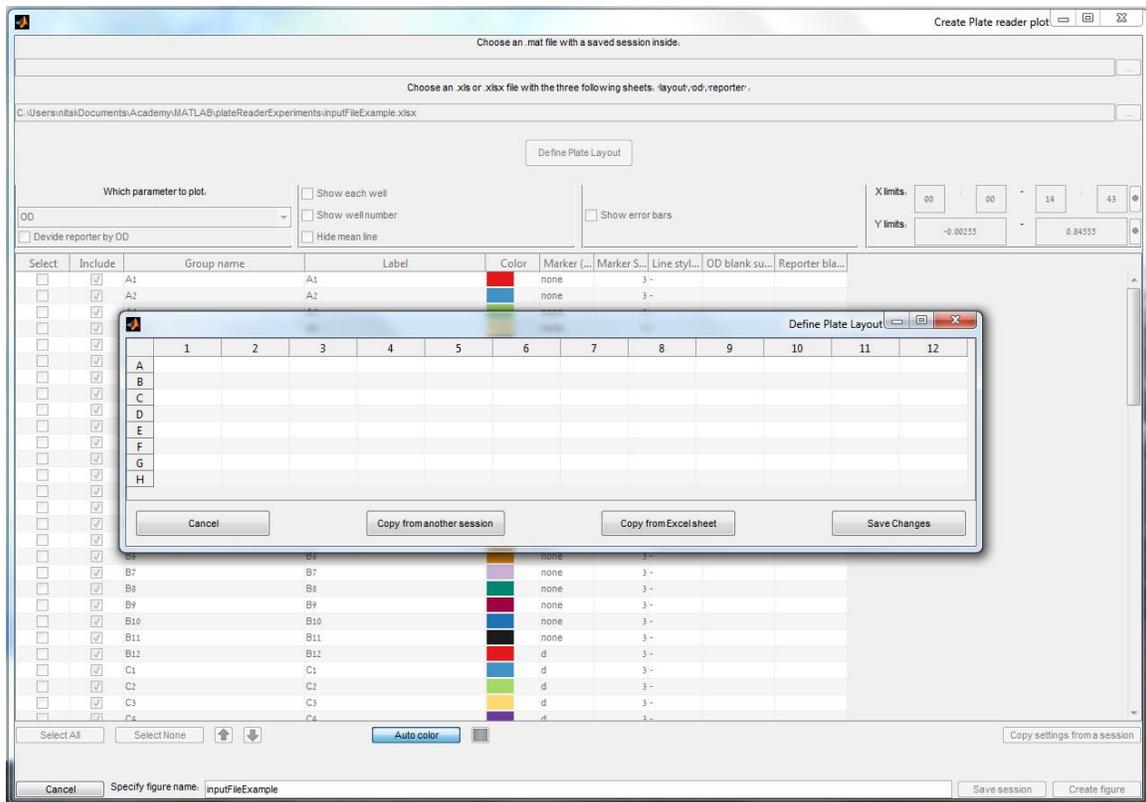
In this table you define in which well each of your samples reside. This part is important if you make repetitions of your samples. In this case you must give all the repetitions EXACTLY the same name in order to group them into the same group (best to use copy paste). If you leave

the table entirely empty – there will be no grouping and each well will be a separate group named by its position. If you leave some empty cells they will be not included in the analysis.

If you click the [Copy from another session] button, you can choose a session from which you will copy the plate arrangement (see section H on saving a session).
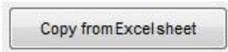
If you click the [Copy from Excel sheet] button, you will be asked to choose an Excel file with a sheet containing the layout. This sheet must contain the following format with no text in any other place in the sheet, and row A (the numbers 1-12) and column 1 (the letters A-H) as they are in the screenshot below. The sheet 'layout' in the input file example file contains such a table as an example.

F. General plot options

In the red frame you can chose whether you want to plot the OD, the reporter, or a ratio between the two (by marking the checkbox below the popup menu when the 'reporter' is selected). It will automatically update the limits in the orange frame to match the plot.

In the blue frame you have an option to show each well separately – each group will have its wells displayed in the same color (a little bit brighter from the color defined in the table). To show the well number beside each line, mark the checkbox below when this option is activated. You can also hide the mean line if you don't want to display it.

In the green frame you have an option to show error bars based on standard deviations of each of the groups in each time point.

In the orange frame you can define the x and y axis limits manually, or you can click on the green buttons on the right side in order to reset them to their default values.

G. Selecting groups and changing their properties

In this table you can select each of the groups and change its properties.

To select which group(s) you want to modify you can mark the checkboxes in the 'Select' column, or change use the 'Select All', 'Select None' buttons bellow.

Once you mark some of the groups you will also see these buttons ⬆ ⬇ 🔲 becoming available, more details on them below.

BEWARE - EACH ACTION YOU MAKE WILL AFFECT ALL THE MARKED GROUPS IN THE 'Select' COLUMN! *if the action is preformed on a selected group, if not it will affect only this group.

So it is wise to deselect all groups using the 'Select None' button between actions to avoid accidents (as there is not 'undo' button…).

The actions you can do are the following:

1. Change the 'Include' column – Define which groups you want to include in the plot, it will change the x and y axis limits accordingly.
2. Change the 'Label' column - Define a legend label that can be different than the name of the group as defined in the Excel input file (it cannot unite groups, in order to do so you need to modify the Excel input file in Excel…).
3. Change the 'Color' column – Click on the color column will open a dialog box to select a new color for the group. It will make the ⬚ Auto color ⬚ button off. If you want to reset the colors to the auto setting, press this button again.
4. Change the 'Marker (+,o,*,.,x,s,d,^,v,<,>,p,h,none)' column – to define which marker will be used in order to plot the selected group(s), it can be each of the options mentioned in the parenthesis, see Matlab help on lineseries properties.
5. Change the 'Marker Size' column – to define the size of the marker in pixels.
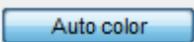
6. Change the 'Line style (-,--,:,-.,none)' column – to define which line style will be used in order to plot the selected group(s), it can be each of the options mentioned in the parenthesis, see Matlab help on lineseries properties.

7. Change the 'OD blank subtract (blank group\scalar)' column – define a blank group for the OD value of the selected group(s), it can also be a constant number. In case it is a group it has to be one of the groups in the Excel input file, and it will subtract the mean of that group wells in each of the time points from the values of each of the wells in each time point of the selected group(s) and then it will calculate the mean of the subtracted values. If it is a constant numbers it will subtract it from all the time points. In order to cancel – just erase the content of that column.

8. Change the ' Reporter blank subtract (blank group\scalar)' column – as in 7 just for the reporter values.

9. ⬆️ ⬇️ - To move the selected groups up/down the list and the display order (which is on top of which in the plot area, and the order of the legend entries). If more than one group is selected all the groups will be moved up or down and will be just below (or above) the highest (or the lowest) selected grpop.

10. 🟦 - In order to create a color gradient of the selected groups (will be of course effective only if more than one group is selected) – will open a dialog box to choose the base color from which the gradient will be made. For now it is only from this color to lighter shades. It will make the [Auto color] button off. If you want to reset the colors to the auto setting, press this button again.
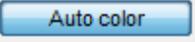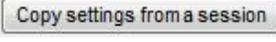
11. [Copy settings from a session] -Pressing this button will lead you to a window to choose a .mat file with a saved session in it (see section H). This will copy the color and line properties of the groups in the saved session into the current session (if the number of groups in the two session is not equal then it will be partially copied).


H. Creating a figure, saving and loading a session

In order to create a figure, press the 'Create figure' button on the bottom right corner of the GUI. This is for instant a figure that was made using the gradient option (See section G).
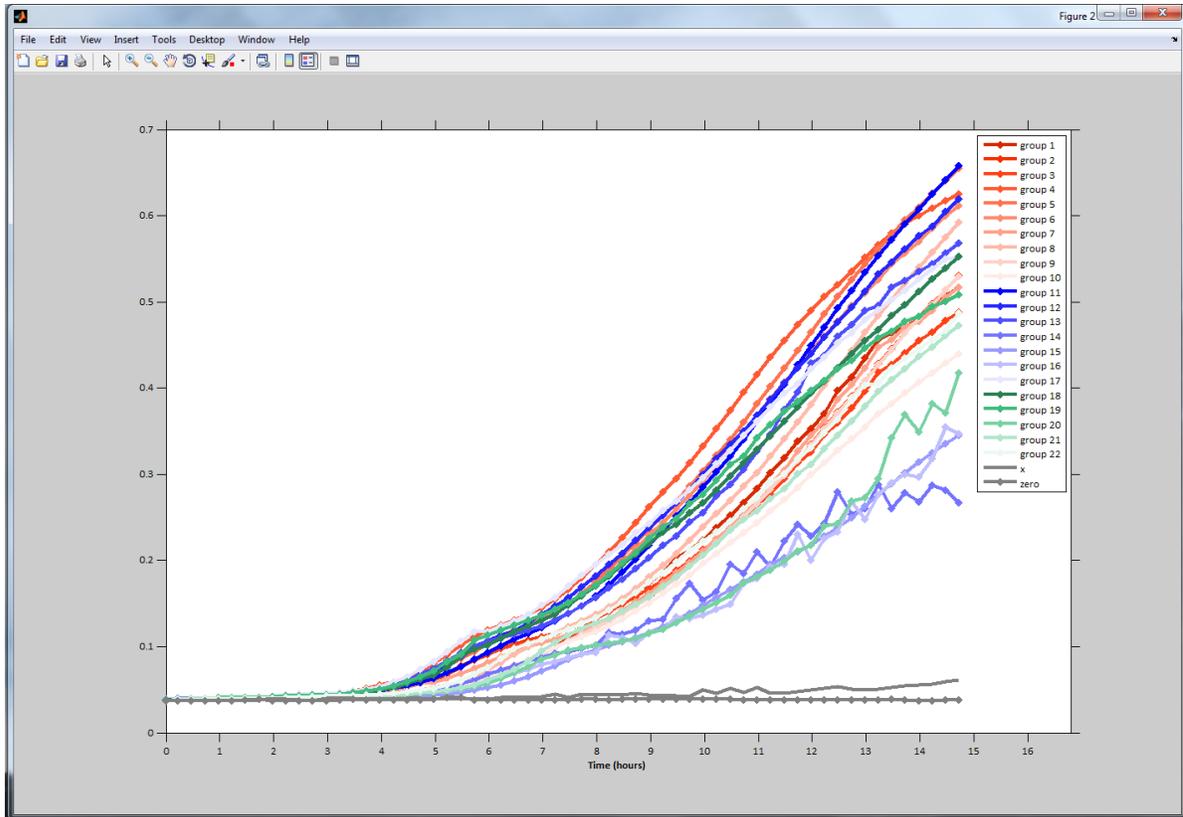
There is an option to save the session in .mat file and load it again later, keeping the same groups settings as when the file was saved. However, later changes in the Excel input file will not affect this file – so it will become another independent copy of your results, and there will be no option to change the groups content (i.e. to exclude or include specific wells from a group) or the 'od' or 'reporter' reads.

In any case, press the 'Save session' button in order to save the session. And in order to load it use the button or the text box in the red frame below (much like the Excel input file loading in section D).
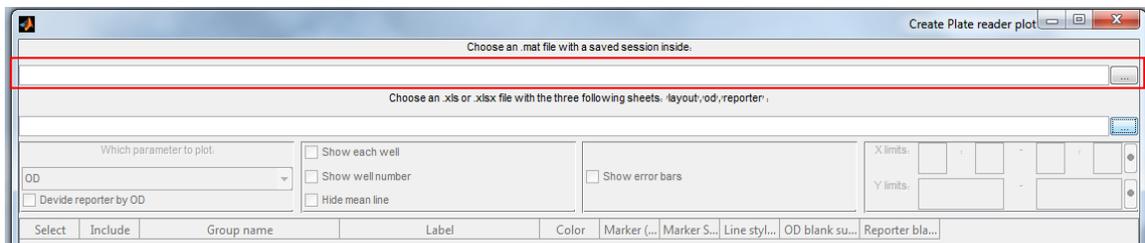
The information in the session file could be also used in order to define the plate layout (see section E) or to define the plot properties of the groups (see section G).