Do-Exp software manual

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Do-Exp program was created as part of the thesis at the Faculty of Chemistry of the Warsaw University of Technology.

This manual applies to the Do-Exp software (version 1.0.0.0).

The nzy3d-api library was used to generate the charts (Copyright (c) 2014, benoit74. All rights reserved).

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Introduction

Software name: Do-Exp.

Version: 1.0.0.0.

Languages: Polish, English.

Web page: http://www.do-exp.com.

The Do-Exp program is used for planning experiments. It enables simple preparation of Design of Experiments and optimization of parameters affecting the studied process.

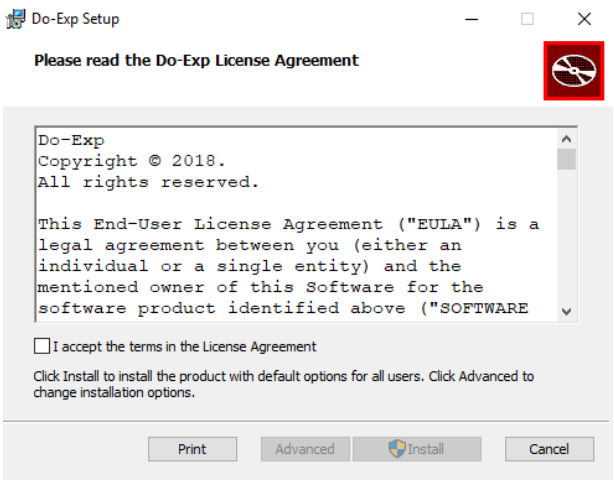
System requirements:

- Operating system: Microsoft Windows XP, 7, 8, 10 or later,
- Microsoft .NET Framework 4.5 or later.

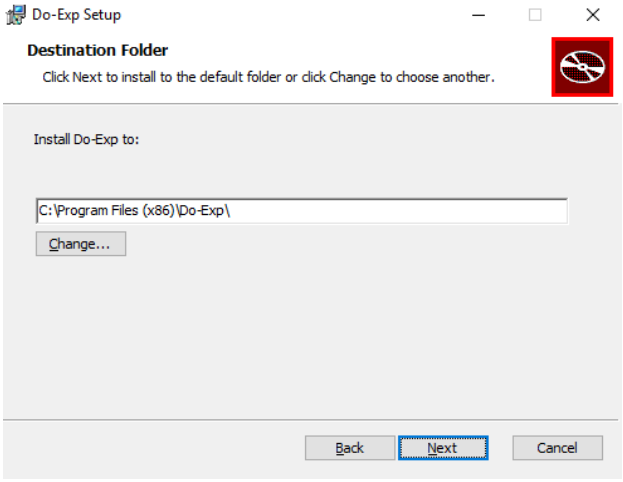
Installation

Software installation starts after opening the “Do-Exp.msi” file.

First, user must accept the License Agreement, then he can optionally use the advanced settings ("Advanced"), where the user can choose the destination path in which the program will be installed.

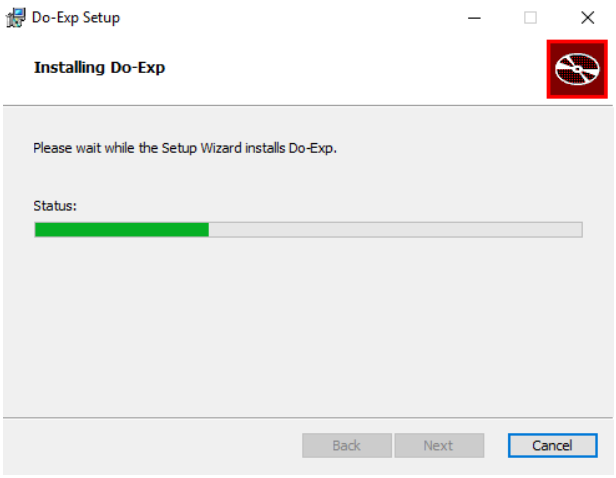


(a) *Welcome window – Licence Agreement.*

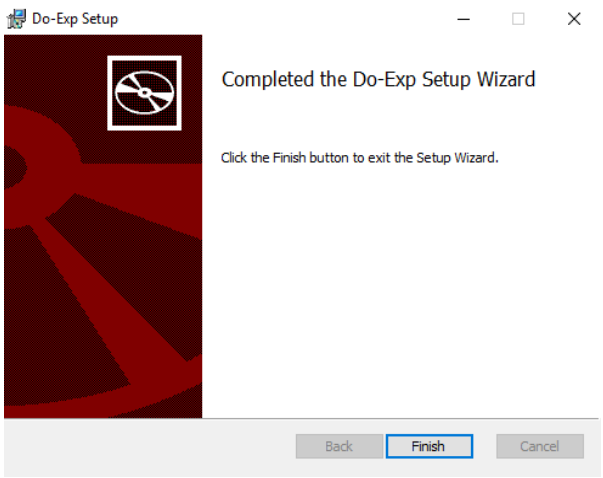


(b) *Path changing window.*

After clicking the "Install" button, installation of the program starts. It should take only a few seconds. When the installation is completed, the final window appears. The installation ends with pressing the "Finish" button. By default, the program icon will be placed on the Desktop and in the Start Menu.



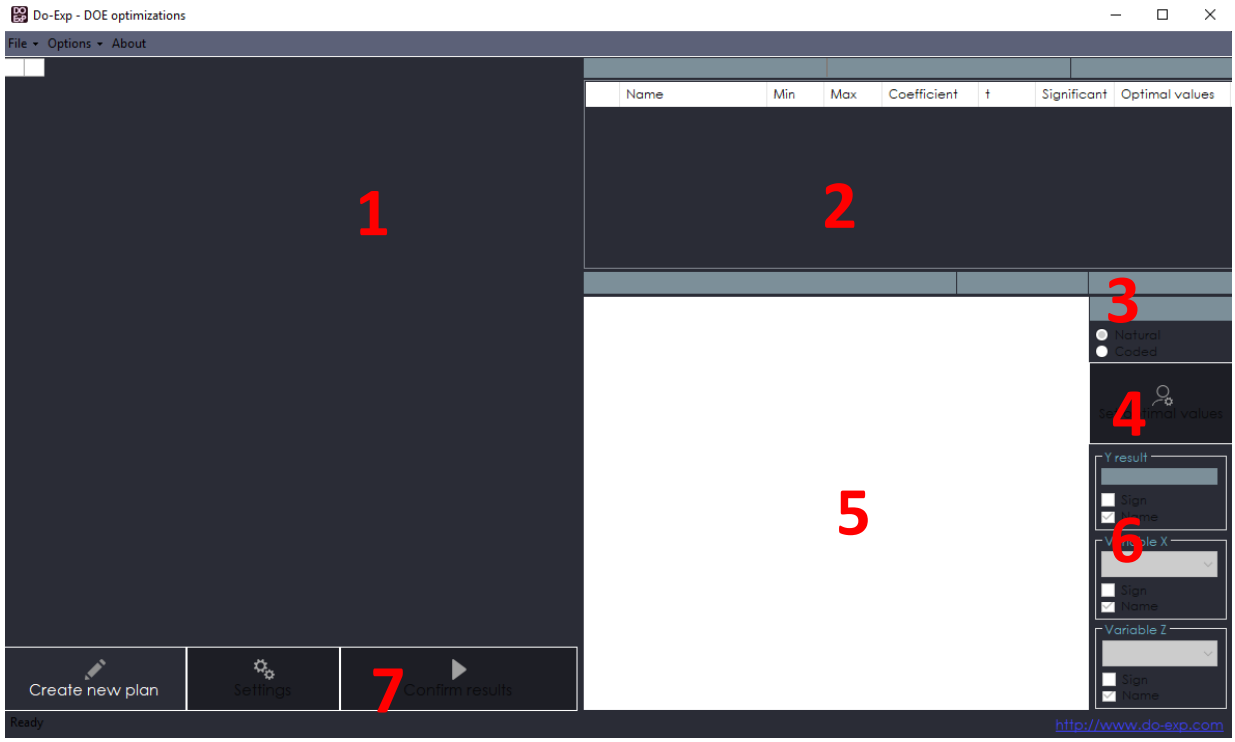
(c) *Installation window.*



(d) *„Installation completed” window.*

Working with the software

Main Window



(e) *Do-Exp software main window.*

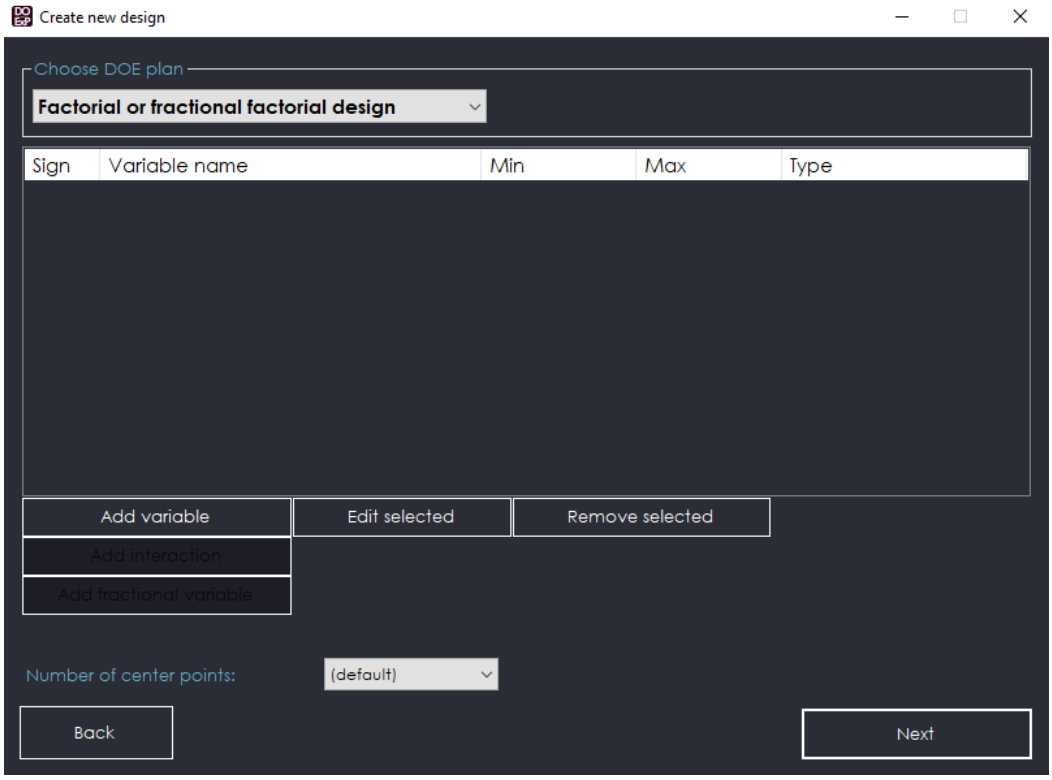
The main window is the first window visible after opening the program. It contains the area with the plan and results of the experiments, and the area with the results and the graph.

It consists of such elements as:

- 1 - display area of the experimental plan,
- 2 - area for displaying detailed data about variables (list of variables),
- 3 - text fields in which the following are displayed: equation, value of the optimum (highest point) and values of the F coefficients: calculated and critical (to test the adequacy of the equation),
- 4 - button that opens the optimization window,
- 5 - a graph describing the dependence of the influence of variables on the result,
- 6 - elements adjusting the name of the axis and variables used to draw the chart,
- 7 - main program buttons (“Create new plan”, “Settings”, “Confirm results”). The “Settings” and “Confirm results” buttons are initially blocked. They unblock themselves after new plan is created.

Creating a new process

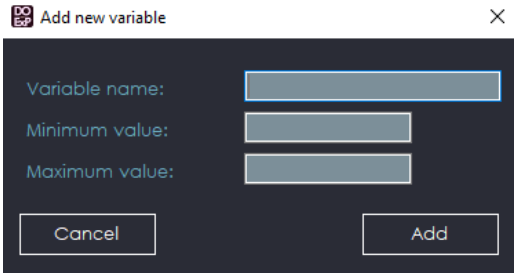
Creation of a new process takes place after pressing the "Create new plan" button in the main window. New window opens in which you first select the plan you want to use, and then you add the variables of which dependency is tested.



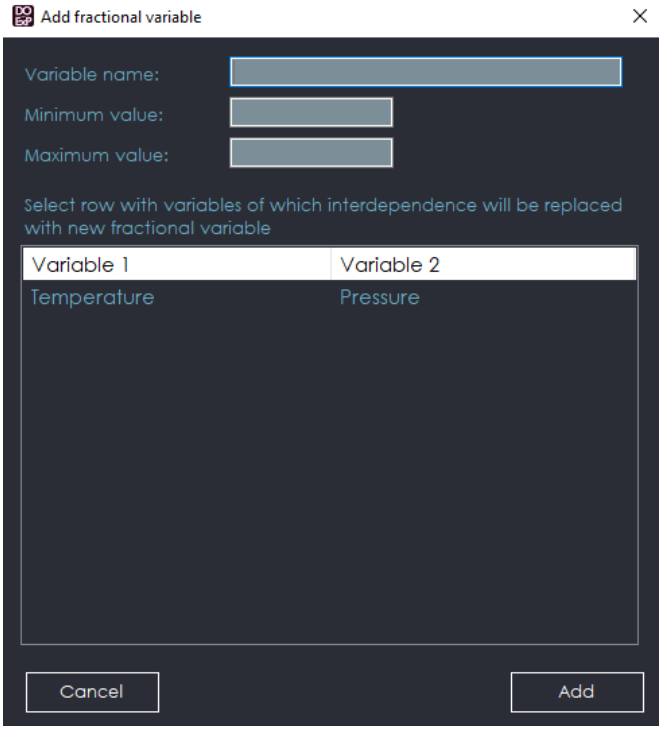
(f) *New plan creator window.*

Adding new variables

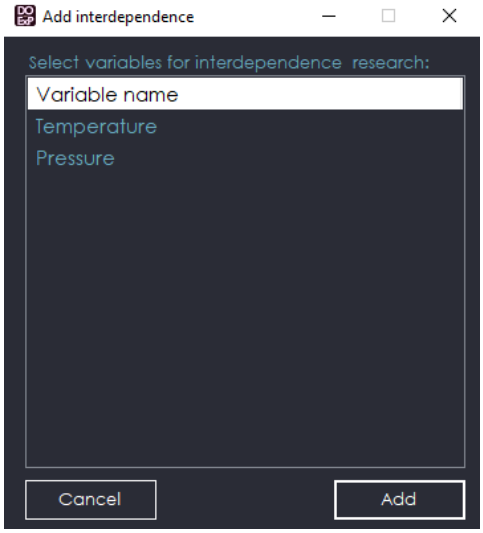
There are 3 types of variables to choose from: main, fractional and interaction effects. Ability to add fractional variables and interaction effects is gained (in the window of creating a new plan) only after adding at least two main variables. **Figures g-i** show windows for adding variables, which are opened after pressing the appropriate button in the new plan creator window.



(g) *New variable form (main variable).*



(h) *New fractional variable form.*



(i) *New interdependence variable form.*

After "Add variable" button is clicked, a new window (**Fig. g**) is opened, and after completing the text fields in the newly displayed window (with the name and range of variables in which it will be examined), the new variable is added.

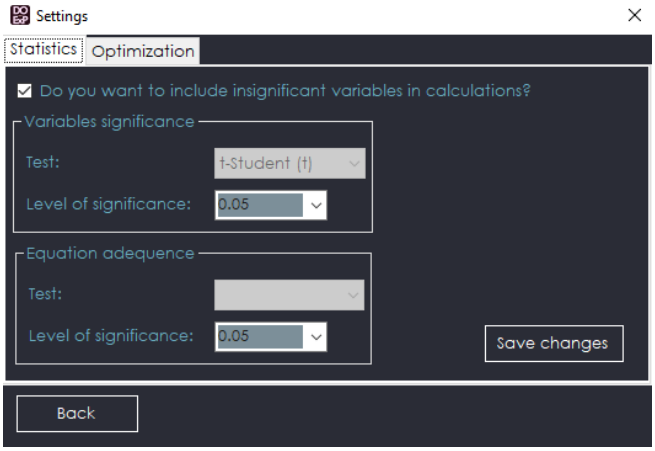
To add the interaction variable, press the "Add interaction" button, which opens the new window (**Fig. h**), and then select the variables (it is preferable to choose two variables), the interaction of which you want to investigate. Variables should be selected with the Ctrl key pressed, allowing selection of multiple rows.

Adding a fraction variable is done by clicking on the "Add fractional variable" button and filling in newly opened window (**Fig. i**) – text fields with the name and ranges of the variable value, and then selecting the combination of variables (chosen interaction effect), in which place the variable will be added.

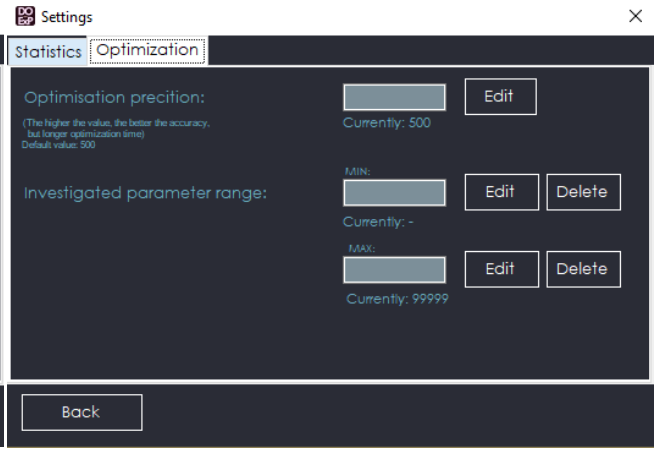
After all variables are added, user should choose the amount of center points (or leave the “default” option).

Experimental plan and settings

After pressing the "Next" button, the user receives the plan of experiments (in area 1 of the main window). The settings and validation buttons are also activated. User can optionally make changes to the statistical settings (the confidence level setting and whether irrelevant variables should be included) and optimization (the accuracy of the optimization setting and, if necessary, the range of the value of the parameter being tested).

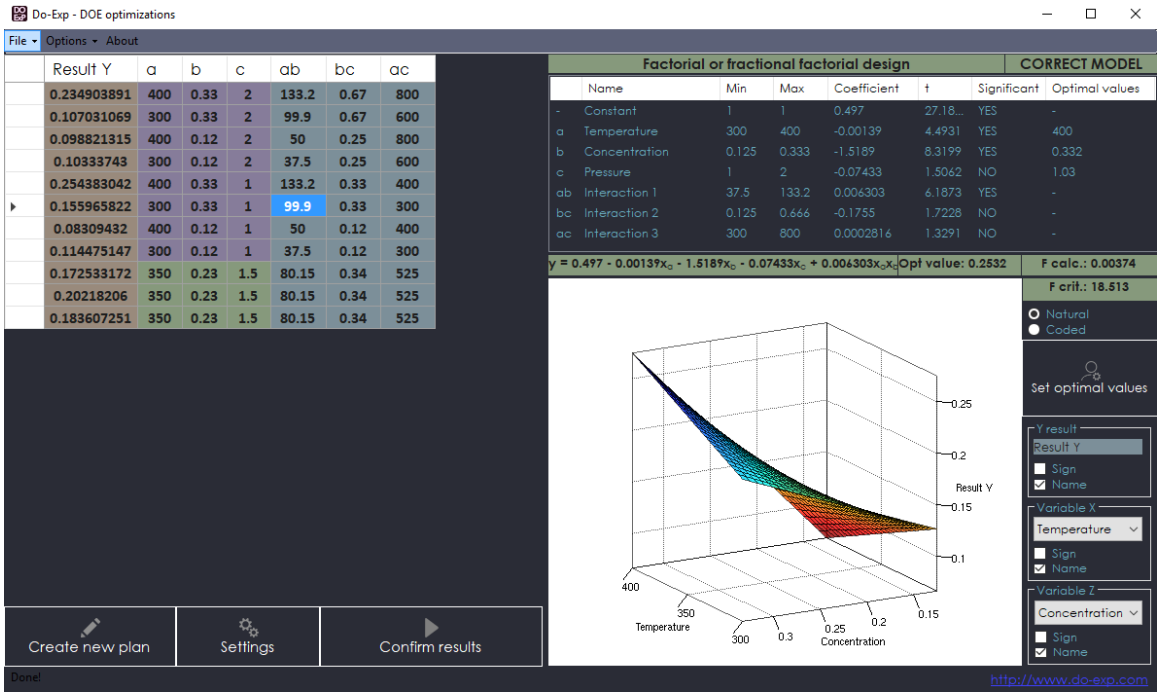


(j) *Statistics settings tab.*



(k) *Optimization settings tab.*

After filling in the results column in the main view (the first column of the plan area), confirm the results by clicking the "Save changes" button. It causes results to be display of optimization and

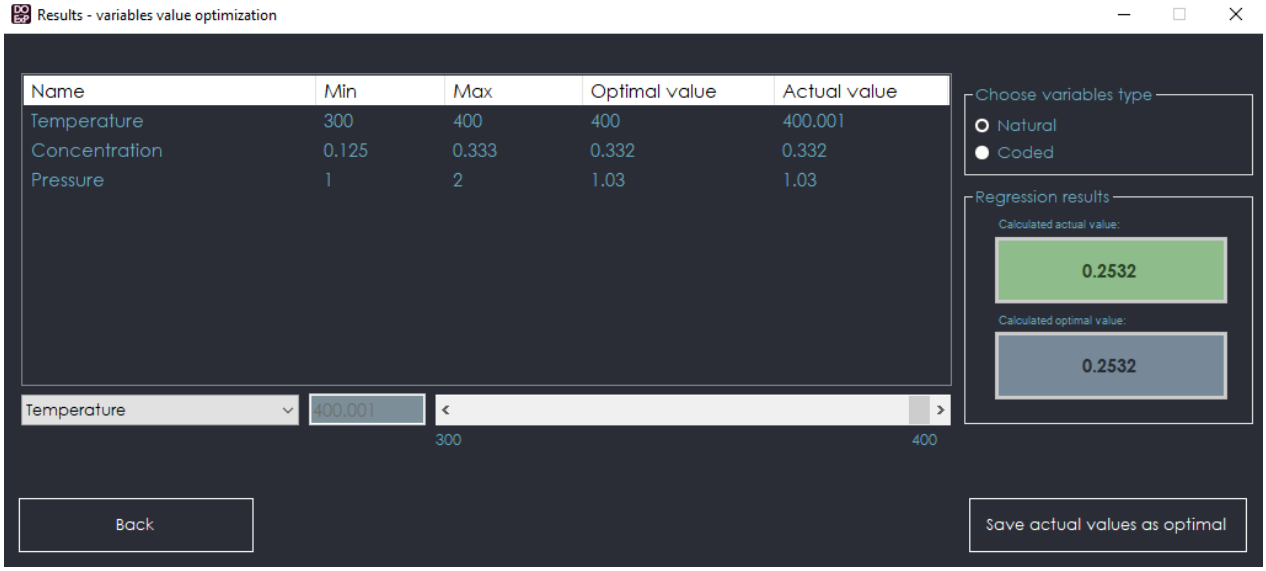


(l) *Final results view.*

graph details (an exemplary final view is shown in **Fig. l**). In the case when the chosen model proves to be an appropriate model for describing the tested process, the text fields on the right part of the window are green and the word "CORRECT MODEL" appears. Otherwise, it is the red color and the inscription "WRONG MODEL".

Optimization

When the user received the results of optimization and analysis of the significance of variables and the adequacy of the equation, he has the possibility to adjust the optimal value by his needs. It could be helpful, for example, when variable does not affect the process much, and lowering its value would significantly reduce costs. This is enabled by the variable value optimization window (**Fig. m**).



(m) *Variables value optimization window.*

In order to adjust the optimal value of a certain variable, it should be selected on the list, and then the slider should be changed to the wanted value. To accept your settings, click "Save actual values as optimal".