The GUI is developed to efficiently analyse the inputs, solve the problem and also provide a detailed analysis of the solution without requiring any in-depth knowledge of the solution procedure or optimization solvers.

Input: In the GUI interface, the required data such as the number of processes, number of products, available budget and the amount of each raw material that is available are the inputs to be provided by the user. The user can set the maximum run time, which if exceeded by the *intlinprog* leads to premature termination of the solver. It is set to 7200 seconds by default. The user can also provide an optional initial guess vector which may help in faster convergence to the optimal solution. However, this initial guess has to be consistent with the structure specified in the earlier part. A user can select one of the three radio buttons in the *Process constraint* panel to indicate the type of process constraints, i.e., UPC, CPC or without unique process constraint that is to be implemented.

There are three push buttons, namely *Start*, *Reset* and *Stop*. The *Start* button triggers the program to run, whereas the *Reset* button is used to clear all the data input provided by the user. The *Stop* button helps the user to terminate the execution of the program. While the program is executing, an un-editable textbox appears on the screen stating the status of the program. This textbox will also display the exit condition of the program.

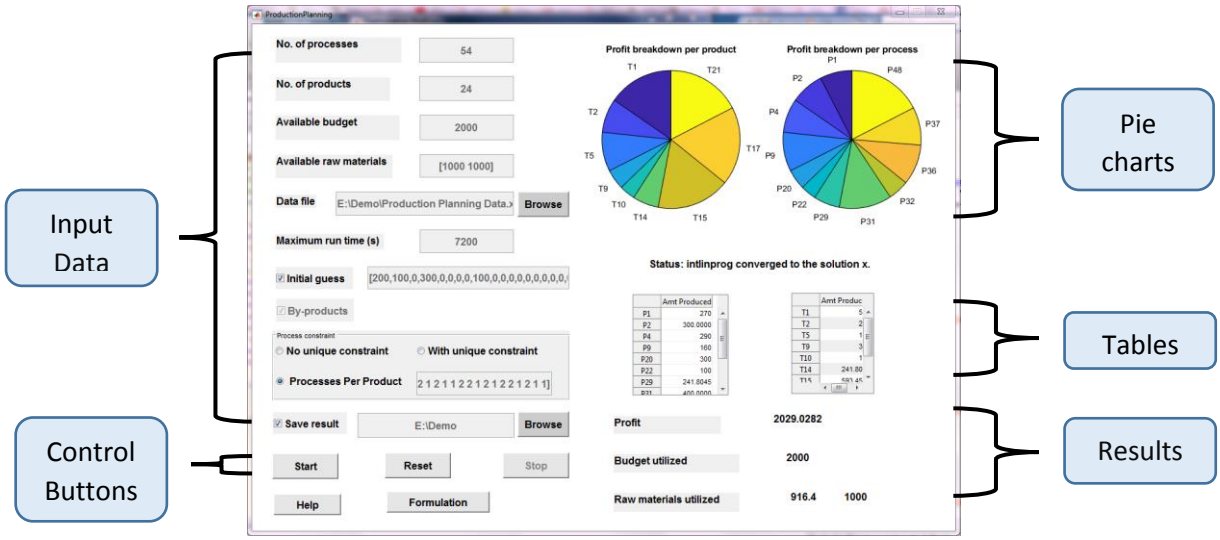


Fig 1. GUI snapshot after execution

Other details have to be provided through a Microsoft Excel File using the browse button for "*Data File*". The "*data*" sheet of the excel file should contain the production capacities, investment costs, production costs, selling price and the consumption of raw materials for each of the process. Additional data required for the by-products is to be provided through the "*byproducts*" sheet of the Excel file selected by the user. A snapshot of the '*data*' sheet and '*byproducts*' sheet containing these details is given in Figure 2.

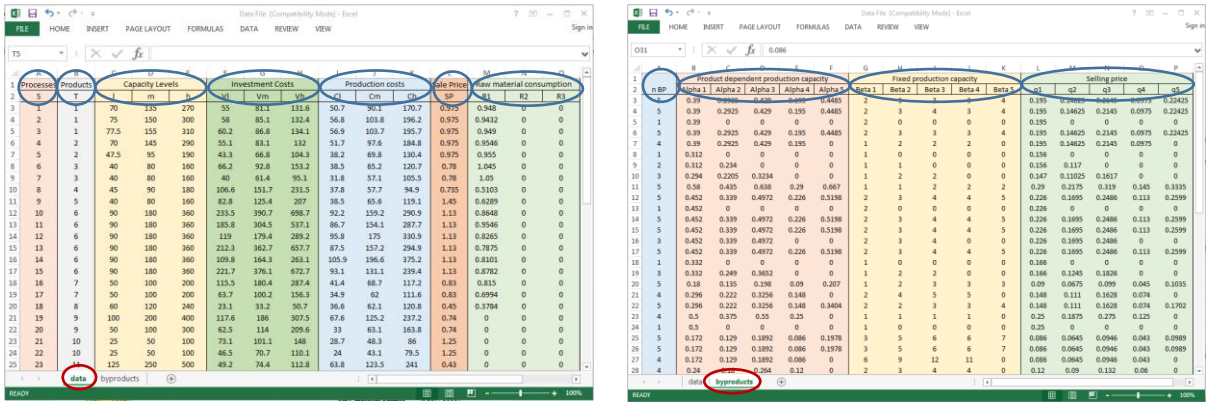


Fig 2. Data sheet and by-products sheet snapshot

Output: The net profit, budget utilized and amount of each raw material utilized are displayed in the text boxes on the GUI. Two pie charts depict the contribution of each product to total profit and the contribution of each process to the total profit. Two tables provide the amount of production from each process and also the total amount of each product that is produced. In addition to these results, three separate figure windows showing (i) the amount of by-products produced by the selected processes, (ii) convergence of the objective function value (with respect to the number of nodes) and (iii) the number of available and utilized processes pops-up.

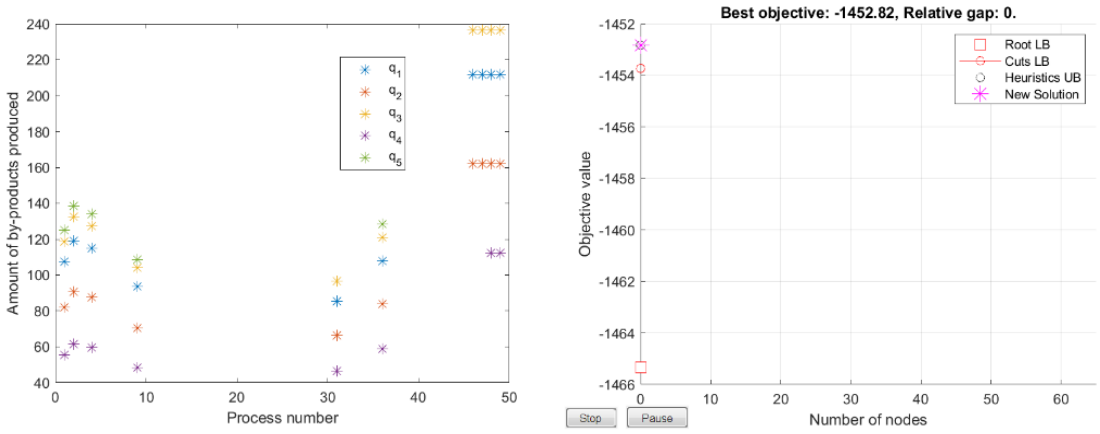


Fig 3. Amount of each by-product produced and convergence curve

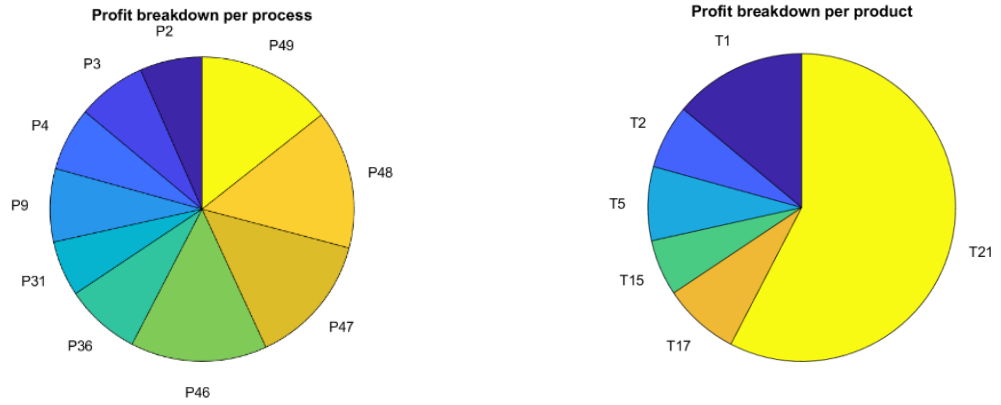
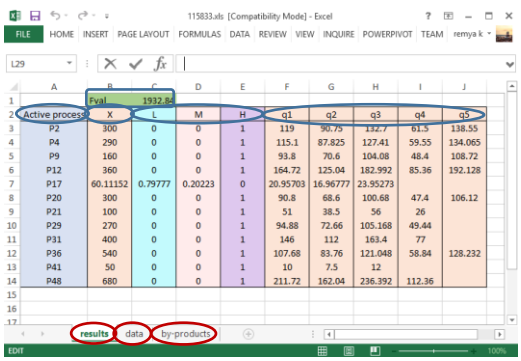


Fig 4. Profit breakdown for each active process and product

The GUI also provides an option to save the result in an Excel file which would be saved in the folder specified by the user. A snapshot of the excel file is shown in Figure 5. The results written in the excel file includes the optimal Profit, the amount of product and by-products produced by each of the active process, and all other decision variables.



For easy reference, this file will also contain all the data given by the user. The GUI also automatically saves all the five figures in .jpg format.

Fig 5. Result file generated on execution