How to use the NSPGen instance generator?

In this tutorial, a manual of the nurse scheduling problem generator NSPGen is presented. The program needs of a number of input parameters to generate nurse scheduling problem instances according to some pre-defined values of complexity indicators. The following table gives an overview of these input parameters. For more information about the specific calculations and the underlying philosophy of the indicators, we refer to Vanhoucke and Maenhout (2005).

Table. The three classes of indicators measuring the size, preferences and coverage requirements of a NSP instance

Size	Preferences	Coverage
Number of nurses	Preference distribution among nurses (*NPD*)	Total number of nurses required (*TCC*)
Number of shifts in a day	Preference distribution over all shifts (*SPD*) (for each day)	Distribution of required number of nurses over all shifts (*SCD*) (for each day)
Number of days in a complete scheduling period	Preference distribution over all days (*DPD*) (for the scheduling period)	Distribution of required number of nurses over all days (*DCD*) (for the scheduling period)

Tutorial NSPGen

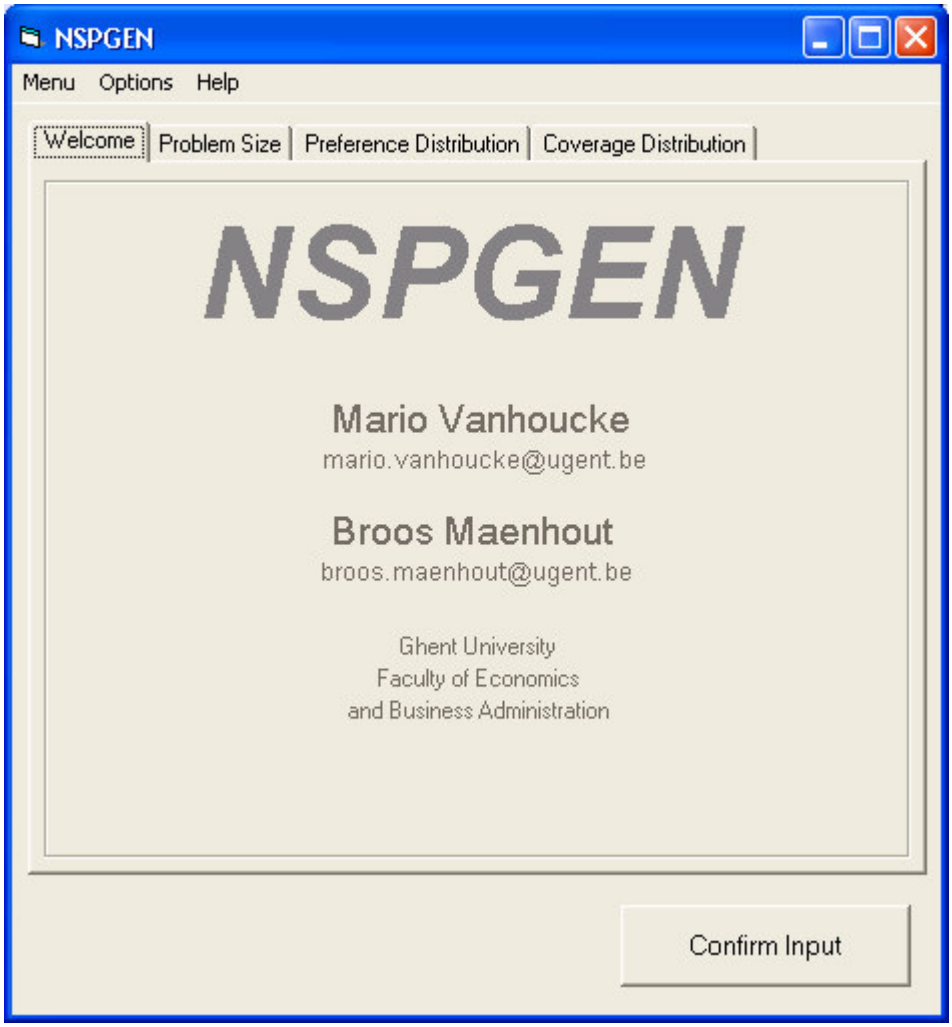
In this brief manual the full working and functionalities of NSPGen are explained. We will give details and make the necessary remarks needed to generate nurse scheduling problem instances correctly.

- Installation

The file NSPGEN.rar has to be unzipped correctly using WINRAR to the directory C:\NSPGEN\. To run the program the user should double click NSPGEN.exe.

- 'Welcome' frame

The welcome frame displays contact information about the makers of the program.



- 'Menu' bar

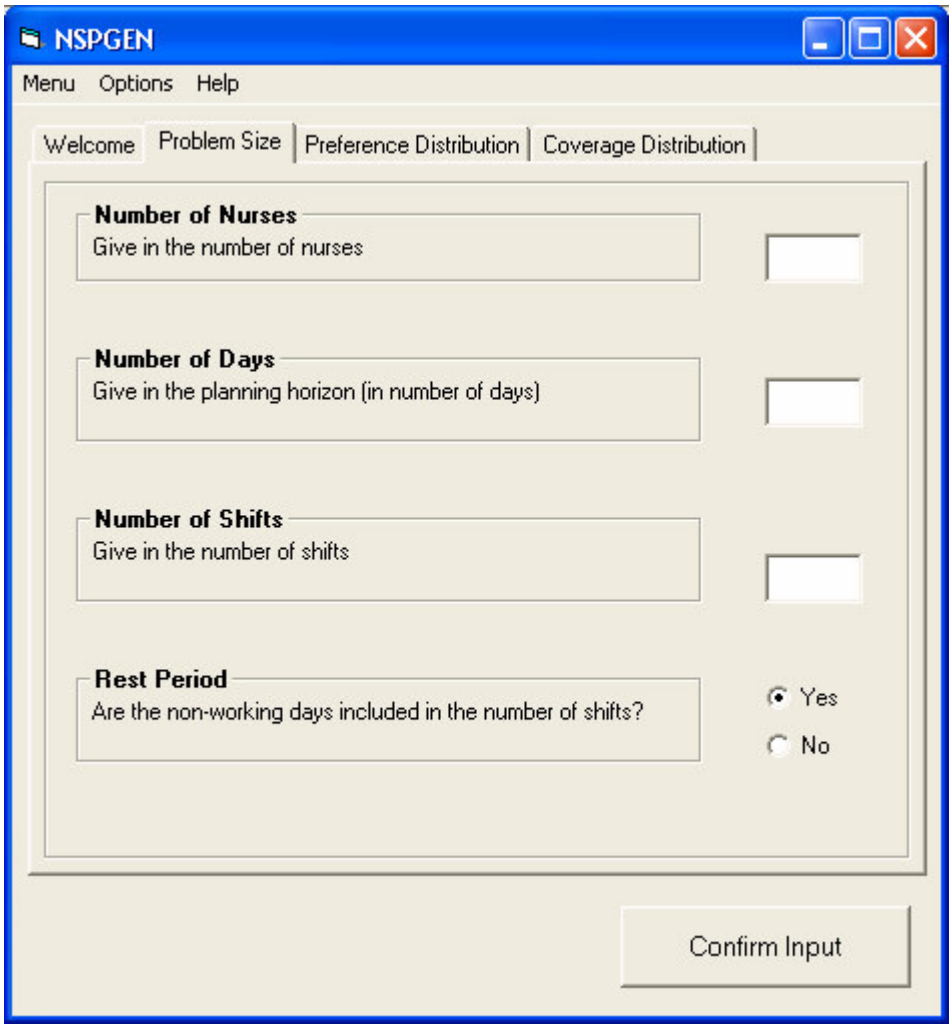
In the menu bar, the user can choose three subjects:

  - 'Menu': the user can choose to end the program ('Exit') or to start again ('New')
  - 'Seed': the user can choose the seed value he wants to generate problem instances with
  - 'Help': this option gives a shortcut to this tutorial ('Tutorial') and displays general information about the nurse scheduling problem instance generator ('About NSPGEN')

- 'Problem size' frame

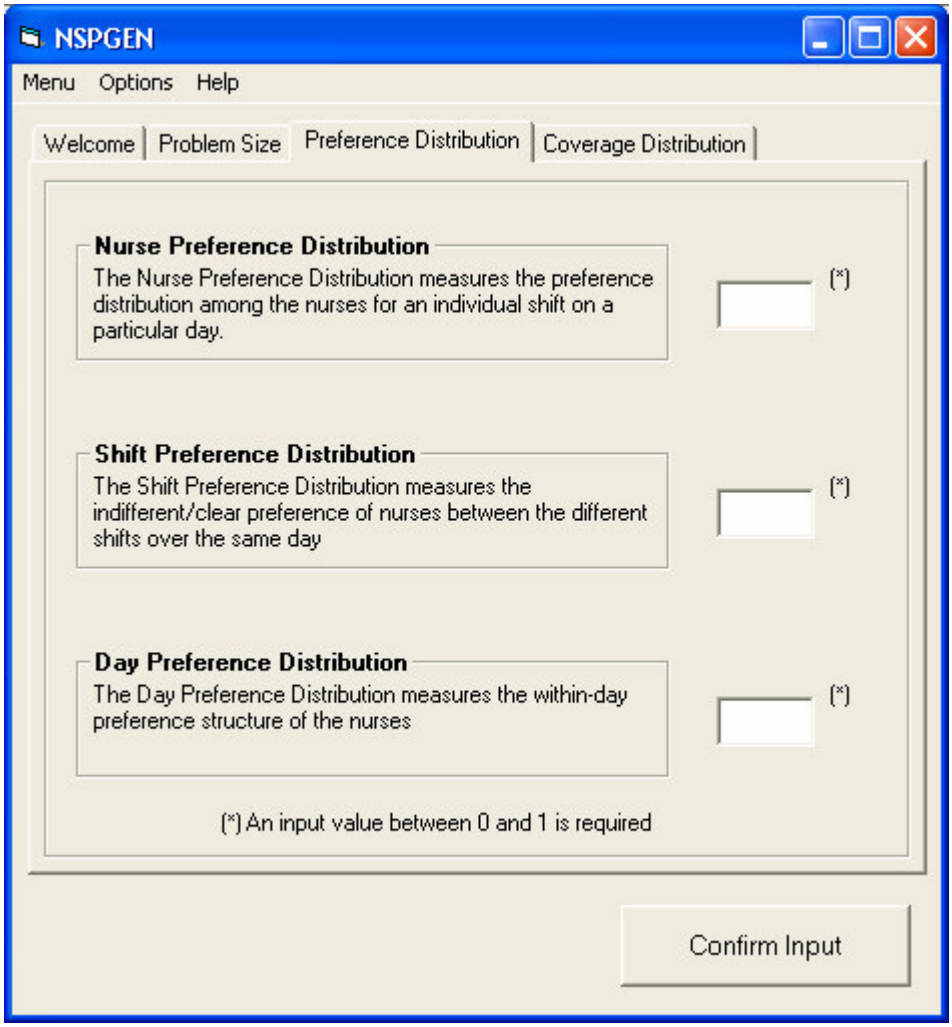
In this frame, the complexity indicators concerning the problem size (# nurses, # days, and # shifts) can be entered. The user should also indicate whether the free shift is already incorporated in the number of shifts entered. If the free shift is incorporated, the program generates zero coverage requirements each day of the planning period for the last shift (i.e. the free shift). The preferences for the free shift are generated like the preferences of the working shifts. If the free shift is not

incorporated, no explicit coverage requirements and nurses' preferences are generated for the free shift, i.e. all entered shifts are working shifts.



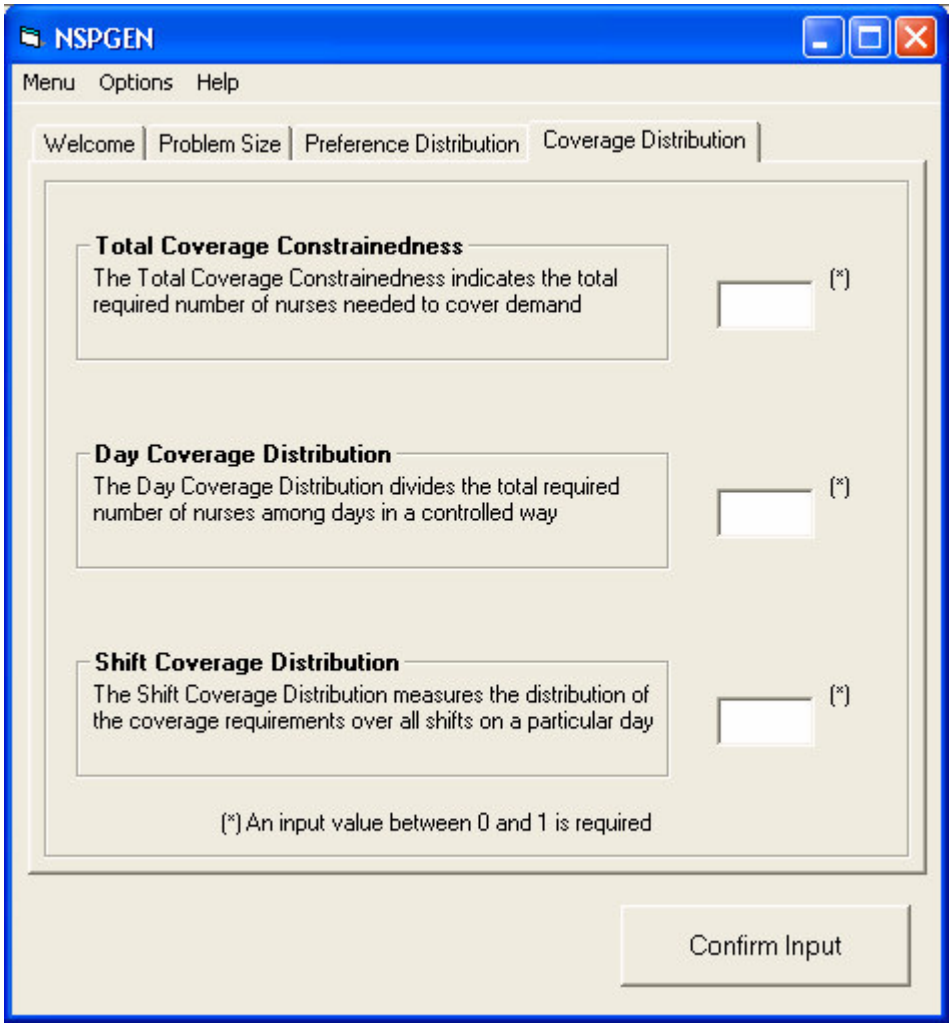
- 'Preference Distribution' frame

The user can enter the values for the indicators measuring the complexity concerning the nurses' preferences. All values entered on this frame have to be a value between 0 and 1.



- 'Coverage Distribution' frame

In this framework the user can enter the values for the indicators measuring the complexity concerning the coverage requirements. All values entered on this frame have to be a value between 0 and 1.

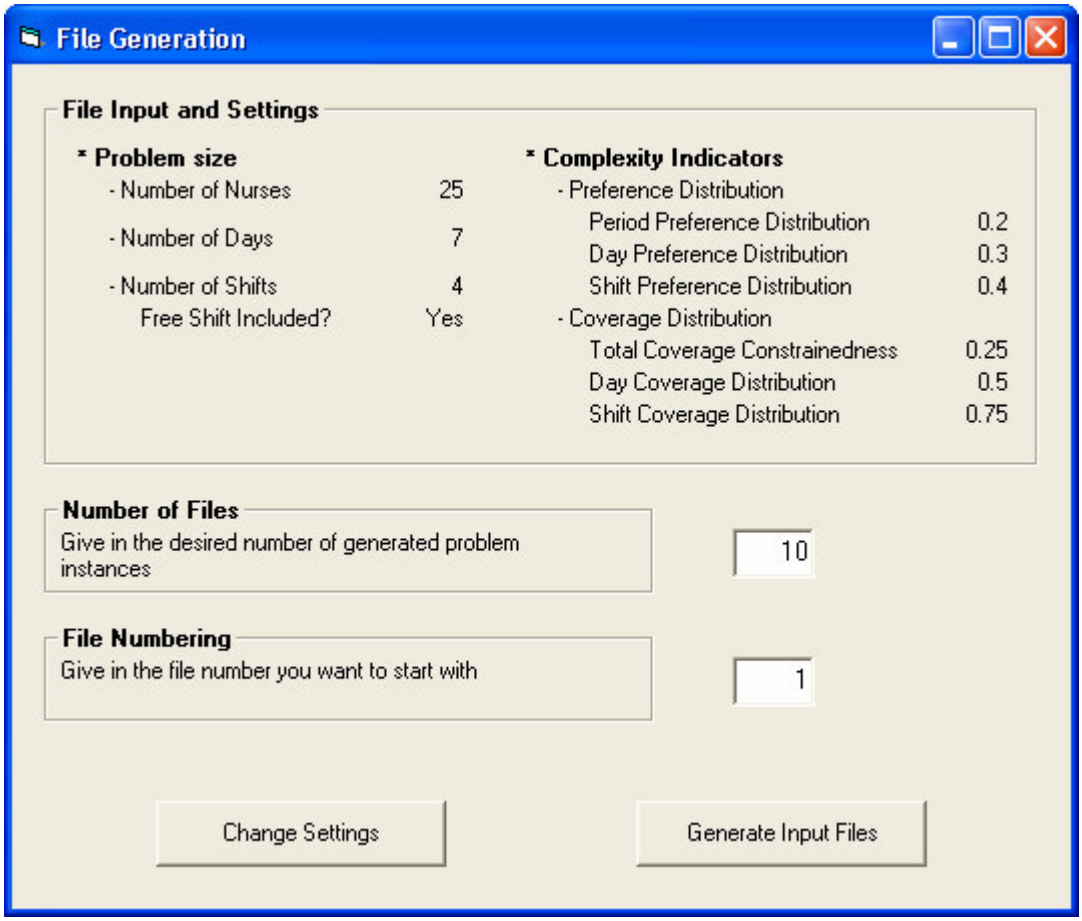


- 'Confirm Input' button

When all required information for the generation process is correct, the user may press the 'Confirm Input' button. This button checks if all input is indeed given in correctly.

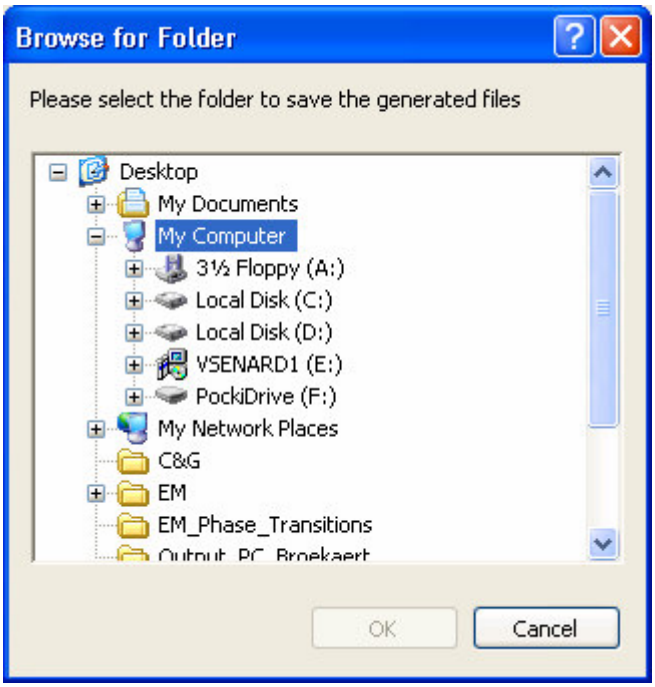
- 'File Generation' frame

If all input is correctly entered, the 'File Generation' frame will pop up. This frame rounds up the entered values for the different complexity values. The user must indicate the number of files to generate with the given parameter values and the file number of the first file. The latter can be very useful when constructing a dataset with different parameter values (first set of files start at number 1, with given parameter values and the second set can start at a higher number, following the first set, generated under other parameter values). If necessary, the user can change the input values by pressing the button 'Change Input'.



- 'Browse for folder' frame

In this frame the user can define in which directory the requested files are generated in.



- Generation process

After the generation process the user can consult the generated ‘input.log’ and ‘output.log’ files to verify whether the obtained values for the complexity indicators of the created files correspond to the entered values. Sometimes, it is impossible to generate instances with a given set of parameter values, since they simply do not exist. In that case the instance generator tries to obtain the file with complexity indicators as close as possible to the requested ones.

References

Vanhoucke, M. and Maenhout, B., 2005, Characterisation and Generation of Nurse Scheduling Problem Instances, Working Paper 05/339, Ghent University,