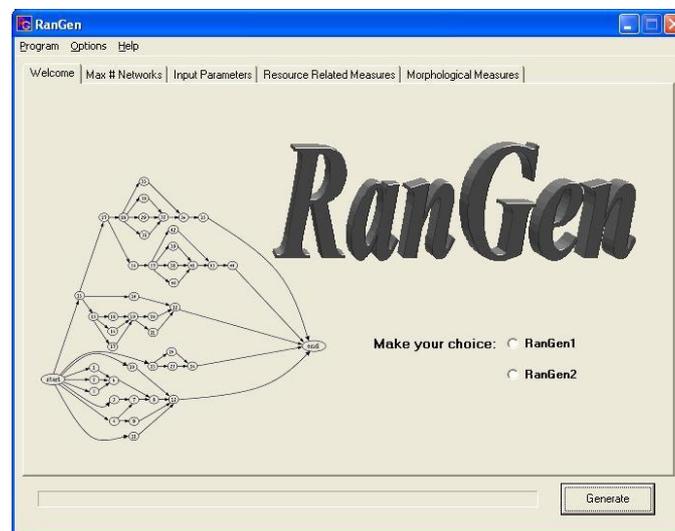


# How to use RanGen1 and RanGen2?

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On the webpage [www.projectmanagement.ugent.be/rangen.php](http://www.projectmanagement.ugent.be/rangen.php), you can download our two network generators to construct project networks under a controlled design. Both generators rely on the same and efficient principle proposed by Demeulemeester, Vanhoucke and Herroelen (2003). Each generator has two types of input parameters: parameters measuring the topological structure of a network and resource related parameters. The choice between RanGen1 and RanGen2 is completely determined by the input parameters measuring the topological structure, and needs to be done at the welcome page of the program.

Figure 1. Welcome page



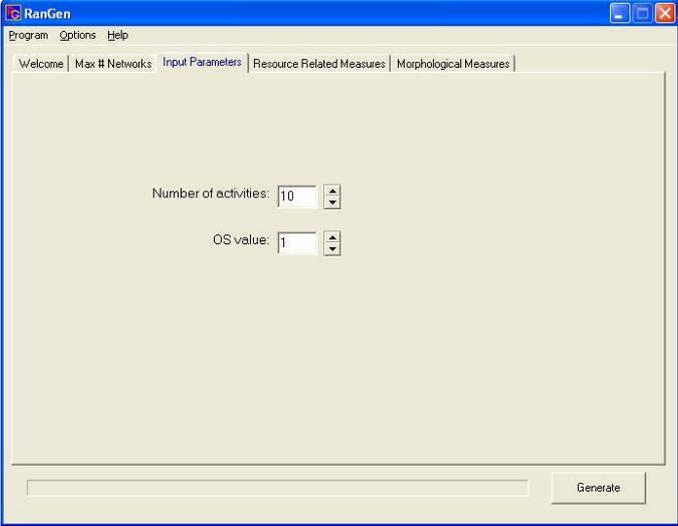
## RanGen1:

- Number of activities
- Order Strength (OS): the number of precedence relations (including the transitive ones but not including the arcs connecting the dummy start or end activity) divided by the theoretical maximum number of precedence relations in the network
- Complexity Index (CI): measure of the closeness of a network to a series-parallel directed graph

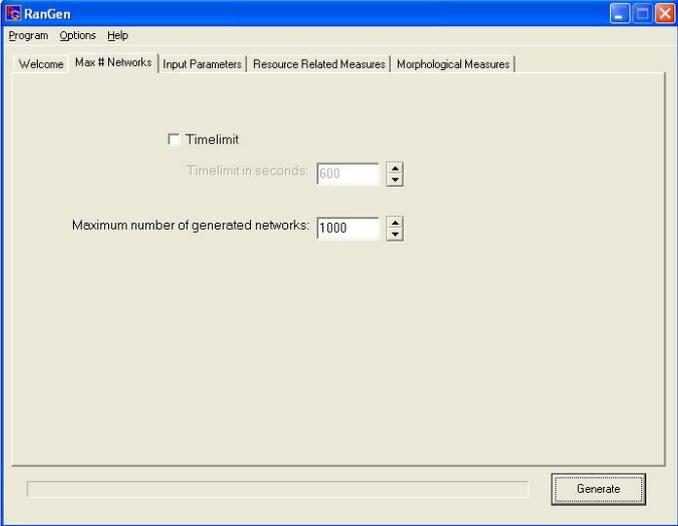
The generation process of RanGen1 is based on two input parameters (the number of activities and the order strength). The generator will generate a pre-specified number of networks in a very short time, and will calculate the complexity index of each network. In doing so, the user can save networks with given values for the three parameters measuring the topological structure of a network. The user can

save networks with a given input value for the number of activities and the order strength and can choose among the CI values as indicated in the morphological measure window.

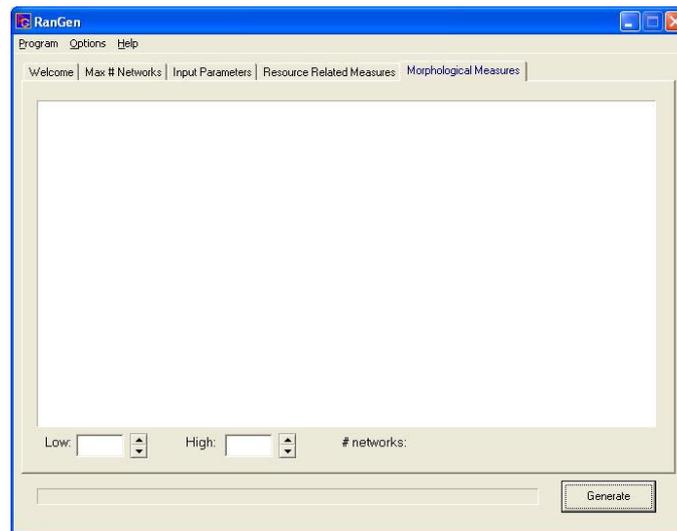
**Figure 2.** Two input parameters of RanGen1



**Figure 3.** Pre-specified number of networks in RanGen1



**Figure 4.** Morphological measure window in RanGen1

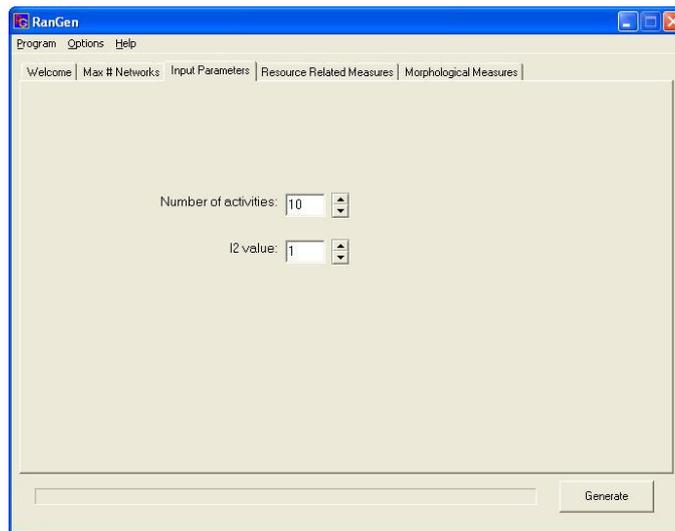


### **RanGen2:**

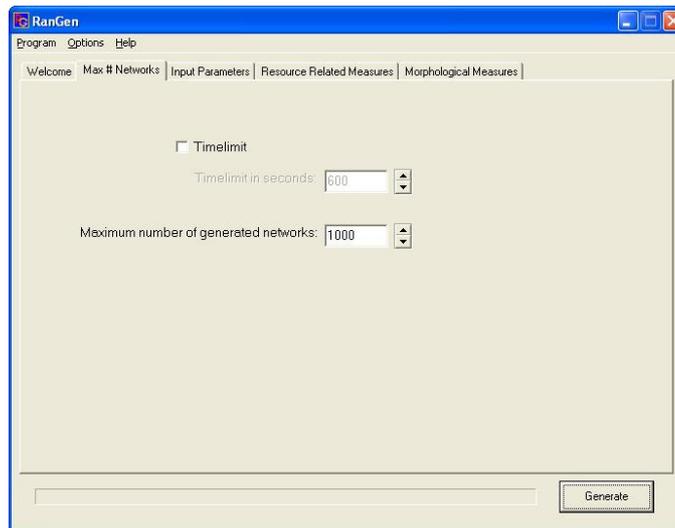
- I1: Number of activities
- I2: Serial/Parallel indicator: measures whether the network is close to a serial network (a chain of activities) or close to a parallel network (no precedence relations)
- I3: Activity distribution: measures the distribution of the activities over the network
- I4: Short precedence relations: measures the presence of short precedence relations
- I5: Long precedence relations: measures the presence of all precedence relations
- I6: Topological float: measures the topological float of activities in the network

The generation process of RanGen2 is based on two input parameters (the number of activities I1 and the serial/parallel indicator I2). The generator will generate a pre-specified number of networks in a very short time, and will calculate the I3, I4, I5 and I6 values for each network. In doing so, the user can save networks with given values for the six parameters measuring the topological structure of a network. The user can save networks with a given input values for the I1 and I2 indicators and can choose among the I3, I4, I5 and I6 values as indicated in the morphological measure window.

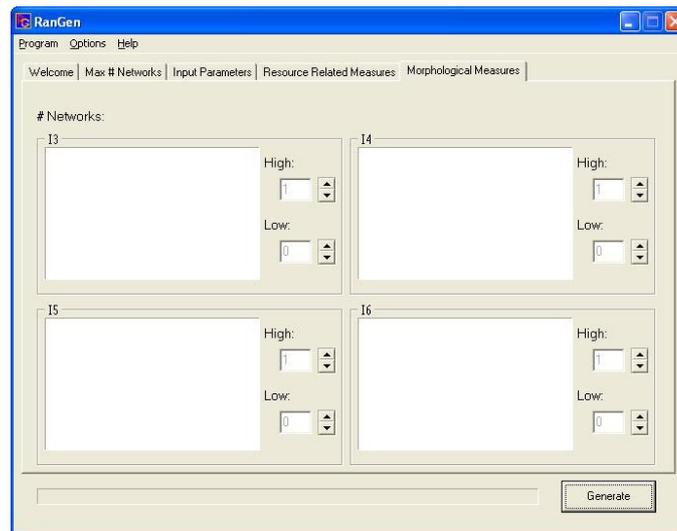
**Figure 5.** Two input parameters of RanGen2



**Figure 6.** Pre-specified number of networks in RanGen2



**Figure 7.** Morphological measure window in RanGen2

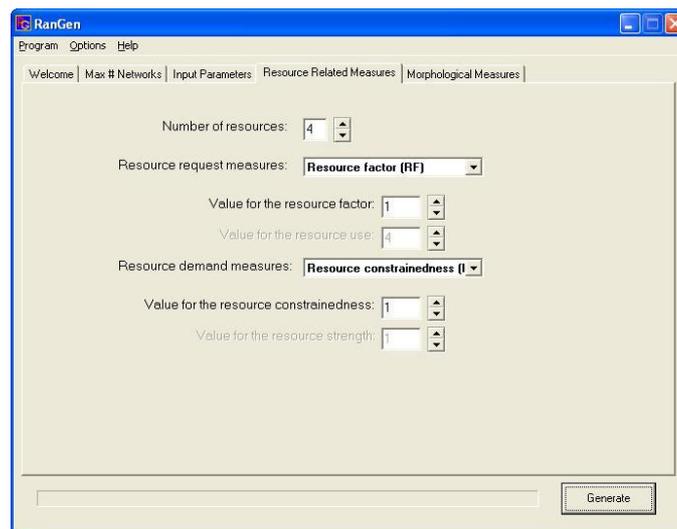


## Resource related measures for RanGen1 and RanGen2

The “resource related measures” link consists of three types of resource related parameters from which the user can choose:

- Number of resources
- Resource requirements: option between resource factor (RF) and resource use (RU)
- Resource demand: option between resource constrainedness (RC) or resource strength (RS)

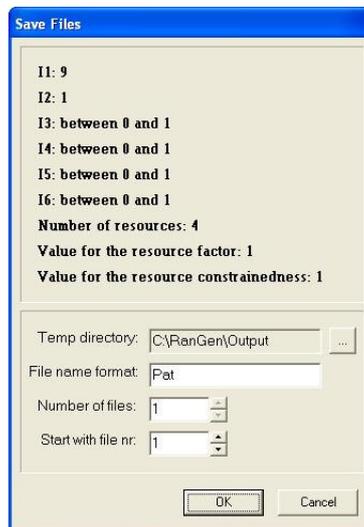
**Figure 8.** Resource related measures



## Saving the networks on your PC

After each generation process the generators have generated a large amount of networks with given values for the two input parameters as mentioned earlier. The other parameters (CI for RanGen1 and I3, I4, I5 and I6 for RanGen2) can be changed by the user each time networks have been saved. Each time a set of indicator values have been chosen (CI or I3, I4, I5 and I6), the “save files” window will pop up. By changing the value for the start file, the generated network files will be numbered according to the wish of the user. This allows the user to easily generate a large amount of networks with different values for these parameters without a new generation run. In order to generate networks with different values for the two input parameters, the user needs to run a simulation for each value of the input parameter.

**Figure 9.** Save files window



## References

Demeulemeester, E., Vanhoucke, M. and Herroelen, W., 2003, “A random network generator for activity-on-the-node networks”, *Journal of Scheduling*, 6, 13-34.

Vanhoucke, M., Coelho, J., Tavares, L. and Debels, D., 2004, "An evaluation of the adequacy of network generators with systematically sampled networks", Working paper 04/272, Ghent University (under submission in *Networks*)