BrunoFBessa_5881890_P8_results

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0.1 SFI5904 - Complex Networks

Project 8: Centrality and acessibility measures in complex networks First Semester of 2021

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A: Obtain the accessibility values for h=2, 3 and 4 for each node of geographic, ER, BA, WS (with 3 probabilities of reconnection). Show the respective histograms for relative frequency.

B: Identify the borders of the networks using thresholding of the accessibility for each node and visuaize the network border marking it with different color.

0.2 Results (A)

For this experiment the following synthetic networks were used (all with N=300 nodes and tuned so that their average degree lied between 5 and 7):

ER = Erdos-Renyi (prob=0.02)

BA = Barabási-Albert (m=4, plot=False)

VO = Voronoi

RA = Spatial with Radius (radius=0.079)

WX = Waxman (alpha=0.048

WS_1 = Watts-Strogatz (prob=0.1)

WS_2 = Watts-Strogatz (prob=0.2)

WS_3 = Watts-Strogatz (prob=1.0)

We calculated a_i for a node i the accessibility [1] according to:

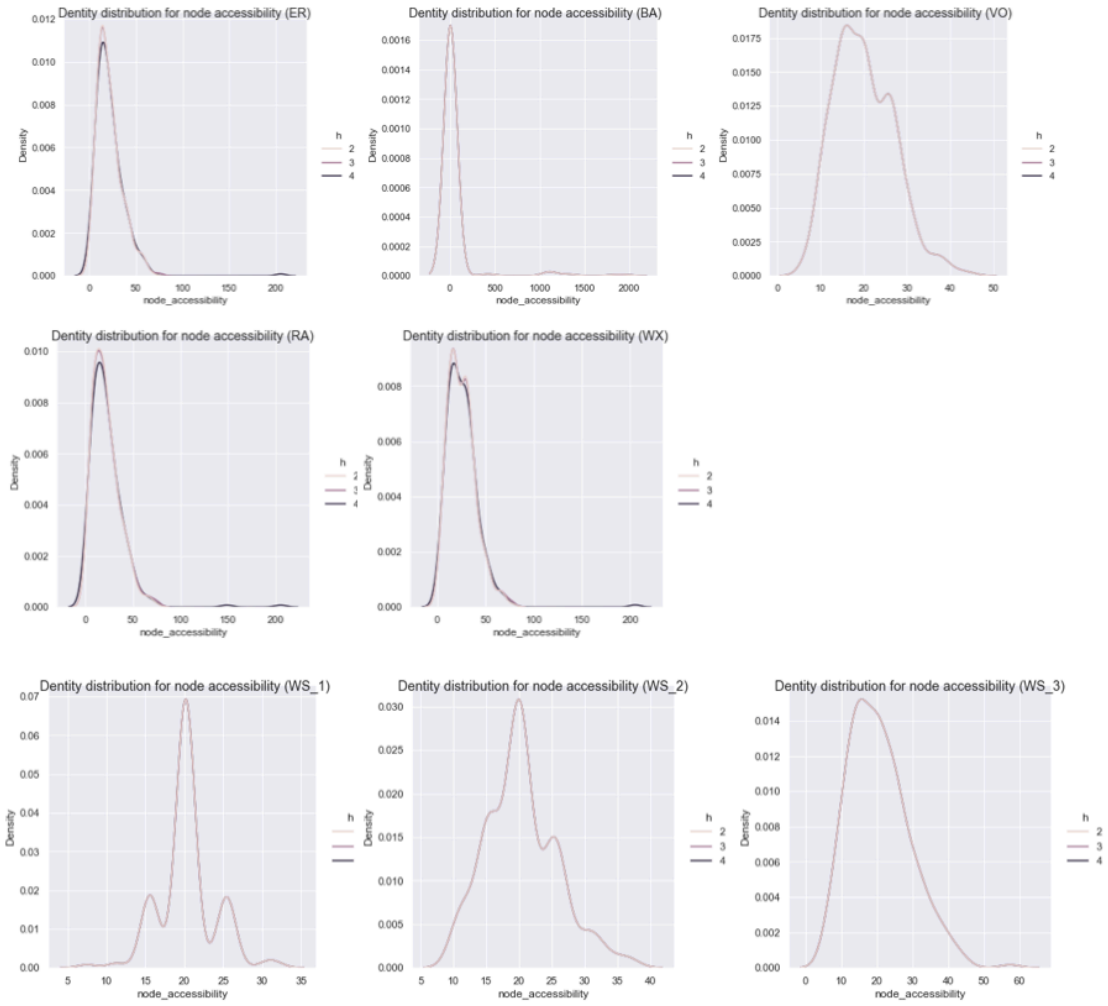
$$H_i = \sum_j p_j log(p_j) a_i = e^{(H_i)}$$

where p is the transition probability from node i to node j. We calculated this metric for different values of distances from i (h parameter).

The results for the suggested networks are as follows:

[2]:
```
display.Image("images/results_accessibility.png")
```

[2]:



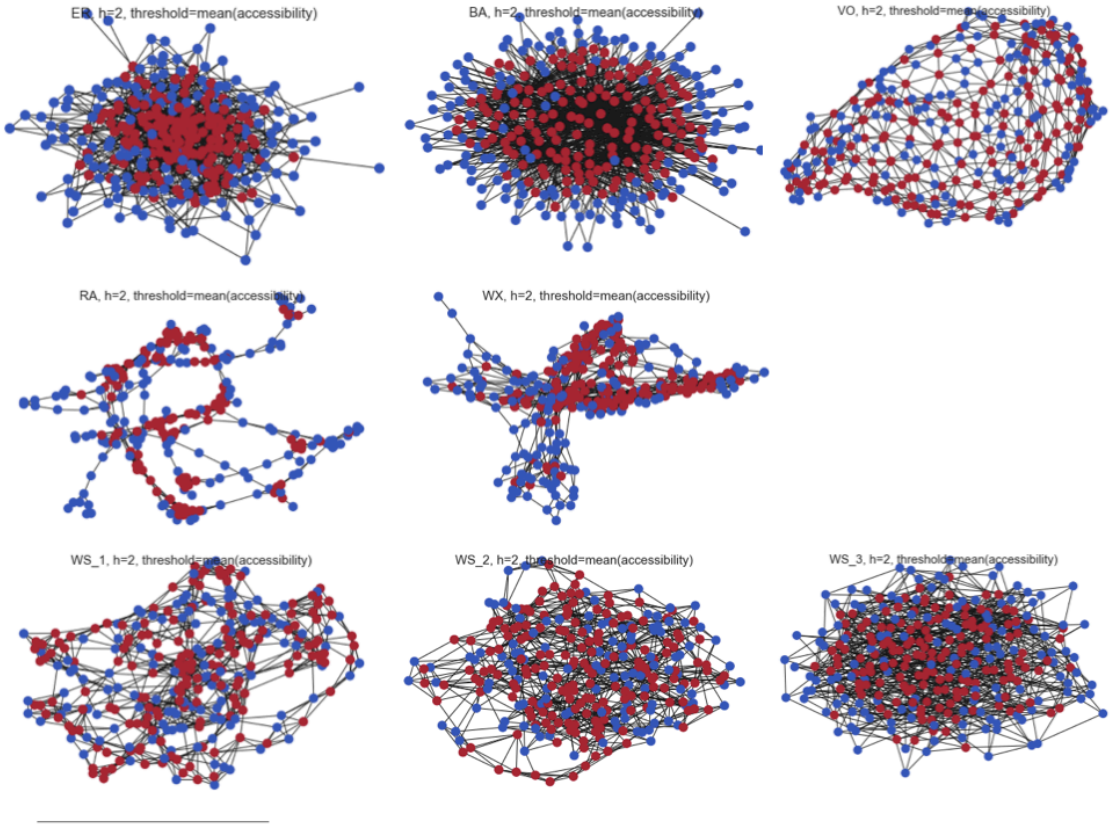
0.3 Results (B)

We used the accessibility values for all the nodes of the networks (for h=2) and set a threshold for it to be considered high or low (the mean value).

The borders of the networks could be spoted as those nodes with low value for accessibility.

[3]:
```
display.Image("images/centrality_accessibility.png")
```

[3]:



[1] Blue: low accessibility, Red: high accessibility

0.4 Conclusion

The accessibility value accordinlgly to this implementation converges rapidly to a stable value and does not change much for h>1.

The accessibility is a good metric to detect borders of a network.

0.5 References

[1] Travençolo, B. A., Viana, M. P., Costa, L. F., Border detection in complex networks, New Journal of Physics, March, 2009