Fractal analysis on growing graph sequences

Levente Simon^{1,2}, Anna Soós¹

¹ Babeş-Bolyai University, Faculty of Mathematics and Computer Sciences, ² Eötvös Loránd University, Faculty of Informatics simonl@math.ubbcluj.ro, asoos@math.ubbcluj.ro

This paper focuses on fractal dimension analysis of growing graph sequences using the Ndim algorithm. We compare the fractal dimension results on two graph sequences: the first one gotten as a modification of the Barabási-Ravasz-Vicsek deterministic model and the other is a growing Apollonian graph sequence. We also apply the fractal dimension calculation on the scientific collaboration network constructed on the publication co-authorships of the faculty members from Babeş-Bolyai University, Faculty of Mathematics and Computer Sciences.

References

- Andrade, J. S., Herrmann, H. J., Andrade, R. F. S., da Silva, L. R., Apollonian Networks: Simultaneously Scale-Free, Small World, Euclidean, Space Filling, and with Matching Graphs, Physics Review Letters, 94(2005), 018702.
- [2] Barabási, A.-L., Jeong, H., Néda, Z., Ravasz, E., Schubert, A., Vicsek, T., Evolution of the social network of scientific collaborations. Physica A: Statistical Mechanics and its Applications. 311(2002), no. 3-4, 590614.
- Barabási, A.-L., Ravasz, E., Vicsek, T., Deterministic scale-free networks. Physica A: Statistical Mechanics and its Applications. 299(2001), 559564.
- [4] Doye, J., Massen, C., Self-similar disk packings as model spatial scale-free networks, Physics Review E, 71(2005), ID 016128.
- [5] Hahn, K., Massopust, P., Prigarin, S., A new method to measure complexity in binary or weighted networks and applications to functional connectivity in the human brain, BMC Bioinformatics. (2016), ID 17:87.
- [6] Lovász, L., Large network and graph limits, American Mathematical Society, Providence, 2012.
- [7] Song, C., Gallos, L. K., Havlin, S., Makse, H., How to calculate the fractal dimension of a complex network: the box covering algorithm, Journal of Statistical Mechanics: Theory and Experiment, 03(2007), P03006.
- [8] E. Ravasz and A.-L. Barabási. *Hierarchical organization in complex networks*, Physical Review E, 67(2003), 026112.