Nonlinear dynamics in multiplex networks

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We will show some of the recent result in our group concerning dynamics in multiplex networks. On the one hand we consider multiplex networks as set of nodes in different layers. At each layer the set of nodes is the same but the connections among the nodes can be different in the layers. Furthermore the connections among the layers is described by a "network of layers". We have studied different processes across the layers (diffusion) and between the layers (reaction) [1]. In this case Turing patterns appear as an effect of different average connectivities in different layers [2]. We also show that a multiplex construction where the layers correspond to contexts in which agents make different sets of connections can make a model of opinion formation to show stationary states of coexistence that are not observed in simple layers [3]. Finally, as a particular case of multiplex network, one can also analyze networks that change in time, since in this case each layer of the multiplex corresponds to a snapshot of the interaction pattern. For this situation, we have shown that there are different mechanisms that dominate the diffusion of information in the system depending on the relative effect of mobility and diffusion among the nodes [4,5].

(2015)

[3] Agreement and disagreement on multiplex networks. R Amato, N E Kouvaris, M San Miguel and Albert Díaz-Guilera, in preparation.

[4] Tuning Synchronization of Integrate-and-Fire Oscillators through Mobility. L. Prignano, O. Sagarra, and A. Díaz-Guilera Phys. Rev. Lett. 110, 114101 (2013)

[5] Synchronization in dynamical networks of locally coupled self-propelled oscillators. D. Levis, I. Pagonabarraga, Albert Diaz-Guilera. arXiv:1608.02423v1 (2016)
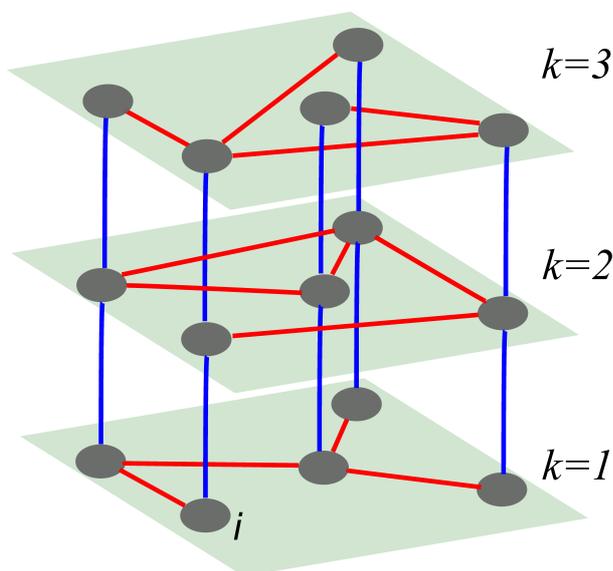
Figure 1: Example of multiplex network.

[1] Replicator dynamics with diffusion on multiplex networks. RJ Requejo, A. Diaz-Guilera. Physical Review E **94**, 022301 (2016)

[2] Pattern formation in multiplex networks. NE Kouvaris, S Hata, A. Diaz-Guilera. Scientific Reports 5, Article number: 10840