

Readme

Time-to-Control Communities in Complex Networks

Time-to-control is a fundamental concept to regulate complex network dynamics towards desirable states under time constraints. We propose a generative model capable of mimicking the tradeoffs between the minimum number of driven nodes and time-to-control of real networks. The proposed model builds on the notion of time-to-control communities that combines networks' partitions and degree distributions. Remarkably, we show that several centrality measures fail to explain the tradeoffs. Thus, we provide evidence that time-to-control communities and generative models build upon this concept are essential to understand and design complex networks' controllability properties.

Getting Started

The main code is in the notebook entitled *Generate_Networks_Progressively.nb*, the code is in **Wolfram Mathematica 11**. There is a section in the notebook with an illustrative example of how to run the code.

Further, the network partitions used in the provided example can be found and are the *.txt* files.

To generate network partitions, we resorted to the *metis* and the *networkx* **Python** libraries. There is a **Python** scrip *celegans.py* that illustrates how the network partitions can be computed.

Prerequisites

To be able to use the provided **Python** script, the following libraries need to be installed:

- **metis**

The *metis* library can be installed following the steps provided in <http://glaros.dtc.umn.edu/gkhome/fetch/sw/metis/manual.pdf>.

- **networkx**

The current release may be installed with pip with the command:

```
$ pip install networkx
```

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