Supplemental Material: Detangler

Paper ID 224

This material contains the same information as the supplemental video in storyboard form, with the text of the narration and many screenshots. It is a more detailed version of the usage scenarios in the Results section of the paper (Sections 7.1 and 7.2).

Video Storyboard

Road Safety Documents Multiplex Network

Detangler’s substrate view is showing 19 news stories about road safety. The catalyst view shows keywords for these documents. The topological structure visible in the catalyst view shows two clear clusters, with the two bridge nodes of accidentPrevention and speed between them.
Selecting nodes using the lasso triggers computation in the underlying multiplex network. The lasso interior is colored by the entanglement intensity, and the perimeter by the entanglement homogeneity. These measure the cohesion of the selected group. Corresponding catalyst nodes are highlighted, and each catalyst node changes size according to their individual entanglement index with respect to the selected set.
The loose cluster turns out to have low cohesion: the yellow interior shows that the intensity values are low, and the green perimeter shows that the homogeneity is in the middle of the range.
We can see that the tighter cluster has higher cohesion, with a blue interior and a dark blue perimeter. These articles all report on the same bad driver who went to prison for speeding.
Harmonizing the layout between these two views requires an algorithm that takes into account the connections between the substrates and catalysts in the underlying multiplex network.
Turning off the harmonized layout shows that visual analysis through linked highlighting is much more difficult without spatial stability between the substrate and catalyst views.

A Social Multiplex Network: Paul Revere’s Night Ride
In this multiplex social network, substrates are people who fought for American independence, and catalysts are societies they belong to. Paul Revere is famous for his midnight ride. Selecting him shows that he belongs to five of the seven societies, highlighted with red outlines.
Double-clicking on the lasso leapfrogs from people to societies: now all of the people who belong to those five societies are highlighted in the substrate view. It’s all of them: he’s connected to everybody through these societies! Checking a few other people in the same way doesn’t achieve the same result. Detangler can let us analyze the situation in a more powerful way than checking one by one.
We switch to the more restrictive pivot mode of connecting through all catalysts instead of any catalysts. We select Revere, and leapfrog again. Now he’s the only one still selected, confirming that he was in a unique position to accomplish that warning ride.
The catalyst node sizes when nothing specific is selected show that North Caucus and London Enemies are the largest groups. Selecting North Caucus and then leapfrogging back shows all the other groups highlighted; the same happens with London Enemies. We thus see that they’re not only large in terms of membership, but also influential.
We select Loyal Nine, a smaller society, and then leapfrog. Now we see that the London Enemies catalyst node is large, meaning that Loyal Nine has a high influence on it.
In contrast, selecting Tea Party shows that Long Room Club and North Caucus are more influential on it.
Continuing our analysis, we can find some small societies that are not influenced by large ones: doing the same operations on Saint Andrew’s Lodge or Boston Committee shows that only the catalyst node itself is larger than the others, suggesting that these two smaller groups are autonomous from the two main groups. Visual analysis with Detangler has revealed the structural reason for Paul Revere’s fame, and also illuminated less well known aspects of this social network.