Exploratory Degree of Interest: a visual interest-based exploration of multilayer networks
Antoine Laumond, Guy Melançon, Bruno Pinaud

To cite this version:
Antoine Laumond, Guy Melançon, Bruno Pinaud. Exploratory Degree of Interest: a visual interest-based exploration of multilayer networks. VIS2017, Oct 2017, Phoenix, United States. hal-02016056

HAL Id: hal-02016056
https://hal.archives-ouvertes.fr/hal-02016056

Submitted on 12 Feb 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.
eDOI: Exploratory Degree of Interest
A Visual Interest-Based Exploration of Multilayer Networks

Antoine Laumond, Guy Melançon, Bruno Pinaud
University of Bordeaux, LaBRI UMR CNRS 5800, France

How to efficiently exploring and navigating within a large multilayer network?

Original DOI metric:

\[
DOI(x|y,z) = \alpha \cdot API(x) + \beta \cdot UI(x,z) + \gamma \cdot D(x,y)
\]

x = node currently analysed
y = focus node (a user preselected node)
z = a query capturing the user’s goal

User Interest - domain-dependent score according to user goal or interest for a topic
A precalculated A Priori score - mostly according to topological information
Distance function - the closer node x and focus node y are, the higher the score

A score of interest is computed for each node
Subnetwork of interest extracted
Selection of a focus node in the initial network


Extended approach:

Exploration of the network with a sequence of subnetworks of interest

eDOI Two New Aspects

Multilayer networks can be explored with full control and management of layers

User explores the network iteratively extracting subnetwork with increasing interest.

A single focus node y is replaced by a focus set Y (blue nodes). In each subnetwork, the user promotes new nodes and add them to the focus set Y.

New subnetworks are created according to the changing focus set Y. At each iteration, the user gathers increasingly relevant semantic information.

The search strategy can be layer dependent. The eDOI further processes the queries on each layer accordingly.

\[
DOI(x|Y,z,L) = \alpha \cdot API(x) + \beta \cdot UI(x,z(Y,L(x)) + \gamma \cdot D(x,Y)
\]

Nodes in the focus set Y are semantically meaningful w.r.t. the search. They are used to compute user interest UI. Each focus node impacts future computations of the UI function.

Distance function D computes a centroid C on x and the focus set Y. Nodes in the focal zone induced from C get selected with higher probability.

L(x) represents the layers containing node x. The query z may vary on each layer in order to comply with the user’s search strategy.

Use case: Digital Cultural Heritage - EU construction and relations with the rest of the world

First documents about relations between USA and France
First, George Bush is selected to create a new subnetwork
Then, two french presidents are also selected by the user. They bring new semantic information for creating a new subnetwork
The new subnetwork shows a lot of documents relative to G.Bush and the French presidents.
Selecting these elements creates a new more relevant subnetwork. This iterative process is repeated until a satisfying network is found.