To: Dr. Erika Paterson

From: Konstantin Mestnikov

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Subject: Proposal to Improve Graph View in TechNotes database

Audience description: Braden MacDonald, software developer, TechNotes CEO.

**Introduction**

TechNotes is an emerging public database for engineering-related knowledge.  It contains various types of entries representing engineering concepts, companies, products and more. In addition, it maps the relationships between these entities into a network. While it is possible to simply browse the information in TechNotes, the database also allows to view it a form of a graph (a visual composed of nodes and edges). The graph view allows for the data to be represented as what it is, a network of nodes representing database entries and edges representing relationships between the entries.

While potentially beneficial to browsing information efficiently and deriving new insights from the data, graphs can quickly become cluttered and hard to interpret. Often this happens because of large number of relationships that connect various entries rendering the graph too dense and making it hard to see how entries are related to each other. Without a way to bundle the relationships or hide the unnecessary ones depending on the context, the graph view may not achieve its goals in helping database navigation and exploration.

**Statement of Problem**

Visualizations of graphs can quickly become complex and confusing especially when the graph connects entities of different types (companies, concepts, products, etc.). Without properly handling the case when the number of edges becomes too large, proper database navigation and data exploration in the graph view become hard or even impossible.

**Proposed Solution**

One possible solution to make a graph visualization decluttered and more useful would be to empirically determine which techniques would serve graph exploration and representation best. Drawing on previous work on graph visualization techniques, such as edge bundling (combining similar edges to make them less confusing), hiding unnecessary nodes, and employing color coding, we conduct a survey on which techniques work best for the particular case of TechNotes. Then, after analyzing the results, a novel design for TechNotes graph will be designed and tested again to objectively assess improvements over the original view, as well as areas of improvements for future graph view iterations.

**Scope**

The following areas of inquiry will be pursued:

1. What information is lost or hard to understand in the current graph view?

2. Which graph decluttering techniques would be most effective based on participants’ views?

**Methods**

The main study will proceed in two stages. For the first stage, I will determine feasible graph decluttering techniques and create graph samples that employ these one a time. A study with participants will be conducted with the samples and questionnaire testing the participants’ understanding of the date presented in the graph. The responses will be analyzed and the best graph decluttering techniques chosen. For the second stage, the best techniques from the first stage will be integrated together into an improved TechNotes graph view, and a new study with participants conducted to see if the improvements do indeed integrate well and offer an improvement on graph visualization.

Secondary sources for these studies will include publications on graph decluttering, edge bundling, and general graph visualization.

**My Qualifications**

I am currently in Bachelor of Computer Science degree, and am familiar with topics in data visualizations as well as have experienced in creating graph visualization using computer programming. Additionally, for the past year I have been exploring various research on the topic on graph edge bundling and decluttering.

**Conclusion**

Since graph view is important to TechNotes’s database as a way to navigate, explore and discover data, it is important to make an effort to make graph useful and easy to understand. By conducting studies with participants, most useful techniques of decluttering can be found and employed, and a new graph view that shows only what is needed in an efficient and elegant way can be developed.