

Educational Data Mining Visualization Tool (EDM-Vis)

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Introduction

Intelligent Tutoring Systems (ITS) are used at universities and public schools to provide an educational learning tool for students. These systems produce thousands of megabytes of educational data in the form of log files. These logs can help teachers to understand student's solutions and steps in solving a problem. In their original text format, the logs are very hard for a human to read, rendering them essentially useless. The challenge is to take these massive amounts of educational data and format it in such a way that it can be visualized.

Background

Intelligent Tutoring Systems (ITS) have been proven to be more effective than regular homework assignments, and to improve them even further, a hint generator was put in place. The hint generator assists students who became stuck at some point in the assignment by automatically generating a hint relevant to a student's progress in the problem. Studies found that the provided hint generator was utilized 91% of the time. However, there was still no way to visualize the student log data from the tutorial system.

What was designed to solve this problem was the Educational Data Mining (EDM) Vis Tool. The first prototype helped visualize the different steps students took in solving a procedural logics problem. Some of the functionalities where, the frequency removal which allowed visualization by blurring any path of action done by the student that was less than the number selected, a MiniMap that gives a

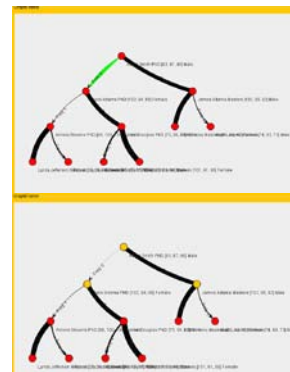
small preview of the overall graph, as well as a detail box which prints more information on a selected node(state student is at). This version showed us the possible to visualize the educational data in a useful fashion. However, we needed to take it a step forward by adding more data exploration tools and formatting a wider range of data files to be able to read them into the EDM Vis Tool.

Research

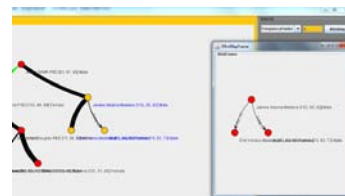
- **File Converter** – reformats log files so that they are compatible with the Visualization Tool.



- **Drop Down Menu/Search Bar** – the user can select a category of the data they wish to look up from the drop down menu, or type it in directly in the search bar. Depending on the type of data, the corresponding nodes or edges will be highlighted.



- **Highlight Function for Nodes/Edges** – reacts to what is entered into the search bar by changing the color of the nodes or edge that fit its criteria.



- **Sub-Graph Generator** - provides a filtering tool that allows the user to explore only a certain area of the graph.

Impact

- Created a file converter that allows different data sets to be loaded directly into the EDM Visualization Tool , therefore reaching a broader audience such as the Data Shop repository at Carnegie Mellon University, which stores educational data logs from many tutoring systems that are in use in numerous school systems across the nation.
- Wrote additional tools and features that provide a cleaner way to search through the data tree, and provided a faster and easier way to understand the student data graph.
- Overall, the tool will facilitate the improvement of tutorial system and the performance of students.



EDM Vis Tool visualizing results of one Proof

Conclusions

This summer I learned how to employ my programming skills from prior programming courses in a project setting. This project will improve the learning experience by first providing a file converter that will format text to be loaded, and to create tools for graph data exploration. I also learned valuable debugging practices that I was not familiar with before, and how to use the Java Universal Networking and Graph Framework Library. The programs I contributed to the EDM-Vis Projects were:

- File Converter.
- Highlighting Node and Edge
- Generating Sub-Graph

Future Work

In future studies, we will conduct a pilot study to gain feedback for new data exploration tools.

We also plan to create a log file library that will allow other tutoring systems to easily import their educational log data into the EDM Vis Tool.