TEXTBOOK PROBLEM DEPENDENCY WEB

An Undergraduate Research Scholars Thesis

by

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ABSTRACT

Textbook Problem Dependency Web

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After a textbook has been written and published, one may want to customize it for a particular audience; it may be desirable to delete or reorder some of the chapters or sections. However, there may be dependencies among the chapters, sections, examples and exercises which make it very tedious to rearrange the order of not only the chapters but also, the associated exercises. Martinsen is building a graph database to describe the dependencies among the chapters and sections in a portion of the online Calculus book, MYMathApps Calculus, being written by Yasskin. In addition there will be a database of examples and exercises which describes their dependencies on the chapters and sections. Further, he is building a GUI for an instructor or institution to reorder the chapters and sections by drag and drop and have the examples and exercises automatically reorder.

1. INTRODUCTION AND LITERATURE REVIEW

1.1 Background Info

Textbooks go through a long and arduous process before a student or professor is able to view and use it. This process requires much work and effort into not only validating the content of the textbook but also validating the ordering of the textbook as whole. Much like a jigsaw puzzle, each chapter fits one after another based on the dependency of the topics being taught. On top of these chapters being ordered, the exercises must also be placed in the correct place in order to not give an exercise that based on a topic that has not been presented to the reader previously.

After all this work on ordering has been completed (among other things), the textbook is read for publication. For many good textbooks, many professors and institutions may enjoy the content within the book but would prefer delivering the content to a student in a different order than the textbook currently is in. Most of the time, work and effort that has gone into meticulously ordering the chapters and exercises must be now be revisited again and modified. This process is nearly as time consuming and laborious as the first time.

1.2 Existing Technology

From what I have been able to find, most re-orderings of chapters and exercises are done by hand with human intervention. Pearson (TM) has the ability to have to reorder their own published textbooks but it is not applicable for the general textbook.

From speaking with several Math professors at the Joint Math Meeting 2019, this idea is not brand new but there is no platform for them to do this task. There is a platform for identifying dependencies between subjects and textbooks that then allows a professor to generate a curriculum based off these topics, but this is done on a textbook level, not by

chapter or exercise.

2.   THE ALGORITHM

2.1   The Motivation

traverse old and new textbooks diff algorithm between two trees

[1] [2] [3]

2.2   The Design

tree of unit (chapters/sections/pages) order – 1a orig and 1b modified

tree of exercise order – 2a orig and 2b modified

tree of unit interdependences 3

tree of exercises dependencies on units 4

flexiblility

1. author creates original trees 1a, 2a, 3, 4

2. adopting institution or instructor specifies desired order of units 1b

program provides warnings of impermissible orders as this tree is created

adopting institution or instructor can override order

3. program automatically creates 2b

adopting institution or instructor previews exercise and can override order

4. actually reorder the files of the text and links between them

3.   THE IMPLEMENTATION

4. CONCLUSION

Some text/figure here

4.1 Results

4.2 Challenges

Section here is to test toc display only.

4.3 Broader Impact

Section here is to test toc display only.

4.4 Future Plans

as

REFERENCES

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