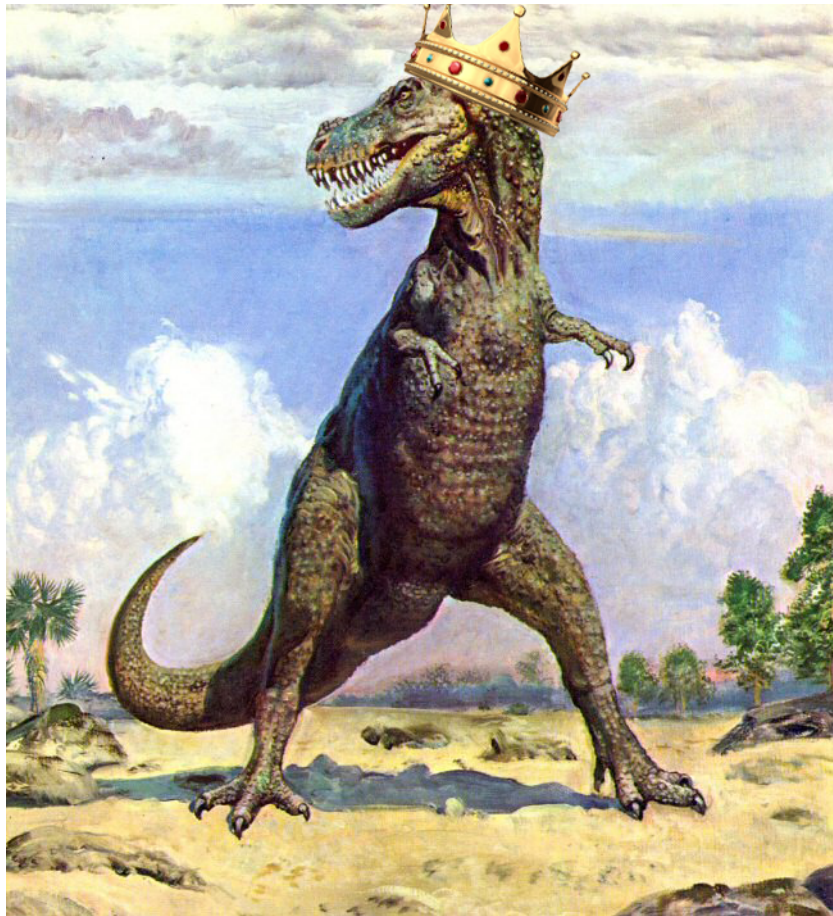


REX User's Manual

CISC475/675 Spring 2010

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1 Introduction

The REX software package assists in the creation of multiple choice exams. It is advantageous to create multiple versions of the same exam with varied questions to discourage cheating in packed lecture halls. This requires choosing questions, rearranging their order, and reordering their answer for several exams. The REX software reduces the effort required in this tedious process.

The program was created as a class project by the University of Delaware's Spring 2010 Advanced Software Engineering (CISC475/CISC675) class.

The REX software is cross-platform, open-source, and extendable. Standard L^AT_EX format is used for the questions and output exams to enable hand editing of exams. Every exam is supplied with an answer key for easy grading.

2 Overview

The REX software package takes two input files. The Exam Configuration File (ECF) specifies the composition of each exam. The Universal Exam File (UEF) contains the question bank. From these inputs multiple versions of the exam are created.

The order of sections, questions, and answers are all randomized differently on each version. There is the capacity to add figures, blocks of text, and a front page to the exam.

3 Installation

The REX software is contained in a single Java .jar file and has no dependencies. No unpacking or installation is required, just locate the `REX.jar` executable in the desired directory. Currently the program only accepts command line input so UNIX systems are preferable.

REX requires a Java 1.6 compatible JRE.

3.1 Building From Source

Optionally the user can build REX from source if custom changes are made.

- Install Ant and a Java 1.6 JDK
- Checkout the project source code from the repository

```
svn co svn+ssh://[user]@cisc475.acad.cis.udel.edu/home/www/repos/cisc475/trunk
```

- Download and extract necessary libraries (Antlr, Corbertura, and JUnit) to trunk/lib from the following URI

```
http://eecis.udel.edu/~cates/rex-external-libs.tar.gz
```

- Create a build.properties file for your local machine in the root of trunk

```
cobertura.lib.dir=lib/cobertura-1.9.4.1
antlr3.name=lib/antlr-3.2.jar
antlr3-task.name=lib/antlr3-task.jar
junit.name=lib/junit-4.8.1.jar
```

- Run ant
- Use java -jar REX.jar to execute the application

4 Universal Exam File (UEF)

The Universal Exam File stores all questions, answers, and figures that will be included in the exam. REX can take a subsection of these questions as specified in the Exam Configuration File.

```
\documentclass{exam}
\usepackage{fullpage}
\usepackage{amsmath}
\usepackage{comment}
\usepackage{graphicx}

\begin{document}

\examheader{CISC 106}{UEF Example}{Developed: 2010}

\section{Topic}

\begin{block}{FSA Description}
  In the following four problems, let  $A$  denote a finite-state
  automaton with exactly one accepting state.
\end{block}

\begin{problem}{topic}{15}
  This is a problem
  \begin{answers}
    \answer This is an answer that is not correct
    \answer answer
    \answer[fixed] This is a fixed answer that is not correct
    \answer[correct] This is a correct answer
    \answer answer
    \answer[fixed,correct] fixed correct answer
  \end{answers}
\end{problem}
```

```

\begin{figure}[placement h]
  \begin{center}
    \includegraphics[scale=0.50]{binary_tree.png}
    \caption{Traverse Binary Tree}
    \label{fig:binary tree}
  \end{center}
\end{figure}

\begin{block}{Goodbye Message}
  Did you remember to write your name on the first page? Did you
  attempt to answer every question? Have a good holiday.
\end{block}

\end{document}

```

5 Exam Configuration File (ECF)

The Exam Configuration File is a text file with a `.tex` extension that consists of a series of constraints. Each constraint is separated by a semicolon, with comments being all text that follows after a pound symbol (`#`) until the end of the line. Please see section 5.5 for a complete example.

There are four defined commands for the ECF file.

5.1 Group Constraints

A group constraint is a command of the form `include int count problems on string topic with difficulty in interval1 difficulty at int points points;`.

The command will choose count problems from topic that fall in the difficulty range, and assigns all of them points points.

For overlapping constraints, REX will attempt find the largest set of questions that resolves all constraints. That is, if there exist two identical constraints for 5 problems each, REX will attempt to find 10 questions total. If REX cannot accomplish this, the request will result in an `RexUnsatisfiableException`.

5.2 Required Problem Constraints

A required problem constraint is a command of the form `includeall string label at int points points;`.

This will ensure the the question with the label given is included in every generated exam, and will be given points points.

¹An interval is a pair of decimals separated by two periods, in between a pair of braces or parenthesis. A brace on an end indicates that edge is inclusive, and a parenthesis that the edge is exclusive. For example, `[3..5)` would be the range from 3 to 5, including 3 but not including 5.

Multiple label's can be given in one command by separating them by commas. This will have the same effect as if each label was given on its own line.

5.3 Append Text

An append text command is a command of the form `append string label;`

This will take the text contained in the block with the given label, and append it to the end of the exam.

5.4 Version Definition

A version definition of a command of the form `versions are string versions;`

Versions are a list of strings, separated by commas, used to distinguish the different exams generated. Each generated exam will use one item in the list, and so there must be at least as many items as there will be exams generated.

In the UEF file, you can use the `\examversion` command to insert the current version string. One example use for this is to have a different date format for each generated exam, so that the exams can be easily distinguished from one another, but a naive student would not know how to tell if his neighbor has a similar exam.

5.5 Example ECF

```
include 5 problems on "Finite State Automata" with difficulty in [0,20)
    at 3 points;
include 5 problems on "ssort" with difficulty in [20,\infty) at 2 points;
include 3 problems on "arithmetic" with difficulty in [0,10] at 1 points;
include 3 problems on "arithmetic" with difficulty in (-\infty,\infty) at 3 points;

# the following problems will be included in their corresponding
# sections on any generated exam
includeall prob:arithmetic:prime, prob:arithmetic:composite, prob:misc:hat,
    prob:misc:complexity at 5 points;

append "Goodbye Message"; # this block will be added at end

versions are "1/21/2010", "Jan.\ 21, 2010", "21-jan-2010", "JAN.\ 21 2010";
```

6 Usage

`java -cp REX.jar edu.udel.cis.cisc475.rex.main.Rex Usage: rex [options] ¡UEF filename¿ ¡ECF filename¿` Options: `-n numExams` : int numExams declares number of exams `-seed seed` : long seed declares the seed for randomization `-pdf` : sets the pdf option in order to have the exams output in pdf as well as .tex files.

6.1 Synopsis

rex [-n num] [-seed s] [-pdf] UEF-file ECF-file

6.2 Description

REX will parse through the UEF and ECF files and generate the appropriate number of output exams, as specified in the ECF file or on the command line.

Below are the options:

- n **num** will generate **num** different exams
- seed **s** will generate the exams based on the specific seed **s**
- pdf will create a PDF file from the generated \LaTeX files

NOTE: The PDF option requires a \LaTeX interpreter to be installed.

7 Troubleshooting

Because of the requirements that REX places upon the input it parses, REX may present the user with a variety of errors. Additionally, it's possible that REX might process the request without any errors or warnings, but will provide an undesired output.

7.1 Errors

7.1.1 RexParseException

This error means that REX encountered a syntactic error in either the UEF or ECF file. Please consult the provided error message for more information.

7.1.2 RexUnsatisfiableException

This error means that the input files were parsed correctly, but that REX determined that the requirements from the ECF cannot be resolved using the provided UEF file. Generally, this means that there aren't enough problems in the UEF. Either reduce the number of requested problems in the ECF, or create new problems in the UEF to resolve this error.

Note: REX resolves the requirements in the ECF simultaneously. This means that if the ECF has two identical requirements of 5 questions each, REX will require at least 10 satisfactory questions.

8 Credit/Copyright

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