ExamMaker Analysis in R

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Abstract

This vignette is intended to instruct users on how to set up and manipulate routines that design multiple choice exams for large classes where several versions are required to avoid the temptation to cheat. The program reads question banks from ASCII text files and creates latex files that are suitable for distribution in class. Answer keys are also created. The main power of ProfessR is the ability to randomize questions as well as in the answer choices, to set up multiple versions of a test. Once a large data bank of questions has been created, any number of tests can be generated, different every year or scrambled in a variety of ways.

1 Test DataBank

The test databanks in the ProfessR package are organized as ASCII text files. The format is relatively rigid at this stage but these restrictions may be relaxed int he future. At this time the questions are all multilple choice. But true/fals questions could easily be incorporated by have a two choice question.

The TEXT format of the data is stored in the following manner:

```
QUESTION: Sandstone cliffs in Montana are categorized as:
ANSWER: a) sedimentary rocks
b) metamorphic rocks
c) igneous rocks
d) intrusives
e) extrusives
```

The program parses this out by search for the key words 'QUESTION:' and 'ANSWER:' Severl question can be stacked on top of each other, and in the event that there is a figure associated with the question, it is signaled by the

key word, "Fig:". For example here we have 2 questions, the second one includes a previous generated figure located on disk and referenced in the question via the standard latex implementation.

```
QUESTION: Convection in the mantle is indicated by
a) hot slab descending at subduction and cold ridges rising
b) cold slabs descending and hot spots rotating
c) voluminous lava flows at transform faults
ANSWER: d) hot magma rising at ridges, cold slabs descending at subduction zones
e) hot spots drifting to the northwestern Pacific
QUESTION: From the follwowing figure (Figure~\ref{fig:faults1}) which is the normal fault:
a) A
b) B
ANSWER: c) C
d) D
e) E
FIG: /home/lees/Class/TESTBANK/faults_4_test.eps fig:faults1
```

The FIG tag indicates a file pointer and latex tag name to refer to the figure in the subsequent exam.

Any number of questions/answers can be in the databank. Once they are read in via the parsing program, questins can be selected in R and a specific Exam is generated.

```
> library("ProfessR")
> QB1 = Get.testbank("climate_change_abbott.txt")
> QB2 = Get.testbank("tsunami_abbot_web.txt")
```

Here we have two data banks installed and we want to select a random sample of 12 questions from the first and 9 from the second.

```
> L1 = length(QB1)
> L2 = length(QB2)
> isel1 = sample(1:L1)
> QBfinal = list()
> for (i in 1:12) {
+     QBfinal[[i]] = QB1[[isel1[i]]]
+ }
> isel2 = sample(1:L2)
> for (i in 1:9) {
+     QBfinal[[i + 12]] = QB2[[isel2[i]]]
+ }
```

To insure that there is no order to the questions the exam can be randomized with simple calls to

```
> QA1 = ran.exam(QBfinal)
```

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On the other hand we may wish to create 2 versions of the same exam with questions mixed up to reduce the possibility of cheating:

```
> examdate = "TUES OCT 30 2007"
> version.exam(QBfinal, "exam2A", exnumber = "Exam 2", seqnum = "1",
+     examdate = examdate)

####  To get the final output, change directory to current directory.
####  Execute the following system commands outside of R:
latex exam2AMAST
latex exam2AMAST
dvips -Ppdf exam2AMAST.dvi  > exam2AMAST.ps
ps2pdf exam2AMAST.ps   > exam2AMAST.pdf

> version.exam(QBfinal, "exam2B", exnumber = "Exam 2", seqnum = "2",
+     examdate = examdate)

####  To get the final output, change directory to current directory.
####  Execute the following system commands outside of R:
latex exam2BMAST
latex exam2BMAST
dvips -Ppdf exam2BMAST.dvi  > exam2BMAST.ps
ps2pdf exam2BMAST.ps   > exam2BMAST.pdf
```

The output of these two calls includes tex files of the two tests, and solution files for printing and distributing to students after the test is over. Of course these should be processed with calls to Latex

```
latex exam2AMAST
latex exam2AMAST
```

and

```
latex exam2BMAST
latex exam2BMAST
```

Note that we call latex twice to rectify all the references to figures in the latex file.

Finally the dvi output should processed to make a printable version. I typically use the calls,

```
dvips -Ppdf exam2AMAST.dvi  > exam2AMAST.ps
ps2pdf exam2AMAST.ps   > exam2AMAST.pdf
```

and similarly for the B test and the solution files. I then can post the solutions on a web site and students can read them using Windows.

1.1 Latex Notes

The Latex header in prep.exam is generated autometically in the R-code. For some users this style may be too primitive and they will want to replace the cover sheet with other more attractive options. Originally I used a style sheet provided by the University of Texas, UOFTEXAM.sty. If the user wants to use this it should be installed in the proper place in the users latex repository, /usr/share/texmf/tex/latex or some such equivalent so the latex program can make the final copy of the test.

Other changes should be made in that file to reflect the user's set up, college, etc.

1.2 Cleanup

As a side effect of the ProfessR routines we have created several files to be used later. For this vignette, however, we will delete these files.

```
file.remove("exam2AMAST.tex")

file.remove("exam2AMAST.tex" )
file.remove("exam2Asolutions.tex" )
file.remove("exam2A.tex" )
file.remove("exam2BMAST.tex" )
file.remove("exam2Bsolutions.tex" )
file.remove("exam2B.tex" )
file.remove("ExamMaker.tex" )
file.remove("Rplots.ps")
file.remove("ExamMaker.dvi" )
file.remove("ExamMaker.log" )
file.remove("ExamMaker.aux" )
```