Multiple choice test creation and marking - the future is barcodes

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Outline

- Space age technology, that is to say, technology from the 1960s:
- Barcodes!
Motivation

- Make some painstaking parts of teaching easier
  - Attendance
    - No calling names
    - No paper based attendance
      - Reduce possibility of any forgeries
      - No need to transcribe to spreadsheet
  - Marking multiple choice tests...

References:

Literature / other options: (2)

· Wanted to stay with paper
  · Paper trail
  · Student: "I swear I answered `B`!"

· Punch cards?
  · Could, but there might be problems with hanging chads...

Barcodes

· Had a good idea it would work
· Keeps me in the loop when marking
· Allows students to correct answers without too much worry about how an OCR scanner will react
· Barcode readers are cheap
  · http://s.dealextreme.com/search/barcode
· (Was already using for attendance)
**pst-barcode for latex [1]**

- Can produce many varieties of barcodes
  - Including 2D ones
- I went with Code-39 (same as our ID cards)

Example code:

```latex
\begin{pspicture}(5,1in)
\psbarcode{BARCODE1234}{includecheck
  includetext}{code39}
\end{pspicture}
```

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**BASH scripts**

- Generate randomised tests:
  - Take a question file (my own tags to indicate what is what)
  - Loop for number of tests to make
    - Write out a header (instructions for taking test, etc...) to the latex file
    - Randomise questions, randomise possible answers - write into the file
    - Write out a footer to the file
  - Build the latex into pdf

- Print all the pdfs, take test
BASH scripts (2)

• Mark:
  • Scan all the barcodes
  • Generates a results file for the student
  • (Analysis of test results at this point)

• email results:
  • emails results text file, and a copy of the original pdf to the student

Demo
Success!

- With 40 tests the only error discovered so far was me scanning two barcodes
  - A few queries, but they were all students misremembering their answers
  - If I had more time, I would have scanned in each test using the photocopier, emailed, and got students to check (but no time!)
    - For now, that that on a per-request basis

Problems

- I did record the question randomisation order, but not the answer order
  - I can tell what students had issues with what questions
  - But can't work out what wrong answer they were marking down - and if there was correlation there

- Some students don't seem to like the randomisation of questions
  - I did instruct students to consider what order they should do questions in, but some still did not
  - I'm not going to fix this
Known bugs / future work

- Hardcoded to 4 options per question
- Can't 'lock' the order of a set of questions, or answers. Random or nothing.
  - ...So don't say "none of the above" - say "none of the other answers"
- Scanning two codes - just marks a question wrong
  - Could add in some more error checking

Known bugs / future work (2)

- My particular scanner seems to have very occasional issues in transmission
  - The error is a missing char - so easily checked for
  - Could implement the use of the checksum

- Could make barcodes smaller if I had a better scanner...
  - Ordered a laser diode based one last night ($35)
Long term future work

- CCD based handheld barcode reading (eg. iPad)
- Cards also contain an RFID chip*
  - Does not contain student ID number though
  - Loose easy ability to cite ID card picture
- API for uploading marks to ESP (ICT Electronic Submission Processor web site)
  - Takes care of recording and releasing marks to students

*One that's standard or proprietary? Can I get a reader? Not sure.