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Building a Statistical Database of NCT Test Items

Tatsuo OTSU*, Tsunenori ISHIOKA, Takamitsu HASHIMOTO
The National Center for University Entrance Examinations (NCUEE, Tokyo)
* otsu @ rd.dnc.ac.jp http://www.rd.dnc.ac.jp/~otsu

Abstract

The National Center Test (NCT) is a nationwide university entrance examination organized annually by the National Center for University Entrance Examinations (NCUEE) and Japanese universities. All national and public universities in Japan have been adopting the NCT. In addition, many private universities use the NCT as one of the tests to screen students. Last January, about 500,000 participants took the NCT.
Although the item development procedure of the NCT is a highly comprehensive process involving reviews by anonymous professors, the NCUEE does not use modern test theory to moderate difficulties.
Organizing statistical data of the NCT is key to item writing for future examinations and educational policy making. We developed a database of item statistics of the NCT between 1990 and 2007. This database contains several statistics based on classical test theory. We included about 18,000 items from various areas. The data is contained in XHTML forms, which are generated using Prolog based XML parser, with links to scripts for dynamic chart generation. The forms also contain links to item documents for reference. The statistics reveal difficulties in moderating scores in the absence of pre-test operations.

Information Required for Item Writing

We do not perform pre-test for NCT. All items are “one-time use”.
Difficulties and identifiablities are necessary for considering characteristics of newly written items.
Statistical data on past NCT items are the most important source for predicting the performance of newly developed items.

Scoring and Statistical Computation

Intensive use of C++ STL containers. Good performance was achieved with Intel C++ compiler on Core2Duo PC. The program completed the process within 10 minutes for a booklet with 500,000 test takers.

XHTML generation with Prolog based XML parser

SICStus Prolog and Fletcher’s XML parser. The parser is able to do bidirectional transformation.

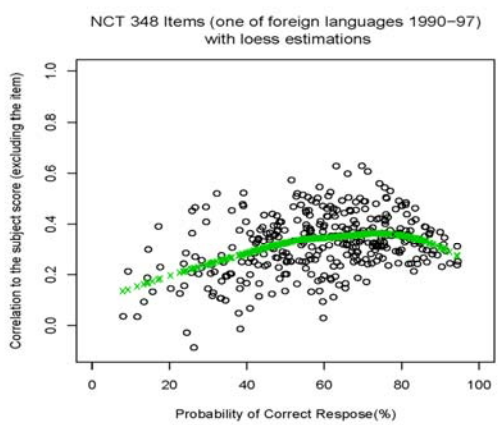
XML document

```
<?xml version="1.0"?>
<xmlsample>
<tag1 attr1a="1A" attr1b="2B">
Sample text1
 <tag2 attr2a="2A" />Another text
</tag1>
</xmlsample>
```

Prolog internal representaion

```
xml( [version="1.0"],
     [  element( xmlsample,  [],
          [  element( tag1, [attr1a="1A", attr1b="2B"],
                  [ pcdata("¥nSample text1¥n"),
                    element( tag2, [attr2a="2A"],  [] ),
                    pcdata("Another text¥n")
                  ] )
          ] ).
```

Statistical Properties of the NCT items



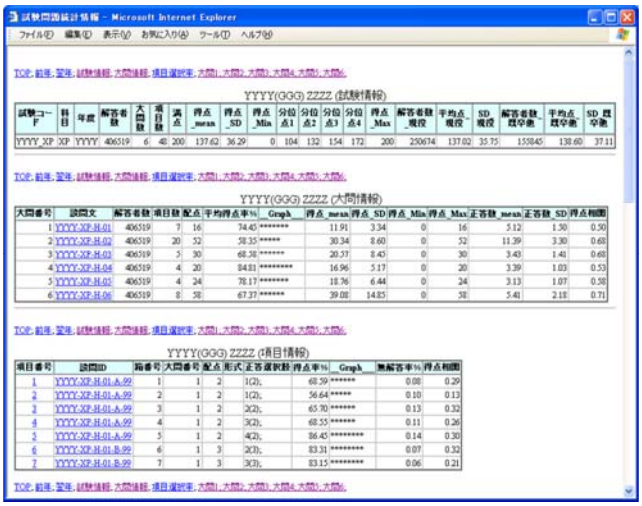


Figure 1. Statistics in XHTML

The top table shows statistics of the test. The second table contains statistics of testlets. The third and forth are statistics of items. The tables contain identification codes, scores, correct answers, response probabilities of correct answers, and correlations between the item score (usually binary valued) and the sum of other item scores.

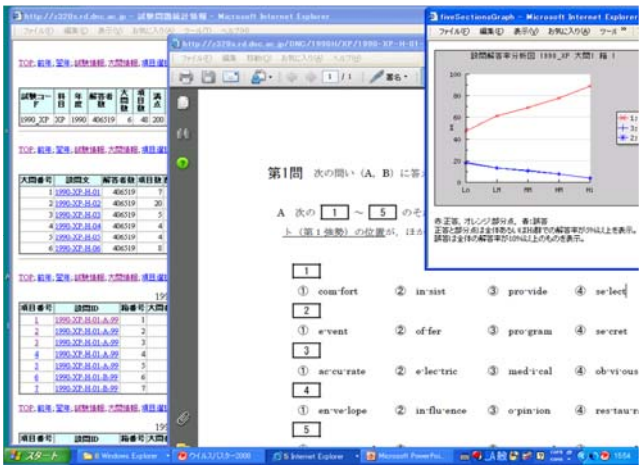


Figure 2. Item retrieval and dynamic chart generation

The XHTML table have links to the item documents (in pdf) and the graph-drawing script in PHP.