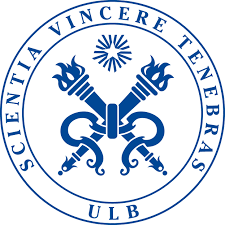
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**LANG -F -301**

**Academic English II**

**Mrs Gyori**

**Game-Theoretic Question Selection for Tests**

**Abstract**

Today when you want to test someone knowledge you can make a test, but when you have to test more people making a test is harder. The tests are not efficient anymore because the tests are passed at different moment and the questions are no longer secret. This happen a lot on the internet with MOOC (Massive Online Open Course). Thus, this kind of large-scale test aren’t really able to test someone accurately. In this article we are going to discuss about different solutions and algorithms about this problem.

**Summary**

With the development of technology in education, more and more online courses have emerged. For the largest of them, they were given the name MOOCs (Massive Open Online Courses). It goes without saying that their impact on the development of society is becoming increasingly important given that 100,000 people are sometimes gathered for a course. The question of how to effectively evaluate these students then became crucial.

One approach used now is monitored test centres. The problems with this method are that the questions may have leaked (online) or in some other way. One example is the tests for the driving licence.

A natural solution would be to generate enough questions and mix them randomly to prevent the interviewee from memorizing all the questions in the test. Another problem arises then, some questions are much more effective than others in testing students' acquired knowledge. Should they be used more often? Another point is that it's better to use a set of questions that is based on the whole subject than questions that are targeted on the same part of the subject. On the same level, choosing questions in a deterministic way is also biased because it would be too easy to memorize.

Therefore, it would be interesting to develop some kind of intelligent random generation technique.

Because this technique could be used in fields other than teaching. The following results have been obtained by acknowledging the loss of confidentiality as a fact. And the test model that was used followed Bayesian's game. It's a game in which the players have incomplete information on the other players (e.g. on their available strategies or payoffs), but, they have beliefs with known probability distribution. In addition, the test phase scores were calculated in two ways: scored and binary tests.

Now we are going to talk about experiments that will show how the optimal test strategy outperforms simple test strategies like choosing random questions. For each experiment we have three parameters, the number of questions, the number of test takers types (a type of test taker define what questions are hard for him). In order to compare scored test to binary test the binary test will be translated to a scored test with question that have a score of 1. The first experiment will be about single-question test, for those experiments we use 5 different algorithms, general LP, marginal-probability, scored-test LP, network-flow, and Push-Relabel. For every case each algorithm creates 5 game instances, and we put the average running time on a graph. We can see on the graph that push-relabel is the best overall algorithms for the single-question test.

The second experiments will use the same algorithms but with multiple-questions test and will generate 50 instances for each case and put the average on the graph. The results of the test show that all the algorithms have advantage. The scored test algorithm will run faster when the number of questions is higher, but the general LP is more efficient when the number of test taker type is higher.

We can conclude that the optimal scored test can be efficiently computed in a polynomial time, however the binary test is much harder to compute. In fact, the best way to make test would be to adapt our strategies directly online depending on the score from the test taker.

Lastly this paper is only a small part about designing algorithm for game-theoretically optimal design of tests. Future research could focus on identifying other tractable cases.

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