Using Mooshak as a Competitive Learning Tool

José Paulo Leal and Fernando Silva

CRACS & DCC-FCUP, Universidade do Porto, Portugal
{zp,fds}@dcc.fc.up.pt

Mooshak is a web based competitive learning system originally developed for managing programming contests over the Internet. From start, in 2001, the system followed the ICPC contest rules and has been used in several local and regional contests as well as for multi-site contests. The system has evolved to include features such as a more sophisticated automatic judging, secure and safe process execution environment, full accounting of memory usage, on-line registration, XML import/export for problem descriptions and users and virtual competitions. Virtual competitions are a wonderful tool for contestants to practice as if they were participating in a real contest, thus experiencing all the contest events in real time. Mooshak has also evolved to manage other types of contests, such as the Portuguese section of the International Olympiad in Informatics (IOI) and the Portuguese Logic and Functional Programming contests, with different rules and different grading policies.

From very early, Mooshak started being used as an e-learning tool in several universities specially in courses on programming, algorithms and data structures, artificial intelligence, among others. In these courses students participate in several "contests" where they have to solve one or more problems, receive immediate feedback on their attempts and are able to compare their own progress with that of their colleagues. These are characteristics of competitive learning that stimulate students to work harder on problem solving using the subjects taught in each course.

In this paper we present the main features of Mooshak and how it in can be used in competitive learning. We present two case studies that make different uses of Mooshak as a competitive learning tool, creating several programming "contests" with different rules. In one of the examples, students participate in several, usually five, assignment-contests, each with a week or ten days duration. Student's participation is remote (they don't have to be in a specific location) and evaluation follows a mixed strategy. Each student submission is automatically evaluated by Mooshak in the traditional black-box approach. This evaluation is later complemented by having the students presenting and explaining their solution to teaching instructors in order to receive feedback and credit for their work. In the other example, "contests" have a short duration (less than one hour), students participate in a specific and controlled location and during the contest students receive error messages explaining the detected semantic errors on their submissions. The purpose of this paper is not to compare the differences of the two approaches but rather to highlight what they have in common from a competitive learning point of view. To assess the methodology we used questionnaires to find evidence of the positive role of competitive learning in computer science education.