

Websheets: A Templated Online Coding Exercise System

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ABSTRACT

Websheets is an online exercise system providing rigorous “fill-in-the-blank” programming exercises. It allows an instructor to quickly create exercises by writing a correct reference solution and indicating the parts to be “blanked out.” It is open-source and has been used successfully in Java and C++ by a half-dozen instructors and over 1000 students.

Categories and Subject Descriptors

K.3.2 [Computers and Education]: Computer and Information Science Education

General Terms

Design, Human Factors, Languages

Keywords

Automatic Assessment; Java; C++; CS1; Open Source

1. GOALS

Websheets is an online exercise system. It began as a way of trying to automate and formalize a collection of “fill-in-the-blank” programming exercises in a large introductory Java course. Fill-in-the-blank exercises are excellent pedagogically since they allow you to focus attention on the new and interesting parts of the code, rather than the boilerplate.

Those exercises were previously provided as .java files with underscores indicating parts to be added. With Websheets, our goals were (1) to provide an online interface which would highlight the editable parts, (2) to make it easy for students to submit their code in the browser and test it, and (3) to rigorously enforce that only the selected parts could be changed. Additionally, we wanted (4) to make it easy for instructors to create new exercises, and (5) to make it open-source so instructors can contribute new exercises or infrastructural improvements. We have implemented the system and provided backends in both Java and C++.

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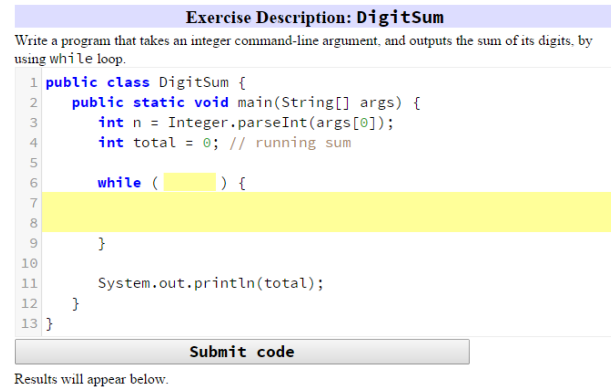


Figure 1: Students’ view of an exercise.

2. INTERFACES

Ease of use is a main goal for the Websheets system, both for the student and the instructor. In Figure 1 we show the students’ view of an exercise called DigitSum. The student accesses the exercise and its description in their browser, fills it out, and submits it, receiving instant feedback on multiple test cases. The yellow areas expand horizontally and vertically to accommodate solutions of any length.

To define an exercise, you must create a template, which acts as both a reference solution *and* the scaffolding for the student. It is a normal program augmented by delimiters \[and]\ which represent the start and end of a blank. Here’s the template for DigitSum:

```
public static void main(String[] args) {
    int n = Integer.parseInt(args[0]);
    int total = 0; // running sum

    while (\[n > 0]\) {
    \[
        total = total + n%10;
        n = n/10;
    ]\
    ...
}
```

The system has received extremely positive feedback from instructors and students. We use it for in-class activities, mandatory homework, and optional practice. Try it out, read the documentation, or obtain the source at:

<http://cscircles.cemc.uwaterloo.ca/websheets.html>