

Development of Online Judge Using Contestant PC As Worker of Autograder

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Abstract—Competitive programming is a computer science competition where the contestants compete to solve computer science problems by writing a program which satisfies the problem constraints. Autograder is used to grade contestant solutions automatically in real-time. Usually autograder is deployed in many computers to increase grading performance. In this work, contestant computers are used as worker to run autograder. By using contestant computers as worker, the number of worker will be proportional to the number of contestant submissions, thus increasing grading performance. Every contestant computer has different specification and can affect grading fairness. To keep grading fairness, contestant's solution and jury's solution executed in contestant worker and compared to check whether contestant's solution satisfies problem constraints. This work tested by simulating grading process in contestant computers. The testing result indicates that using contestant computers as worker gives performance improvement in the grading process.

Index Terms—competitive programming, online judge, autograder.

I. INTRODUCTION

Competitive programming is one of the most popular competition in computer science field. In competitive programming competition, contestants are asked to solve computer science problems correctly and as fast as possible. Some institute and organization often organize competitive programming competition periodically. Some big companies like Google and Facebook organize competitive programming competition annually. Competitive programming competition supported by online judge system. Usually, online judge system is a web based application where contestants can read the problems, create clarifications, submit their solution, and watch the scoreboard. Currently, the most popular online judge are Codeforces, URI Online Judge [8], Uva, and SPOJ.

In order to grade contestant submissions, online judge system has a subsystem called autograder. Contestant submissions which are source code in certain programming language will be graded by autograder system by compiling the program and executes compiled program using test-cases that have been prepared by juries or problem setter. According [14], this grading method is called black-box grading. By using autograder system, the grading process can be done automatically and juries don't have to evaluate contestant submissions manually. In order to increase the number of contestant submissions in certain amount of time, juries usually deploy autograder

in many computers. In order to run autograder in many computers, the juries need to prepare many computers with the same specification to keep the fairness of grading process.

Currently, almost every competitive programming competition use online judge system to support the competition and use many computers to run autograder in order to improve grading performance. Grading performance is defined as the number of submissions graded in certain amount of time. Even though autograder deployed in many computers, the grading performance often not enough to evaluate contestant solutions in real-time because the number of contestants is increasing. Furthermore, the number of computer to deploy autograder affect the procurement cost that juries need to be incurred. Therefore, new grading system is needed to increase grading performance without increasing procurement cost that need to be incurred.

When competing in competitive programming competition, the contestants usually use their personal computer to write the solutions. Every contestant computer usually have sufficient specification to compile and execute contestant submissions. Therefore, contestant computers have ability to run autograder program and evaluate contestant submissions.

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- The word “data” is plural, not singular.
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- Do not confuse “imply” and “infer”.
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- There is no period after the “et” in the Latin abbreviation “et al.”.
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a) *Positioning Figures and Tables:* Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables should span across both columns. Figure captions should be placed below the figures; table captions should appear above the tables. Figures and tables should be cited in the text as "Figure 1" or "Table 1", even at the beginning of a sentence.

TABLE I
TABLE TYPE STYLES

Table Head	Table Column Head		
	Table column subhead	Subhead	Subhead
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^aSample of a Table footnote.

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity "Magnetization", or "Magnetization, M", not just "M". If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write "Magnetization (A/m)" or "Magnetization {A[m(1)]}", not just "A/m". Do not label axes with a ratio of

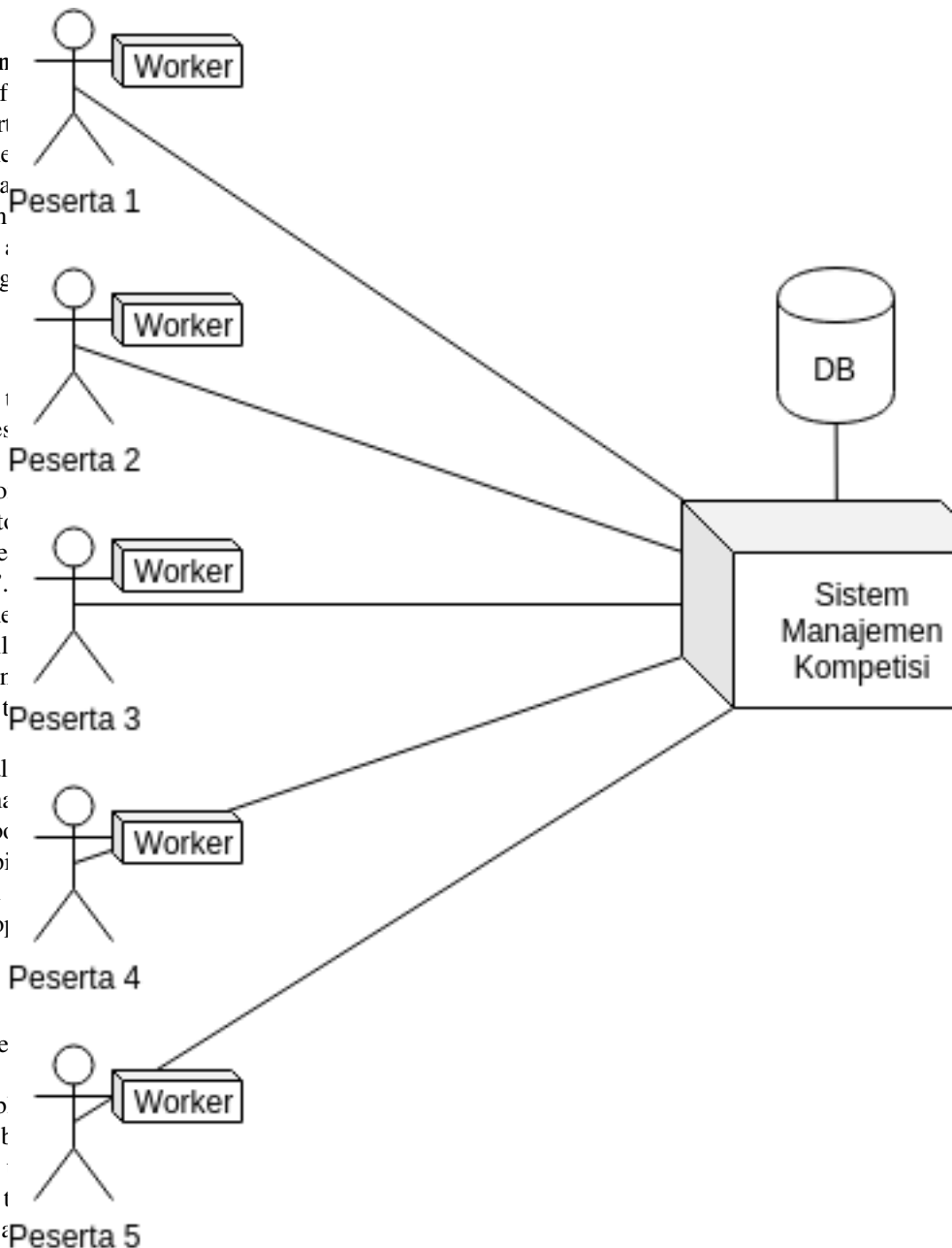


Fig. 1. Example of a figure caption.

quantities and units. For example, write "Temperature (K)", not "Temperature/K".

ACKNOWLEDGMENT

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REFERENCES

- [1] TODO.
- [2] TODO.
- [3] TODO.
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