

# Design of PYTHON Program Experiment Real-Time Evaluation System

Dan Meng

University of Science and Technology Liaoning, China

## Abstract

**This paper introduces a method of transforming program source code into graphics to realize visual evaluation of code quality. This method is based on the visualization theory, follows the principle of program code quality evaluation, and uses relevant technical means to convert the source code submitted by students into specific graphics, and then the teacher judges the quality of students' code according to the standard graphics mode. The experiment shows that this visual evaluation method can greatly improve the evaluation speed of teachers without sacrificing the evaluation quality, and then improve the overall teaching efficiency. This method can also effectively stimulate students' interest in learning, and its realization ideas can also be popularized to other types of courses.**

## Keywords

**Visualization; Code Quality; Judge.**

## 1. Research Significance and Current Situation Analysis of the Project

PYTHON Programming is a basic course for computer and related majors, with a large number of learners and wide influence. However, in the experimental teaching of PYTHON, the following problems generally exist: students' interest is not high, the learning content is boring and outdated, and the learning purpose is not clear; When students experiment on the computer, they often copy the program codes in textbooks or problem sets into the compiler. Then, even if you finish your homework, you don't know whether it is right or wrong or completely correct, let alone thoroughly understand the procedure; Due to the huge workload of teachers, it is impossible to review all students' programs, and at most, it is difficult to fully understand the learning situation of the class, and the problems in the experiment cannot be communicated with students in real time.

All the above problems directly affect the learning effect of PYTHON programming, resulting in the low pass rate of PYTHON programming course, many complaints from students about programming course, and teachers generally feel that the teaching effect is poor.

## 2. The Purpose of the Project Research

Real-time evaluation system is used to check the correctness of program source code online. The system can compile and execute codes, and test these programs with preset data. The submitted code will generally run in a limited environment, including time limit, memory limit, security limit, etc. After the answers to the test questions are submitted, the scoring system will evaluate the instant scores, The judgment result submitted each time will be notified in time, including the prompt of whether it is correct or wrong; The system will also rank users, based on the number of answers submitted by users or the execution time of a topic.

Real-time evaluation system is based on the open source real-time evaluation system, which can be used as a computer programming experiment or test to replace the traditional written test system. The system compiles the code submitted by the answerer into a runnable program,

and detects whether the input and output of the program are consistent with the preset results by using a plurality of groups of test cases preset by the system. If it is completely consistent, it is judged that the question is passed; otherwise, it is judged that the question is not passed and the reason for it is given.

### 3. Basic Contents of the Project

If PYTHON's experimental teaching revolves around the real-time evaluation system, it is easy to form an unsupervised teaching situation because of the automatic feedback of the results and the reduction of teachers' intervention, which will lead to the out-of-control of experimental teaching. Therefore, we must do a good job of "process control" in the teaching plan, assessment methods, classroom teaching and counseling. Guide students to use the real-time evaluation system in an orderly way.

#### (1) Teaching plan

Because the student-centered teaching mode is adopted, the traditional teaching mode is no longer used in the classroom, and students are required to watch the video of the teacher's lecture before class. Instead of passing on the course knowledge in one way, the emphasis is on organizing students to have discussions on difficult points and a large number of computer programming exercises.

A completely different teaching mode requires a new teaching plan. The traditional teaching plan consists of theoretical course and experimental course, while the new teaching plan consists of discussion course and computer course, in which five tests of programming ability are interspersed, so as to carry out process assessment. The five tests are all centered on the lecture content. After learning the contents of sequence structure, Branch Structure, Circular Structure, Array and Function respectively, students are required to complete the topic of this chapter in the question bank.

#### (2) assessment methods

The evaluation method reflects the scoring results of the real-time evaluation system. The scores of the five programming ability tests required in the teaching plan are directly included in the course final score, and the scores are directly derived from the real-time evaluation system. By counting the scores of this system into the final grade, students are urged to complete these questions.

The total score of the student-centered teaching mode is converted by combining online learning assessment with offline course assessment.

(1) Online academic performance (30%): online usual homework performance+online final exam performance;

(2) Usual assessment (40%): offline class discussion and questioning (20%)+ five programming ability tests (20%)(3) final exam (30%): offline final exam of Chongqing University of Science and Technology.

Among them, online daily homework, online final exam and five programming ability tests are all online evaluations.

#### (3) Classroom organization

With the student-centered teaching mode, the leading role in the classroom is changed from teacher to student, and all discussions and interactions are student-centered. Teachers can divide the whole class into groups, sit in groups during class, encourage the members of the same group to help each other, and discuss the topics in the real-time evaluation system interactively in groups. Encourage students to actively think about problems, design algorithms, write programs, share their ideas with others, and create a good learning atmosphere.

#### (4) Counseling and answering questions

Although the real-time evaluation system can instantly judge whether the program is right or wrong and give wrong tips, sometimes students still encounter unsolvable problems, and counseling and answering are still essential.

The problems in the real-time evaluation system are generally difficult, and the description of the problems is complicated. Some students will have difficulty in understanding the problems, and there are various problems in the programming process, so teachers' counseling and answering work is very heavy. Teachers should try to do the questions in the real-time evaluation system before class, so as to know the possible problems. On the basis of pre-topic discussion, common problems should be explained in a timely and unified manner. Graduate assistants can also be hired to participate in counseling and answering questions. At the same time, teamwork should be encouraged.

#### 4. Key Problems and Innovations to be Solved

Using real-time evaluation system to assist PYTHON's experimental teaching is innovative:

- (1) to stimulate students' interest in learning. The questions in the question bank are carefully designed and generally interesting; It has the incentive mode of system ranking and similar game clearance, such as the balloon will float up after the program completely passes the test.
- (2) Immediate feedback of results. Students can get their own code review results and error feedback in real time, and the scoring is objective and fair. It is very easy for teachers to count their grades and know the distribution of students' grades, which greatly reduces the workload of teachers.
- (3) The questions in the question bank can help students establish programming ideas and master programming ability. The topic is comprehensive, difficult, and requires the result to be completely correct. Besides, it also requires students to have stronger thinking ability, stronger program realization ability, and more comprehensive consideration of problems.

#### 5. Project Implementation Plan and Implementation Plan

Project implementation plan

01. Receive the answer information of the question entered by the user;
02. Calculate the difficulty values of at least two test cases according to the answer information and the preset at least two test cases;
03. Calculate the default scores of at least two test cases according to the difficulty values and total scores of the questions of at least two test cases.

Another embodiment of the server processing method of the real-time evaluation system in this system includes:

01. Receive the answer information of the question entered by the user;
22. Compile the answer information and the preset topic condition information to obtain a code program;
23. Use at least two preset test cases to run the code program, and obtain the memory occupied value and processing time of the preset at least two test cases;
24. Calculate the difficulty value of at least two test cases according to the preset occupied memory value or processing time of at least two test cases;
25. Calculate the default scores of at least two test cases according to the difficulty values and total scores of the questions of at least two test cases;
06. Generate a score distribution operation interface, which includes the score distribution ratio, default score and score entry dialog box of at least two test cases;

07. Determine whether the user has entered a new score in the score entry dialog box, and if so, execute step 208. Otherwise, step 209 is executed. ,

28. Assign new scores to at least two test cases;

09. Keep the default score.

For example, if a topic has three test cases, the total score of the topic is 12 points, and the difficulty values of the three test cases are 2S, 4S and 6S, respectively, then the distribution ratio of the scores of the three test cases is 1:2:3, and the default scores of the three test cases can be 2 points, 4 points and 6 points. Of course, users can also enter a new score in the score allocation dialog box, and the system will automatically judge whether the score ratio is reasonable. In this embodiment, the system can calculate the default scores of at least two test cases according to the difficulty values and total scores of the test cases, and generate a score distribution operation interface, which includes the score distribution ratio, default scores and score entry dialog boxes of the test cases.

The server processing method of the real-time evaluation system provided by this system is described earlier. Please refer to Figure 3 below. The server processing system of the real-time evaluation system provided by this system includes:

A receiving unit 301, configured to receive the answer information of a question input by a user;  
A first calculation unit 302, configured to calculate the difficulty values of at least two test cases according to the answer information and the preset at least two test cases;

A second calculation unit 303, configured to calculate the default scores of at least two test cases according to the difficulty values and the total scores of questions of at least two test cases;

Further comprising a generating unit 304 for generating a score distribution operation interface, wherein the score distribution operation interface comprises score distribution ratio, default score and score input dialog boxes of at least two test cases;

A judging unit 305, configured to judge whether the user enters a new score in the score entry dialog box;

A new value allocation unit 306, configured to allocate new values to at least two test cases if the user inputs new values in the value entry dialog box.

## Acknowledgments

The 2022 Experimental Teaching Reform Project is supported by the project number SYJG 2022 08.

## References

- [1] Overview of geo-environmental visualization methods [J]. Zhao Wenshuang, Jiangnan, Xie Yurui, Guo Wei. *Surveying and Mapping Science*.2022 (01).
- [2] Multi-dimensional visualization method of laser sensor data based on virtual reality technology [J]. Liu Yang, Cao Yu, Xin Xu. *Laser Journal* .2021 (02).
- [3] Visualization method of papermaking process under the combination of 3D printing technology and virtual reality technology [J]. Wan Cheng. *Papermaking Science and Technology* .2021 (02).
- [4] Research on interactive visualization method of vector field based on multi-resolution [J]. Yuan Xiaowei. *Electronic Components and Information Technology*. 2020(02).
- [5] Overview of event visualization methods [J]. Chen Xiaohui, Li Jing, Ge Lei, Ding Ziyue, Liu Haiyan. *Journal of Information Engineering University* .2019 (05).
- [6] Visualization method and its application in information analysis [J]. Huo Liang, Chao Lemen. *Information Theory and Practice*. 2017(04).