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# Exploring the Landscape of Competitive Coding Platforms: An In-Depth Analysis and Comparative Study

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**Abstract:**

Due to the cutting's rapid development edge data society, it's critical to educate the youth who will be responsible for the Information Technology (IT) industry's future. The issue solution is a thoughtful discovery that is used to enhance capabilities and updated IT information. To genuinely improve Among students' comprehension of programming, we have created a website with competitive coding. The majority of pupils lack the ability to even comprehend a brief bit of code. Additionally, we created the contest management Web server, a website for competitive coding. Through an execution test, the server assesses the software that was submitted using input and output data. We provide many planning assessments for incremental sub-objectives as a prerequisite for customizing a competition for novices. This offers the answer at the conclusion as well. It also oversees the student's performance and advancement. We're developing a tutoring and tracking feature set for our teacher assistance system.

## 1. Introduction

Programmers participate in the analytical sport of competitive programming by trying to solve as many algorithmic problems as they can in the least amount of time. Many of the computer science topics that are used in app development—like databases, GUIs, and networking—will not be included in these competitions. It all comes down to your ability to solve algorithmic challenges, your knowledge of data structures, and your implementation abilities. Competitive programming got its start in 1970 when Texas A&M University hosted

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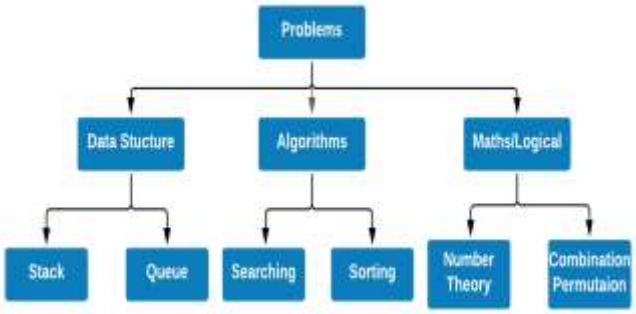
a competition hosted by ACM-ICPC. According to Competitive Programming [1], competitive programming is a mental sport in which players try to programmer over a local network or the Internet in accordance with predetermined specifications. The contestants are referred to as sport programmers. A number of global software and Internet companies, including Facebook, Google, and IBM, are aware of and supportive of competitive programming.

A number of organizations regularly host programming contests. The host of most programming competitions gives the competitors (whose numbers might range from tens to several thousand) a set of logical or mathematical challenges to solve. The competitors must create computer programmer that can solve each problem. Real-time updates occur on the scoreboards, and players get a rush of excitement when they defeat their rivals and solve a challenging puzzle. The top athletes from each region or school come together to fight for gold, trophies, or even cash prizes at higher levels of competition.

Fig 1: Problem Tree




There are numerous competitive coding platforms available, such as CodeChef [2], Spoj [3], CodeForces [4], and HackerEarth [5]. These platforms support more than 50 programming languages and have a sizable programming community that assists professionals and students in testing and improving their coding abilities. Its objective is to give students and prospective software engineers an environment that is conducive to learning, competition, and improvement. Numerous programming contests are held on platforms for competitive programming.

There are two types of contests: timed and untimed. A short-term competition round lasts between one and three hours. Competitions with a longer duration span from a few days to

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Research paper  UGC CARE Listed (Group -I) Journal Volume 8, Issue 1, 2019

several months. The majority of competitions normally consist of multiple rounds due to the high number of entrants. All rounds typically involve online participation, with the exception of the final round, which requires onsite attendance. The top performances in IOI and ACM-ICPC receive gold, silver, and bronze medals; the top finishers in the other competitions receive cash prizes. Moreover, placing highly in these competition score tables may get the attention of recruiters from Internet and software businesses. The ability to programmer is very practical and hands-on. To get good at something, one must practice constantly. Theoretical problem solving is insufficient; you also need to code the answer and get it approved. Selecting the appropriate algorithm and putting it into practice are two entirely different things. These are both necessary for excellent programming. A lot of programmers argue that real-world programming and competitive programming are not that different from each other. Most of the time that is correct. But it increases your productivity. You may write accurate answers quickly with the help of critical test data! Additionally, it enhances debugging abilities. Complex difficulties necessitate segmenting the problem into smaller parts, resolving each one independently, and then piecing the whole thing together to address the primary issue. While not the only approach to develop these skills, competitive programming is one of the most effective.

## 2. Related Work

The author of the first paper presents encouraging findings regarding the use of programming as a teaching tool; this highlights the need for additional long-term studies in schools with larger student populations to draw specific conclusions about the types of learning that programming could support. Several planning tests that serve in part as detailed sub-objectives for the specification. We also set the law of partial points and plus or minus points dependent on time. The gadget displays the rating tab instantaneously and illustrates the judgment's result. There is a teacher assistance subsystem that comprises of tutoring and tracking functions. First, there's a webpage. to keep tabs on a class, every student, and problems Provide time series and graph views so that teachers can see common mistakes made by pupils and provide guidance to those who are struggling. The procedure for education Impacts of early and frequent submission via performance testing Points in time and series. There are efforts to improve usability through instructor user testing.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper  UGC CARE Listed (Group -I) Journal Volume 8, Issue 1, 2019

In the second paper, they describe how to use programming tools that should enhance skills and update IT knowledge. These secondary school understudies' programming problems are a major component of data training, but there haven't been many research looking at their effects and role in the curriculum. This study proposes an investigation apparatus for comparing and analyzing programming difficulties, as well as an investigation structure based on an overview of programming issues. In this work, the equipment, the system's nuances, and the study's outline are clarified. We learn more about the Online passing judgement on a programming task framework in the third paper. A fair application is required in order to get a precise, responsive, and unambiguous conclusion regarding a framework for the opposition. In any case, problems arise when minor modifications are made in order to comply with worldwide guidelines, specifically with regard to the programming language's usage. This study proposes an Online Judge (OJ) structure based on the UM structure to overcome the related problems. This strategy's flexible framework judgement is designed to be used for any programming rivalry, both domestically and internationally, such as ACM ICPC, SPOJ, and so forth. It has been demonstrated that the suggested internet passing judgement on the framework has a 99.9% accuracy rate and a source code ordering pace of 3.6 seconds per code.

## 3. Methodology

A programming contest is a competition where participants compete to solve a set of programming tasks, sometimes known as issues, under a time and space constraint limit. A single task can be divided into several, more complex subtasks. Some of the more challenging subtasks may only require very specialised algorithmic approaches and data structures, while others may be solved with basic techniques within the allotted time and/or space constraints. Among the competition for programming, we highlight

- One work can be divided into several smaller tasks that will increase communication.The UNESCO-sponsored International Olympiads in Informatics (IOI) is a yearly programming competition for students in secondary schools. http://www.ioinformatics.org/
- The World Finals of Google Code Jam are the culmination of several online rounds. code.google.com/codejam/ is the URL.

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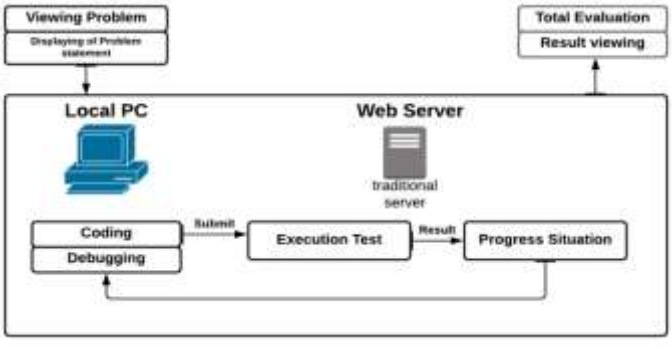
- In contrast to IOI (individual competition), the more recent International Informatics Olympiads in Team (IIOT), which began in 2017, is a team competition similar to ACM ICPC.Complexity: While some of the subtasks can be solved with simple techniques within the allotted time and/or space constraints, others may call for specialised algorithmic techniques and data structures. Among the competition for programming, we highlight.
- The Facebook Hacker Cup is an annual global programming competition where hackers battle it out for glory, money, and the chance to win the coveted Hacker Cup.
- The ACM International Collegiate Programming Contest (ICPC) is a multitier, team-based programming competition run by ACM. https://www.facebook.com/hackercup/. This URL: icpc.baylor.edu.

Generally speaking, students that take part in programming contests have access to multiple platforms, such as Codeforces, USACO, COCI, TopCoder, Both Codechef and HackerEarth, which hold competitions with many regularity. The languages supported by programming in the Competitions differ greatly; IOI and IIOT are two examples. accept only Pascal and C.C++; ICPC additionally adds to the list Java, Kotlin, and Python (2 and 3).

We used PHP, NodeJS, Ajax, JavaScript, and MySQL to implement the system. GCC is the C compiler for evaluating C code, Java8 is the compiler for evaluating Java code, and Python8 is the compiler for evaluating Python server-side code. Following contest participation, the problem list page displays each problem's headline details. Every problem page displays the problem's title, description, code editor, input editor, and display section. to maintain the same page without using the inner frame approach to switch between pages. The problem statement includes an input form for uploading source code as an answer, implementation tips, and sample data. Figure 2 shows the exercise style with a small contest

Fig 2. The exercise style with a small contest



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The implementation is divided into two sections: the compiler page, which is where the user simply codes and runs the application without seeing a problem statement; and the problem statement page, which presents the user with a list of problems to solve. Once the user submits their solution, the output is compared to the actual output on the server-side, as shown in the figure3.

Fig 3. The program judgment by execution tests with given sample data

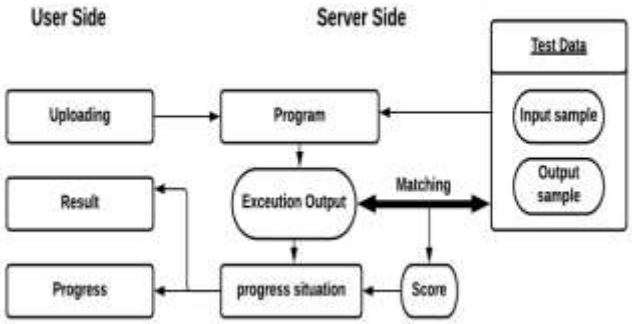
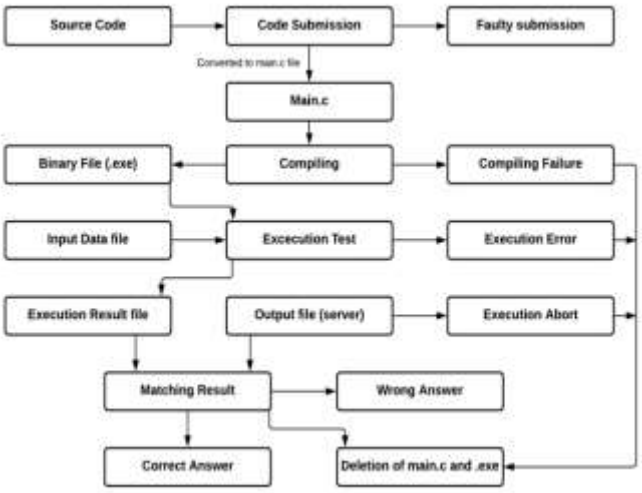



Fig 4. The 7 steps in the judgement process by given sample data




Here, code sent by the user will be translated to a server-side file called "main.c" when it is submitted. For the main.java Java language and the same for Python. Compilers and executors for the C language will assist in converting the generated file to a machine code file. For Java, it will be a class file with the extension.exe. Should a mistake occur in the user will push the error-causing code, and if the code successfully complies, running the resultant file will create an output file to be compared with another output file. The real output file

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Research paper  UGC CARE Listed (Group -I) Journal Volume 8, Issue 1, 2019

that has an issue encoded in it output file for the statement if the two output files match successfully and without any discrepancies, then the decision is accurate. Otherwise, the decision is incorrect. And the user will see this message in response to his submission code. After the user receives this answer, all server-side created files that are compiled files and executable files will be removed, marking the completion of the process. Scores will be awarded to the user based on how well they complete the job and get the right answer. The only person with the authority to add a problem statement is the website administrator. These scores will be added to its progress scores. To add a problem statement on the server-side, view a list of problems on the problem statement page. The description of a problem statement and its output will be in the file.txt format. A form containing fields for the problem's title, description, description of the problem statement file, and problem output will be submitted. The user will have access to a profile page with examples of their past activity, solved issues, and credentials. All user credentials, user activity (submission), and problem statement database are managed using MySQL. Password mail and other user credentials are encrypted using the MD5 technique.

## 4. Result and Discussion

We suggested a beginner-friendly programming exercise with a brief competition. Using provided sample data, the system automatically evaluates a response programmer that is uploaded and assembled. It alerts the user to. The judgment is instantaneous and displays each user's progress situation in the profile part. For incremental refining, we use execution test series in conjunction with the flexible matching method. We gained an understanding of competitive programming's significance and its impact on computer science, the IT sector, and graduates during the project's development. In the realm of academics, universities can leave their imprint through competitive programming. University talent is reflected in competitive programming. Students develop their problem-solving abilities through competitive programming, which is crucial for day-to-day work at internet giants with product-based businesses (Facebook, Twitter, and Google). Additionally, it is crucial for the demanding Coding Interviews that these tech behemoths conduct. India now trails far behind in the yearly ACM-ICPC. Seldom does an Indian team, or none at all, make it to the Finals. India is becoming into a hub for IT, yet the bulk of the companies in this hub are service-based. Even if there aren't many massive tech companies, relatively few graduates of

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computer science or information technology work there. It is imperative that graduates in computer science and IT improve their competitive programming skills.

## 5. Conclusion

In this paper, we would want to discuss how problem-solving is the foundation of competitive programming contests and how they might enhance coding abilities. In order to get the necessary results, we conducted a literature review and gathered the necessary data. A programming contest's data will be added to the database system. This has been tested, and the results are competitive. It is capable of managing and analyzing suggested contest programming. We have put in place a variety of initiatives that offer instruction for online programming competitions. We're also considering using this technique in other contexts.

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