A report depicting the analysis keeping the technical aspect in viewpoint, indicating the proposed system, its advantages and disadvantages, contrasts with existing system and the approximate project schedule planned for the completion of the project.

Technical Feasibility Report

SEN Team #3

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Executive Summary

This is a feasibility report for the project – "*Ecodena*", an Online Judge system which will be used by the Programming Club DAIICT as a part of its teaching to help its members practice and improve their skills and to evaluate its members by organising programming contest. The feasibility report begins with some background information that provides the appropriate context for describing the project. It then describes the proposed system, lists the advantages and disadvantages of the system, the different technical requirements. It then compares and contrasts the existing and proposed systems. An approximate roadmap for the project is then listed. The report concludes with a final recommendation on the feasibility of the project.

Many users who are new to programming and who visit online judging sites for the first time seldom find themselves in a comfortable position and have no clue where to start. They find it difficult to learn in absence of a guiding system. The proposed system will help the user overcome these difficulties. Among the different proposed features of the system, the core ones are the provision of various tutorial and tutorial based problems intend the help the user "learn" rather than "solve", improved error detection mechanisms to help user realise the errors by him/her. The contest problems will be subdivided into various categories to help the users improved his skill sets incrementally. The user can interact with other users and gain knowledge/experience. There are, however some disadvantages to the system. These include the problem of having to store all solutions of a user (which will require large memory as the number of users increase), the constraints on the compiler, etc.

The schedule for the project involves the requirements study phase (to be completed by last week of January), the designing phase (to be completed by second week of February), implementation and unit testing phase (to be completed by third week of March) and finally system and integration testing phase (to be completed by first week of April). As a final recommendation, the reports stated the project to be technically feasible and the project team will make best efforts to complete the project on scheduled time.

Background Introduction

1. There are around 3500+ engineering colleges in India. Considering an conservative intake of 60+60 students in IT and CS branch, the total number stands around 420,000. Also every student needs to take a basic Introduction to Programming course in their first year of UG degree.

2. Among these most of the students are learning programming language for the first time. Generally the learning curve is very steep for first time learners of these languages.

3. Few sites are already available like SPOJ, CodeChef, TopCoder etc. but most of them are mainly competition oriented. In these sites a registered user is presented with a particular set of uncategorized problems, from which user can select any problem and solve it.

   When submitted, if the solution is wrong, only information presented to user is wrong answer/compiler error/ run time error/ etc. No mechanism of constructive error reporting is available which can help user pin point his/her problem.

   The reward mechanism of these sites work on basis of ease of the problem. Higher the number of users who have solved a particular problem, lower is the reward for the problem. But this mechanism has a basic flaw which discourages a beginner which gets less rewarded for solving a problem.

   With due considerations one can even host a programming contest, which can be solely designed by the host.

   For beginners as well as advanced coders a site where users can help each other out would be a better alternative as they can learn and grow and help their peers.

4. A practicing cum implementing cum learning cum competition platform would be best for beginners as well as advanced coders.

Proposed System

Description

There are sites like http://spoj.pl and http://codechef.com which are online judges primarily meant for contest holding. It is often extremely difficult for newbie programmers to actually learn/solve more problems, since there is no specific guiding system implemented. People are expected to access internet resources and learn on their own, which is often detrimental to learning. So we decided to create a platform which along with contest hosting, primarily focuses on tutoring members to actually learn new programming paradigms and implement them in code, before moving on to the actual, more difficult problems. This would enable programmers to learn new methods or even simply revise them, and give them confidence to solve the challenging stuff.

Proposed Features:

1. Support for multiple programming languages(primarily C, C++, Python and JAVA)
2. Category-wise properly classified problems based on number of users and solving accuracy, along with recommendation system to actually lead to problems they know about.
3. Availability of tutorial problems to help them pick up new programming paradigms and methods.
4. Strong communication features amongst users, and between users and admin and tutors, along with tutoring privileges for good users to actually help new users properly and systematically.
5. Properly designed User-Interface so as to make accessing the server non-intimidating and less confusing.
6. Ranking system for users based on solved problems. This provides the competitive edge for normal users to perform better.
7. Contest holding features with complete control to handlers for customized settings.
8. Error reporting to help users diagnose their faults better.

Advantages and Disadvantages of the system

Advantages:-

- The user can develop his knowledge and skill set incrementally by solving different classes of problems
- The site also allows users to host contests with various problems.
- The site provides the users with tutorials as an easy and interesting way to start learning.
- There will be a ranking system in place to motivate people to perform better.
- The user shall be able to interact with other programmers and discuss about a problem and gain knowledge/experience.
- Error detection mechanisms for the solutions submitted to problems are proposed to be of high degree.
- Properly divided problems so the user can practice for a particular set of problems

Disadvantages:-

- Will be able to support a limited number of programming languages.
- If a track of previously solved problems of a particular user is to be maintained then the memory allocation would become an issue as the number of users increase.
- It is not possible to make error checking completely efficient. Also there would be no way to suggest a logical error if any.
- Even though system security measures have been taken the system may still be susceptible to malicious attacks.
- The compilers used for testing will have a fixed number of flags and will ignore all warning messages.

Technical Requirements

Proposed format of work:

The project shall basically consist of a judge back-end that takes care of actually running the code and checking it w.r.t correct answers. It would use sand-boxing for system security, along with usual analysis of run-time and used memory to provide user feedback. The server front-end would comprise of the net-based framework that handles transfer of information, that is, code from users to judge, and results from judge to users. Also work would be dedicated to developing proper UI for the front-end that enables ease of use.

Development Resource Requirements:

Keeping the above format in mind, listed below are some of the resources that we plan to use in the course of the project:

The proposed language of use is python.
Python has a very good sandboxing API which in turn will help us to help the backend to run the user code in a secure environment following the principle of least privileges.

The proposed web framework to be used is the Django framework.
Django is a high-level Python Web framework that encourages rapid development and clean, pragmatic design.

We shall use these tools for both the web service back end and the server front end. The front end also requires a good User Interface (UI). ***We shall be using Adobe Dreamweaver and Adobe Photoshop for the above purpose.***

Adobe® Dreamweaver® CS5.5 is the industry-leading web authoring and editing software that provides both visual and code-level capabilities for creating standards-based websites and designs for the desktop, smartphones, tablets, and other devices.

Adobe Photoshop is a graphics editing program developed and published by Adobe Systems Incorporated.

Comparison of existing and proposed system

The comparison of existing and proposed system is summarized as under:

- The current system is more focused on organizing contests but our site is more oriented towards enhancing the learning experience of the users.

- The user interface of these sites is bit crude which we have planned to make more user friendly which he or she may find pretty easy to use.

- Also we are looking forward for a system where a more experienced and skilled coder can personally interact with a newbie which would enhance his or her learning experience.

- Classification of the problems will also be done by the type.

- As an extension – if time permits, we plan to include a forum and wiki which will give a better opportunity for users to learn.

- We are planning to include extensive error detection which most of the sites don't possess as they just tell whether the code submitted is correct or wrong.

Project Schedule

An approximate plan for the project development is listed below:

- Feasibility Studies & Technical Proposal
- Requirements Study – produce Software Requirements Specification (SRS), draft user manuals, system test cases and test plans

  (To be finished by last week of January)

- Division of project Team into subgroups and work allocation
- Prepare Schematic Design based on the Software Requirements Specification (SRS) – produce design blueprint

  (To be finished by second week of Feb)

- Set Code Guidelines, Platform convention, coding standards for the project.
- Implementation of various individual modules – produce working modules (unit tested)

  (To be finished by third week of March)

- System and Integration Testing – produce test reports.

  (To be finished by first week of April).

- Working System to be submitted for evaluation.

The project team will be meeting on an on-going basis throughout the project to discuss various aspects of the project.

Conclusion

As a final remark, it is hereby stated that the above project is technically feasible and this feasibility report serves as a rational evidence for it. The schedule has been approximated based on the proposed features of the project and the duration available to complete the project. The project team will make its best efforts to meet the desired features in the desired time.

References:

- Sphere Online Judge (http://www.spoj.pl)
- Codechef (http://www.codechef.com)
- Topcoder (http://topcoder.com)
- Adobe (http://www.adobe.com)
- Wikipedia (http://www.wikipedia.org)