Programming Design, Spring 2016
Final Project

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In the final project, you are invited to design and implement an information system for a self-select topic. Your system may consist of just one or multiple programs. The only technical requirement is that the system itself must be built in C++. What we really want to see are (1) how you select a topic that is interesting while challenging, (2) how you analyze the problem and make a good system design and work division, (3) how you write correct, efficient, and easy-to-maintain C++ programs, and (4) how you present your ideas and results. Good luck and enjoy!

1 Teams

Please form a team of one to four people for this project. One student cannot participate in two teams.

2 Tasks

In this project, each team needs to design and implement an information system that can complete a certain task. The topic will be chosen by team members. While there is no restriction on the topic, it will be nice that the topic is (1) relevant to our daily life and (2) can be understood easily by everyone in class.

While you are choosing your own topic, you are welcome to discuss with the instructor and TAs to ensure that the topic is fine. Below are some directions for your references:

1. (Optimization) Write a program to solve an optimization program whose algorithm is non-trivial. For example, what algorithm can find a near-optimal solution for the following NP-hard problem

$$\max_{x_i,y_j\in\{0,1\}} \sum_{i\in I}\left\{r_i\left[\lambda_i+g\Big(\sum_{j\in J}s_{ij}y_j\Big)\right]-f_i\right\}x_i-\sum_{j\in J}h_jy_j,$$

   where $g(\cdot)$ is a non-decreasing concave function? When is the algorithm most effective?

2. (Data analysis or processing) Given the MRT transaction data of senior people, what insight may you find? What are the implications on the operations, marketing, or policy design of the public transportation system or healthcare system in Taipei? Similarly, given the transaction data of a public bike sharing system, what may you do with your information system?

3. (Game) Create a game that makes a lot of fun!

As this is a project, most details should be left for you to decide. However, you are more than welcome to discuss your ideas with me. Please note that you may need some knowledge and skills not covered in lectures. You will be able to learn them by yourselves; just try it!

3 Technical requirements

Each team needs to write a proposal, make a presentation, and write a report.

1. Proposal: A proposal describes the system you want to build and the tentative design of your system (in words, pseudocode, and/or graphs with no code). A hard copy should be submitted in class by ***3:30 pm, May 23***. Please indicate each team member's name and student ID on your proposal. Limit your proposal to ***two pages*** (including everything), i.e., two single-sided sheets (not recommended) or one double-sided sheet (recommended).

2. Demonstration:

   (a) Each team needs to do a demonstration for around 10 minutes on ***June 20***. You may decide the number of speakers by yourself (at least one, of course).

   (b) To save time, all teams must pre-install their programs, slides, data, and whatever they need ***on the PC in the classroom***. It is not allowed to use a student's own device.

   (c) ***All team members*** should show up in class during the presentation of your team.[1] The one who is absent will get ***zero*** point for presentation.

3. Written report:

   (a) In your report, describe your topic, system design, algorithms, and work division. Do not copy and paste codes onto your report. It is highly welcome for you to leave any thoughts you obtain while doing the project.

   (b) Limit your report to ***eight pages***, excluding the cover page. This means eight single-sided sheets (not recommended) or four double-sided sheets (recommended).

   (c) Upload your report and program(s) onto PDOGS by ***11:59 pm, June 19***. Supplemental materials (data, slides, etc.) are also welcome. Submissions on June 20 will get one letter grade lower as a penalty. Submissions afterwards are not accepted.

4 Grading policy

Below we describe how your works will be graded:

1. Proposal: A team gets full credits once a proposal is submitted. The proposal is for the instructor to know how students form teams and, more importantly, give comments and feedback to some teams when it is helpful.

   Note. The key is to find your teammates and submit a piece of paper!

2. Functionality: According to the quality of your system functionality (which is perceived mainly through your demonstration), a letter grade will given to you by the instructor AND students. Grades from all students will be averaged (A for 4, B for 3, etc.) and counts for 60% of the grade; the grade from the instructor counts for 40%.

   Note. The key is to choose a good topic, give a clear and interesting talk, and show that your system is great.

3. Design: According to the quality of your system design, (which is perceived mainly through your written report), the instructor will give you a letter grade (with + and −).

   Note. The key is to design the system properly and write a formal report to clearly convey your ideas.

4. Peer review: Each student will give a letter grade based on the contribution of each other teammate.

   Note. The key is to work hard and be responsible!

The four average grades for functionality, design, peer review, and proposal are then averaged with weights 35%, 35%, 20%, and 10%. A final letter grade (with + and −) will then be determined based on the standard conversion rule.

[1] Unless one has completed a formal petition for being absent in class due to sickness, duty, etc., and gets the instructor's approval.