**AMS 550.400 HW SET 1 Zichan Wang**

Last Compiled on October 10, 2012

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**General Instruction:** To complete the homework set, you are required to do the followings. Your solutions must be typed in LaTeX using the course homework template. The progression of your homework solution is to be "recorded" by making a git folder specifically for this homework set. The burden of proof is on you, and if your git commit history is sparse, then you may be liable for a penalty. A paper copy of the PDF output of your LaTeX file is to be submitted to your instructor in class on the due date. *After* submitting the paper copy, but *before* the end of the due date, you will upload your work to your github by making a remote repository specifically for the homework, and post the link to the repository at the designated *Discussion* forum in Blackboard by making a thread just for you. The repository name in your github should be `550400.homeworkset.1` and the discussion forum thread should be named `YourFirstNameMiddleInitialLastName`, e.g., `BaracHObama` and `WillardMRommey`. You have till the end of the due date to finalize your github repository. However, any commit made after the class time of the due date will be inadmissible. *Your attention to details in following this instruction will be critical, and if not followed exactly at the time of collection, the homework set may be graded at* 90% *of the full score.*

**Problem 1 (10 pts):** Assume that you are starting from "scratch" at the directory `~/`. Provide a sequence of git/bash commands that yields a git folder with a commit history such that:

- the *master* branch has commits $A$, $B$, $C$, $X$ and $D$,
- the *alt* branch has commits $A$, $B$, $X$,

Suppose that you are currently working on `master` branch. Draw its commit history graph (i.e., the graph portion of the output of `git log --graph --oneline`). Next, assume that you are on `alt` branch. Draw its commit history graph.

- .....
- Zichan Solution:
- When working on master branch, the commit histroy graph is shown in Figure 1 as attached in the back of the document.
- When working on the alt branch, the commit histroy graph is shown in Figure 2 as attached in the back of the document.

**Problem 2 (10 pts):** Assume that you are starting from "scratch" at the directory `~/`. Provide a sequence of git/bash commands that yields a git folder and

- configure your git with your name and your email address,
- set up an alias for each of the git remotes listed below:

```
git://github.com/nhlee/550400.stanza1.git
git://github.com/nhlee/550400.stanza2.git
git://github.com/nhlee/550400.stanza3.git
```

Assume that each remote contains exactly single commit with a txt file for a single (different) stanza,

- pull to combine three stanzas of a poem,
- after the first pull, add the title of the poem,
- after the second and third pull, resolve the merge conflict,
- after resolving the third pull merge conflict, push the result to your (newly created) remote repository.
- .....
- Zichan Solution:
- When configure my git with my name and may email address, the command is shown as follow
- git config –global user.email zichan.wang@gmail.com
- git config –global user.name "Zichan"
- .....
- After finished the pull, merge and push the poem, the finished work is save as
- https://github.com/wangzichan/hw1
- The screen shot is shown in Figure 3 as attached in the back of the document
- .....

**Problem 3 (40 pts):** Consider a team of four students, say, $A$, $B$, $C$ and $D$, who just started working on writing a `latex/beamer` file, say `main.tex`, for a class presentation of their work statement. Assume that they do not wish to coordinate their schedules for a concurrent group meeting (both virtually and physically). Assume that:

- $A$ is in charge of *Introduction*,
- $B$ is of *Problem Statement*,
- $C$ is of *Timeline*,
- $D$ is of *Deliverable* part of the presentation.

In other words, their contributions to `main.tex` do not overlap. Then,

- first, devise a work flow strategy for the team so that they can collaborate asynchronously using `git`,
- next, devise yet another `git` strategy different from your earlier proposal.

Finally,

- discuss the strength and weakness of each of your proposed strategies in terms of merge conflicts resolution,
- make the final recommendation.

In order to answer this question, *build* a mathematical model, *following* the guideline from IMM. Use Section 1.4 and Section 1.5 of IMM as *role models*. For example, you are to identify which variables are exogenous and which are endogenous. More specifically, among other things, in your model, is the preamble part of `main.tex` an endogenous or exogenous variable? Note also that in addition to this issue, there are other issues that you are to consider. So, *be sure to consult IMM*.

- .....
- Zichan Solution:
- The strategy 1 is shown in Figure 4 as attached in the back of the document
- The strategy 1 is to consider student A as master branch, and then create 3 alt branches for student B, C and D. After each of them finished the work, student A will in charge of merging the alt branches into the master branch.
- Strength: There is only 1 student need to merge the braches.
- Weakness: Student A need to wait for all other 3 student finish their work.
- .....
- The strategy 2 is shown in Figure 5 as attached in the back of the document
- The strategy 2 is similar with strategy A. The difference is that it is not student A in charge of mering all the branches together, it is the student B, C and D need to merge their own branch into the master one after they finish their own work.
- Strength: Students don't need to wait for other student finish their work.
- Weakness: The merge order might not follow the original sequence.
- .....
- I recommend strategy 1.
- .....

**Problem 4 (aka. Fair Play, 40 pts):** Answer the following question:

Is the tennis game fair?

Note that unlike Problem 3, this question is vaguely stated. This is intensional, whence to begin, you will first need to clarify what exactly your question is. You may use the class discussion on this particular problem, but you *may not* directly refer to our discussion. Instead, formulate the model carefully but concisely in your own words.

**Final Remarks about Problem 3 & Problem 4:** They are open-ended problems. However, your scores will be determined by how well do you follow the exposition style outlined by IMM and WMA. For both problems, your write-up should be

- self-contained,
- covering all four parts of Section 1.3 of IMM,
- paying a particular attention to any causal relation that you might be investigating, following Chapter 3 of WMA,
- answering questions that are explicitly asked in the problem statements.

For Problem 3, focus mostly on Step 2 and Step 3 of Section 1.3 of IMM. For Problem 4, focus mostly on Step 1 and Step 2. For each problem, minimum 1 pages and maximum 2 pages.

- .....
- Zichan Solution:
- This question is vaguely stated, so we need to clarify what exactly the question is before we scratch the solution. Since I am not familar with the tennis game rules for each small round, I prefer using a probability approach to solve this problem from a broader aspect. In my opinion, whether the game is fair or not depends on whether the two players have the same probability to win the game while igonoring their skill level. Under this opinion, we can assume that the two players has the same skill level, which means the probablity of each players to win each round is 0.5. According to our class discussion, there are 2 requirements for a player to win the entire game. First, the player should win at least N rounds. Second, the player should be ahead by 2 rounds. For the first condition, we can calculate the probability for one player to win the whole tennis game by using the following formula:

$$P = 0.5^n + \sum_{k=1}^{k=2N-1} \binom{N+k-1}{k} 0.5^N (1-0.5)^k = 0.5$$

From the caculation, we can see that the tennis game is fair under this condition. For the second condition, we can calculate the probability for one player to win the whole tennis game as well. We assume the players played N games, the winner should win k times while the loser should win k-2 times. In addition, k+k-2=N, which is N=2k-2. We then can use the following formula to calcaulte the winner's probability,

$$P = \sum_{k=2}^{k=N} 0.5^k 0.5^{k-2} = 0.5, while N = 2k-2$$

From the caculation, we can see that the tennis game is fair under this condition.

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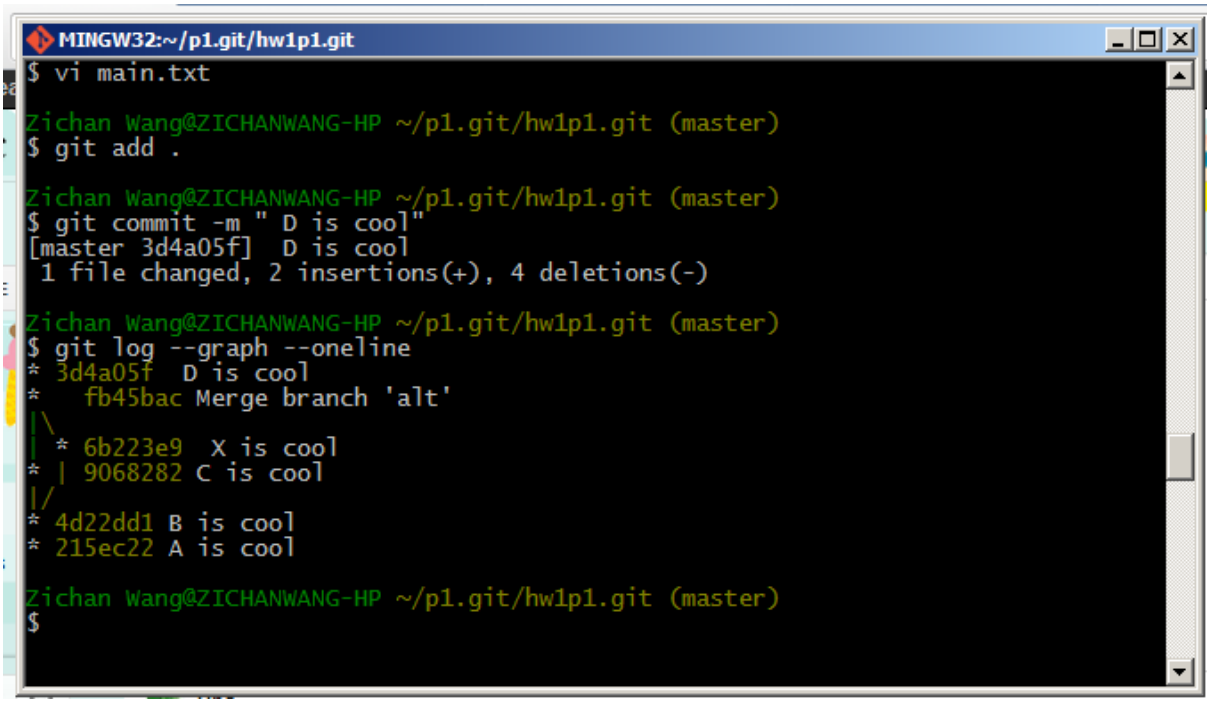


Figure 1

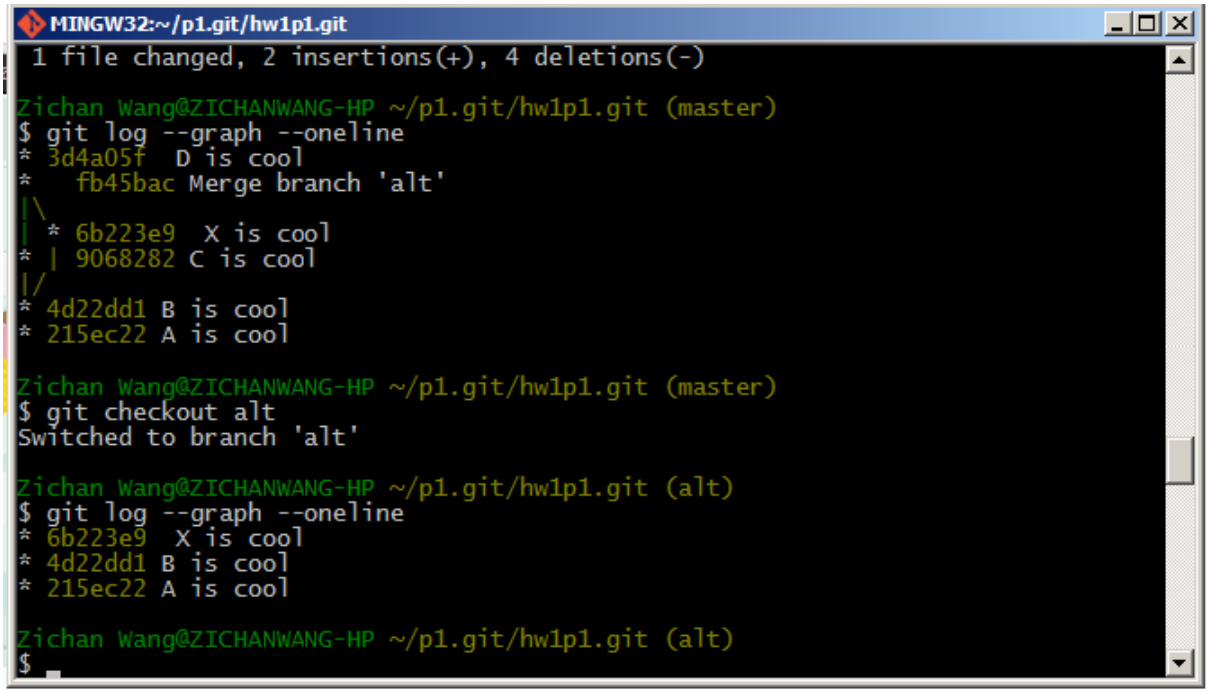


Figure 2

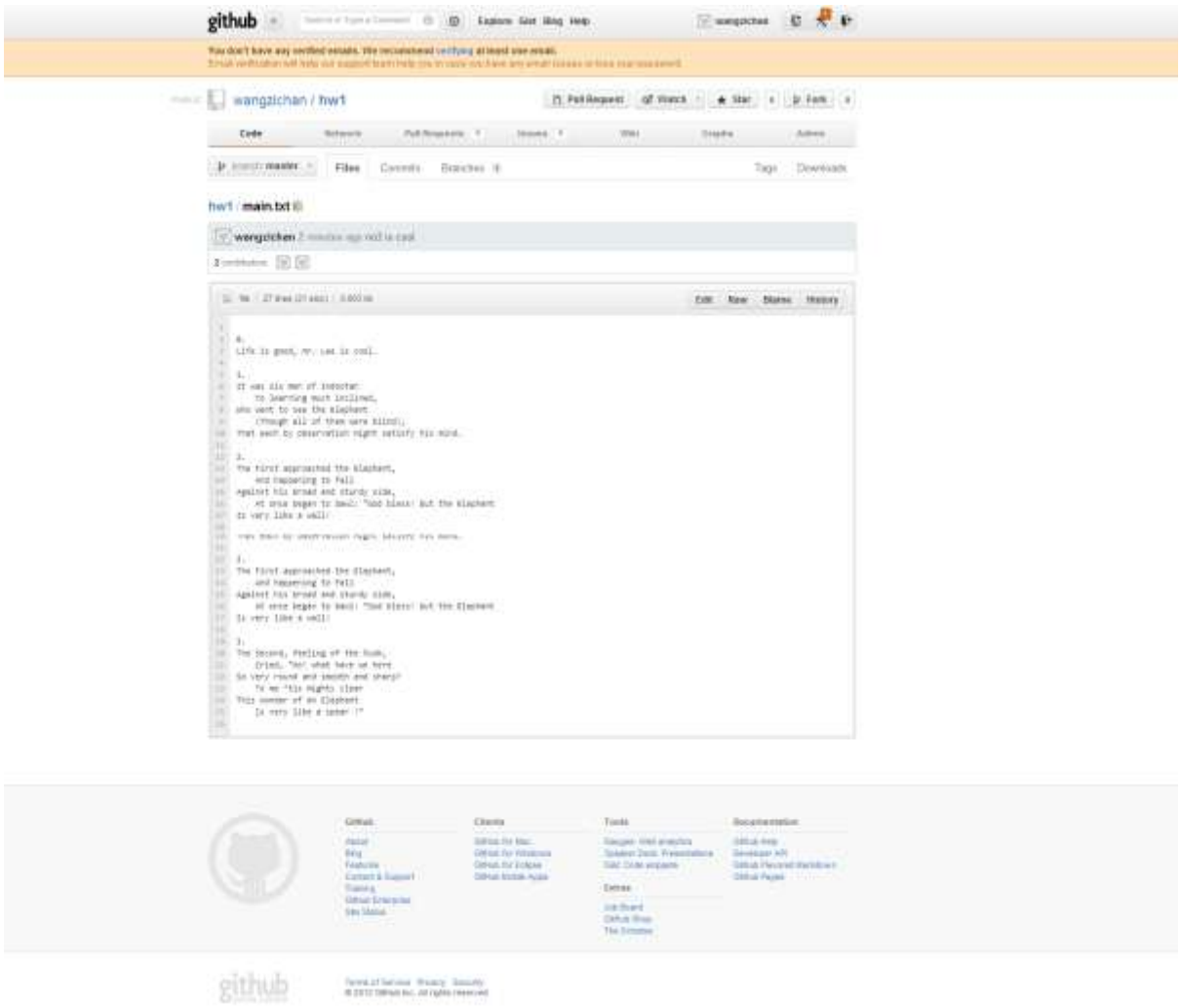


Figure 3

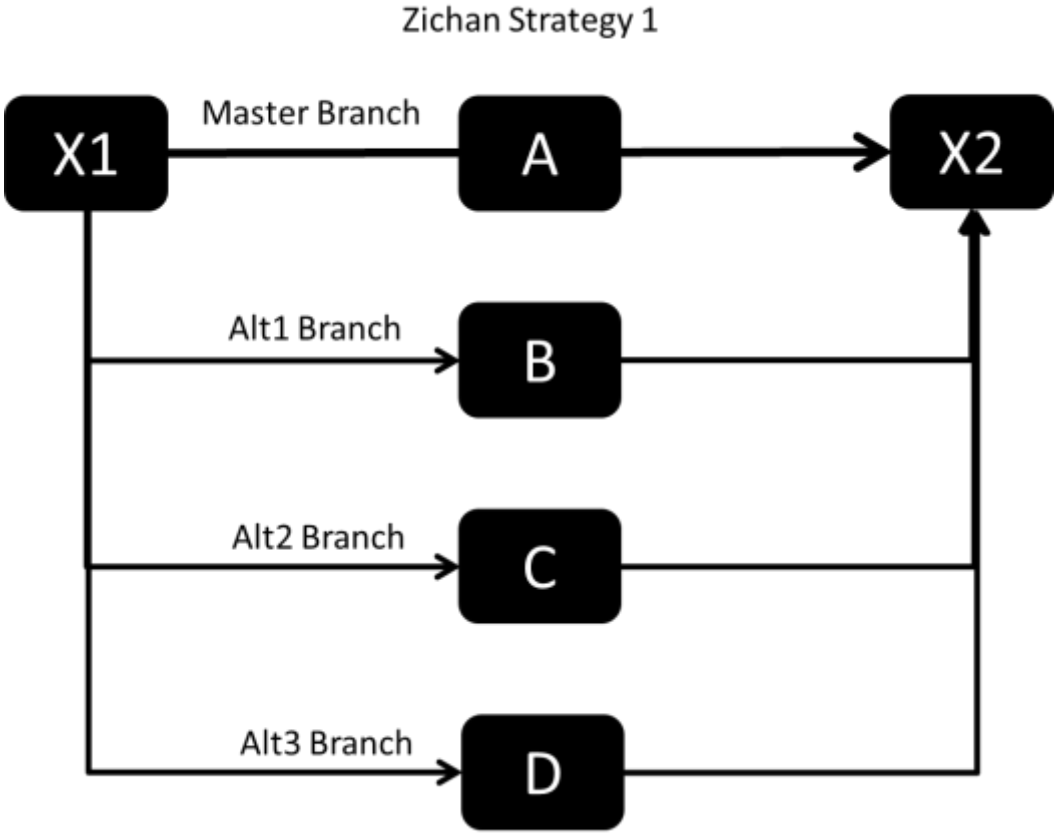


Figure 5

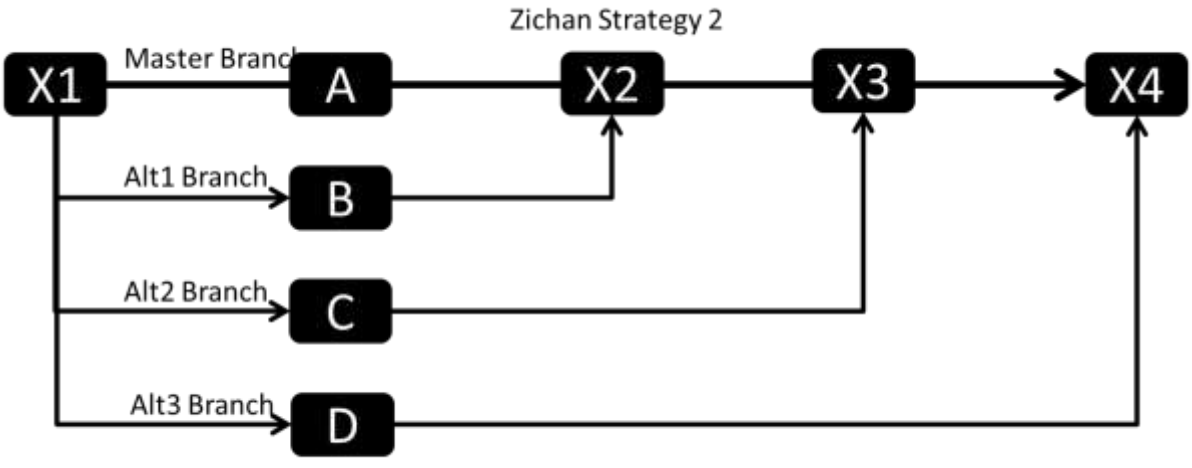


Figure 6