Lab 1: Introduction to Git and GitHub

Course Code: CSE 4302

Week: 1

Topic: Version Control and Collaboration Tools

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Overview

This lab introduces **Git** and **GitHub**, two essential tools for modern software development and collaboration. Students will learn how to manage project versions, collaborate with team members, and maintain a clean workflow using Git commands and GitHub repositories.

Learning Resources

Students are encouraged to review the following materials after or during the lab:

- **Git Official Video Tutorials:** https://git-scm.com/videos
- **Introduction to GitHub (GitHub Training Lab):** https://lab.github.com/githubtraining/introduction-to-github
- **Git Documentation:** https://git-scm.com/docs
- **Managing Remote Repositories (GitHub Docs):** https://docs.github.com/en/github/getting-started-with-github/managing-remote-repositories

Introduction to Version Control

Version control systems help developers manage changes to their code over time. They allow multiple people to work on the same project safely without overwriting each other's work. With version control, you can track the project's history, revert to earlier versions when needed, and coordinate contributions across team members.

Getting Started with Git

Installation

You can download Git from git-scm.com/download and follow the installation instructions for your operating system.

Configuring Git

After installation, set your Git *username* and *email address* (for local attribution, not credentials):

```
git config --global user.name "YourGitHubUsername"
git config --global user.email "your.email@example.com"
```

Omit the `--global` *flag if you wish to set configurations only for a specific repository.*

Initializing a Local Repository

Create a new repository folder:

```
git init "<Full Student ID>_CSE4302"
cd "<Full Student ID>_CSE4302"
```

Create a `readme.txt` file, add it to the staging area, and commit:

```
echo "This is my first Git repository." > readme.txt
git add readme.txt
git commit -m "Initial commit: Added readme file"
```

Create a `.gitignore` file to exclude unnecessary files (you may read documentation for details of gitignore) and add the following lines:

```
*.o
*.exe
```

Commit the file:

```
git add .gitignore
git commit -m "Added .gitignore file"
```

Connecting to GitHub

Go to GitHub and create a new repository. Don't include a `.README` file there. Copy the repository's URL, then connect your local repo to it (You may read documentation to understand adding remote):

```
git remote add origin <repository-url>
git push -u origin main
```

What is GitHub?

GitHub is a platform that makes it easy to host, share, and collaborate on Git repositories online. It adds useful features like issue tracking, pull requests, and integration with CI/CD tools, making teamwork more transparent and organized. It ensures everyone stays on the same page and that all code changes are properly reviewed and tracked.

Commonly Used Git Commands

Command	Description
`git status`	Displays the current state of the repository.
`git log`	Shows the commit history.
`git add .`	Adds all modified files to the staging area.
`git commit -m "message"`	Records a snapshot of the repository.
`git push`	Uploads local changes to the remote repository.

Lab Task Guidelines

For this and future labs, keep your work neatly organized. Inside your main repository, create a folder for each lab (for example, `Lab1/`). For each task, write your code in a `.cpp` file named using the **last three digits of your student ID** followed by the task number, such as `101_task1.cpp`.

After finishing a task, stage and commit your changes before pushing it to GitHub:

```
git add .
git commit -m "Completed task 1"
git push origin main
```

References

1. Git SCM: https://git-scm.com/
2. GitHub Docs: https://docs.github.com/
3. Git Ignore Documentation: https://git-scm.com/docs/gitignore

Tasks

1. Printing

Write a C++ program that uses `cout` to print the following image:

```
 ___                ___
I   I              I   I
I   I \  /\  / I   I
I___I  \/  \/  I___I
```

To print backslash (‘\’), you need to write double backslash (‘\\’) instead, since backslash is an escape operator. Printing ‘`endl`’ takes you to the next line.

2. Conversion

Two of the most common units for measuring length are kilometers per hour and meters per second. The relationship between them is as follows:

$$1\text{km/h} = \frac{5}{8}\text{m/s}$$

Write a C++ program that will convert 4301km/h to m/s.

3. Dynamic Input

Change the program from Task 2 to take the input value from the user in km/h and convert it to m/s.

[Sample Program]

```
Enter value in km/h: 43.02
Value in m/s: 68.832
```

4. Hydrocarbon: Alcohol

In organic chemistry, alcohol is an organic compound that carries at least one hydroxyl functional group (-OH) bound to a saturated carbon atom. An important class of alcohols, of which methanol and ethanol are the simplest members, includes all compounds for which the general formula is $C_nH_{2n+1}OH$ Write a C++ program that will take the value of n as input and print the corresponding simple alcohol formula.

[Sample Program]

```
Enter value of n: 2
Formula: C2H5OH
```

5. Mountain Climbing

Cliff Hangers, a group of enthusiastic mountainers, go mountain climbing regularly. Their mountain climbing expeditions go on for several hours. Each member has a maximum height (in meters) that

they can climb in an hour. In the first hour, each climber has lots of energy and climbs their maximum height during that hour. For every subsequent hour, the climber's energy falls and they can only climb 50% of the height they climbed in the previous hour. The climber always climbs an integer number of meters in an hour. In the case that the climber needs to climb a fractional value, they get lazy and only climb till the nearest whole number.
Given the initial maximum height of a climber, you have to print the height they can reach after 1, 2, and 3 hours.

[Sample Program]

```
Enter maximum height: 64
Height after hour 1: 64
Height after hour 2: 96
Height after hour 3: 112
```