Final Assignment
Computer Workshop Course

Your Name

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Contents

1 Exploration Task

1.1 Vim Advanced Features

Explore and document 3 advanced features of Vim that were not covered in class.

1.1.1 Macros

- **Description:** Macros allow you to record a sequence of commands and replay them.
- **How to Use:**
  1. Start recording a macro by pressing `q` followed by a register name (e.g., `a`).
  2. Perform the sequence of commands you want to record.
  3. Stop recording by pressing `q` again.
  4. Replay the macro by pressing `@` followed by the register name (e.g., `@a`).
- **Example:** Record a macro to delete a line and paste it below:

  qa dd p q

  Replay it with `@a`.

1.1.2 Marks

- **Description:** Marks allow you to save positions in a file and quickly jump back to them.
- **How to Use:**
  1. Set a mark by pressing `m` followed by a letter (e.g., `ma` to set mark `a`).
  2. Jump to a mark by pressing `'` followed by the letter (e.g., `'a`).
- **Example:** Set a mark at the top of a file (`ma`), scroll down, and return to the mark (`'a`).

1.1.3 Global Commands

- **Description:** The `:g` command allows you to perform actions on lines matching a pattern.
- **How to Use:**
  - Syntax: `:g/pattern/command`
  - Example: Delete all lines containing the word "TODO":

    :g/TODO/d

1.2 Memory Profiling

This semester, you got to know about dynamic memory allocation in C in your Programming Fundamentals class.

1.2.1 Memory Leak

- **What is a Memory Leak?** A memory leak occurs when a program allocates memory (e.g., using `malloc` in C) but fails to release it (e.g., using `free`). Over time, this can cause the program to consume more and more memory, leading to performance degradation or crashes.
- **How It Happens:**
  - Forgetting to call `free` after `malloc`.
  - Losing the pointer to the allocated memory (e.g., reassigning the pointer without freeing the original memory).

1.2.2 Memory Profilers (Valgrind)

- **What is Valgrind?** Valgrind is a tool for detecting memory leaks, memory errors, and profiling programs. It is widely used for debugging C and C++ programs.
- **How It Helps:**
  - Detects memory leaks by tracking all memory allocations and deallocations.
  - Identifies invalid memory accesses (e.g., reading/writing freed memory).
  - Provides detailed reports to help pinpoint issues.
- **Example Usage:**

```
valgrind --leak-check=full ./your_program
```

1.3 GNU/Linux Bash Scripting

In this section, you will get to know some handy bash utilities.

1.3.1 fzf

- **What is Fuzzy Searching?** Fuzzy searching is a technique for finding items that approximately match a search pattern, even if the pattern contains typos or is incomplete. It is useful for quickly locating files, commands, or other data.
- **Install fzf:**

```
sudo apt install fzf  # On Debian/Ubuntu
brew install fzf      # On macOS
```

- **What Does `ls | fzf` Do?**
  - Lists all files in the current directory using `ls`.
  - Pipes the output to `fzf`, which allows you to interactively search and select a file.

1.3.2 Using fzf to Find Your Favorite PDF

- **List All PDF Files:** Use the `fd` command to list all PDF files recursively:

```
fd -e pdf
```

- **Select a PDF Using fzf:** Pipe the output of `fd` to `fzf` for interactive selection:

```
fd -e pdf | fzf
```

1.3.3 Opening the File Using Zathura

- **Command to Open the Selected PDF:** Use `zathura` with command substitution to open the selected PDF:

```
zathura $(fd -e pdf | fzf)
```

- **Explanation:**
  - `$(...)` runs the command inside and substitutes its output.
  - `fd -e pdf | fzf` selects a PDF file.
  - `zathura` opens the selected file.