

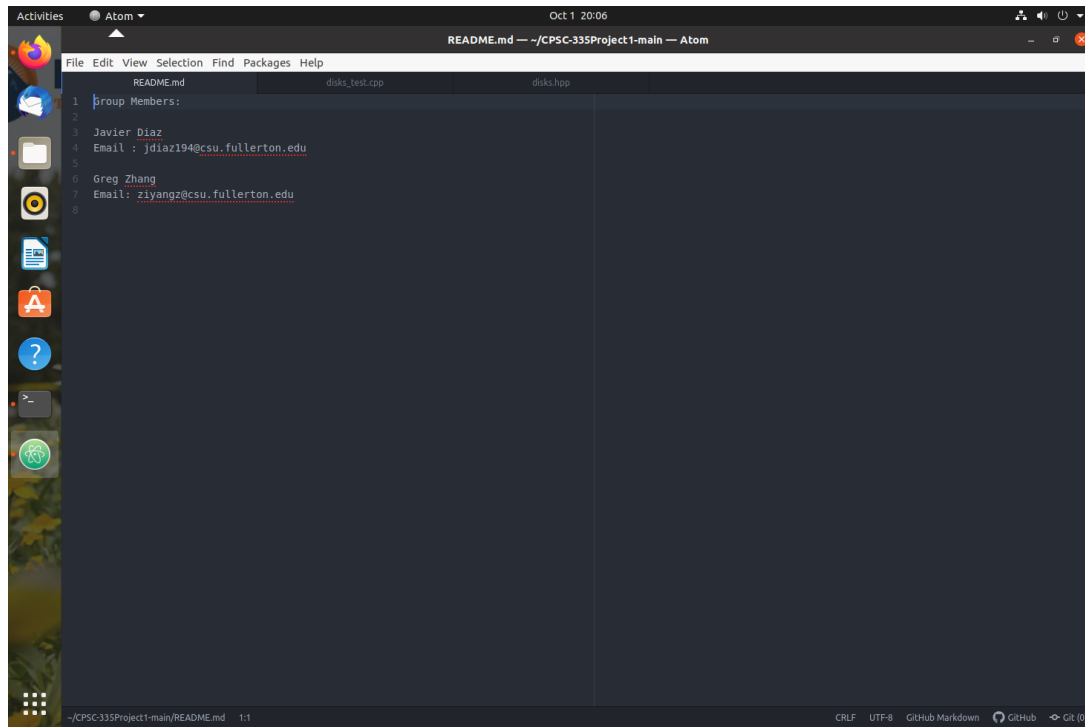
## CPSC 335-02 Project 1 Report

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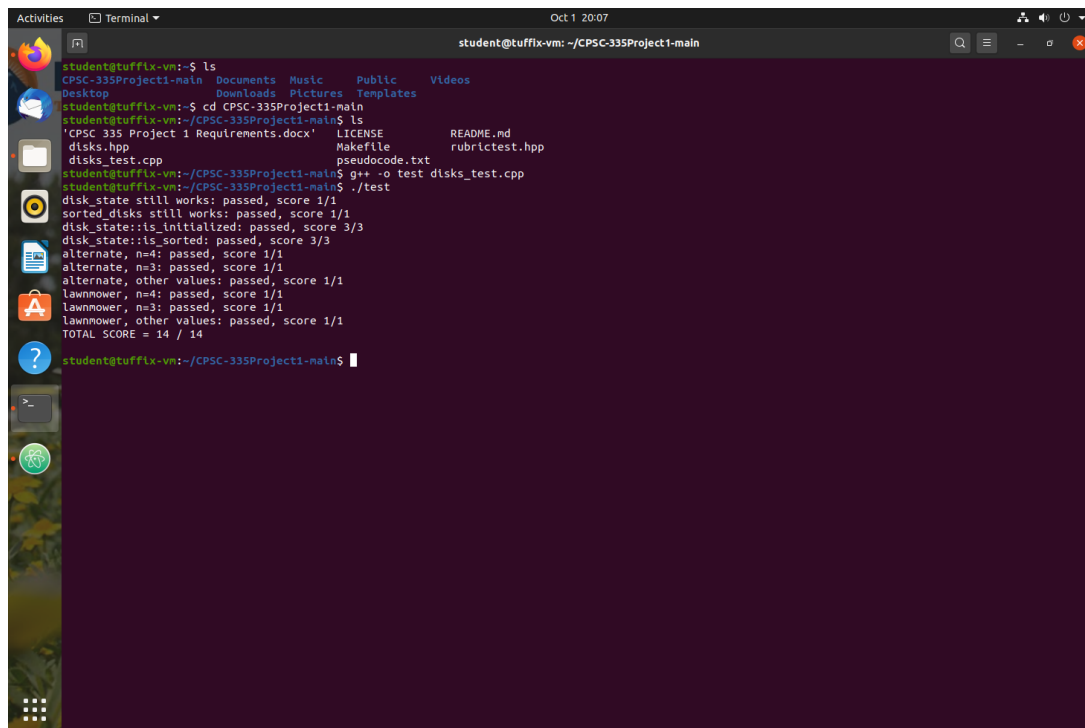
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The screenshot shows the Atom text editor interface. The title bar indicates the file is 'README.md' in the directory '~/CPSC-335Project1-main'. The menu bar includes File, Edit, View, Selection, Find, Packages, and Help. The left sidebar shows the file explorer with 'README.md' selected. The main editor area displays the following content:

```
1 Group Members:
2
3 Javier Diaz
4 Email : jdiaz194@csu.fullerton.edu
5
6 Greg Zhang
7 Email: ziyangz@csu.fullerton.edu
8
```

The status bar at the bottom shows the file path '~/CPSC-335Project1-main/README.md', line 11, and various settings like CRLF, UTF-8, GitHub Markdown, GitHub, and Git (0).



The screenshot shows a terminal window titled 'student@tuffix-vm: ~/CPSC-335Project1-main'. The terminal output shows the execution of a test script:

```
student@tuffix-vm:~$ ls
CPSC-335Project1-main  Documents  Music  Public  Videos
Desktop               Downloads  Pictures  Templates
student@tuffix-vm:~$ cd CPSC-335Project1-main
student@tuffix-vm:~/CPSC-335Project1-main$ ls
'CPSC 335 Project 1 Requirements.docx'  LICENSE      README.md
disks.hpp                             Makefile     rubricTest.hpp
disks_test.cpp                       pseudocode.txt
student@tuffix-vm:~/CPSC-335Project1-main$ g++ -o test disks_test.cpp
student@tuffix-vm:~/CPSC-335Project1-main$ ./test
disk_state still works: passed, score 1/1
sorted_disks still works: passed, score 1/1
disk_state::is_initialized: passed, score 3/3
disk_state::is_sorted: passed, score 3/3
alternate, n=4: passed, score 1/1
alternate, n=3: passed, score 1/1
alternate, other values: passed, score 1/1
lawnmower, n=4: passed, score 1/1
lawnmower, n=3: passed, score 1/1
lawnmower, other values: passed, score 1/1
TOTAL SCORE = 14 / 14
student@tuffix-vm:~/CPSC-335Project1-main$
```

Pseudocode for sort\_alterate (Left to Right Algorithm):

```
sorted_disks left_to_right {
  numOfSwap = 0
  for (size i = 0; i < dark_count; i++)
    for (size j = 0; j < (total - 1); j++)
      if(j is DISK_DARK and j + 1 is DISK_LIGHT)
        swap j
        numOfSwap++
      end if
    end for
  end for
}
```

Pseudocode for Lawnmower algorithm (Left to right, right to left):

```
sorted_disks lawnmower {
  numOfSwap = 0
  boolean direction = TRUE
  for (size i = 0; i < dark_count; i++)
    if (direction == TRUE)
      for (size j = 0; j < (total - 1); j++)
        if(j is DISK_DARK and j + 1 is DISK_LIGHT)
          swap j
          numOfSwap++
        end if
      end for
    else
      for (size j = (total - 1); j > 0; j--)
        if(j is DISK_LIGHT and j - 1 is DISK_DARK)
          swap j
          numOfSwap++
        end if
      end for
    end if
    direction = TRUE
  end for
}
```

Step Count Alternate Algorithm:

```

sorted_disks left_to_right {
  numOfSwap = 0 → 1 tu
  for (size i = 0; i < dark_count; i++) →  $\frac{n}{2}$  times
    for (size j = 0; j < (total - 1); j++) → n times
      if(j is DISK_DARK and j + 1 is DISK_LIGHT) → 2 tu
        swap j → 1 tu
        numOfSwap++ → 1 tu
      end if
    end for
  end for
}

```

$$S.C. = \left(\frac{n}{2} * n * 4\right) + 1 = 12n^2 + 1 tu$$

Step Count Lawnmower Algorithm:

```

sorted_disks lawnmower {
  numOfSwap = 0 → 1 tu
  boolean direction = TRUE → 1 tu
  for (size i = 0; i < dark_count; i++) →  $\frac{n}{2}$  times
    if (direction == TRUE) → 1 tu
      for (size j = 0; j < (total - 1); j++) → n times
        if(j is DISK_DARK and j + 1 is DISK_LIGHT) → 2 tu
          swap j → 1 tu
          numOfSwap++ → 1 tu
        end if
      end for
    else
      for (size j = (total - 1); j > 0; j--) → n times
        if(j is DISK_LIGHT and j - 1 is DISK_DARK) → 2 tu
          swap j → 1 tu
          numOfSwap++ → 1 tu
        end if
      end for
    end if
    direction = TRUE → 1 tu
  end for
}

```

$$S.C. = \left(\frac{n}{2} * (1 + \max(4n, 4n) * 1)\right) + 2$$

$$= \frac{n}{2} * (1 + 4n) + 2 = 2n^2 + \frac{n}{2} + 2 tu$$

Alternate Algo proof argument

Alternate algo. Proof by limit thm

$$\lim_{n \rightarrow \infty} \frac{2n^2 + 1}{n^2}$$

$$\lim_{n \rightarrow \infty} \frac{4n}{2n}$$

$$\lim_{n \rightarrow \infty} \frac{4}{2} = 2$$

Lawnmower Algo proof argument

Lawnmower algorithm, Proof by limit thm

$$\lim_{n \rightarrow \infty} \frac{2n^2 + n/2 + 2}{n^2}$$

$$\lim_{n \rightarrow \infty} \frac{\overset{4}{\uparrow} 4n + \overset{\rightarrow 0}{\frac{1}{2n}}}{\underset{2n \rightarrow 2}{2n}} = \frac{4}{2} = 2$$