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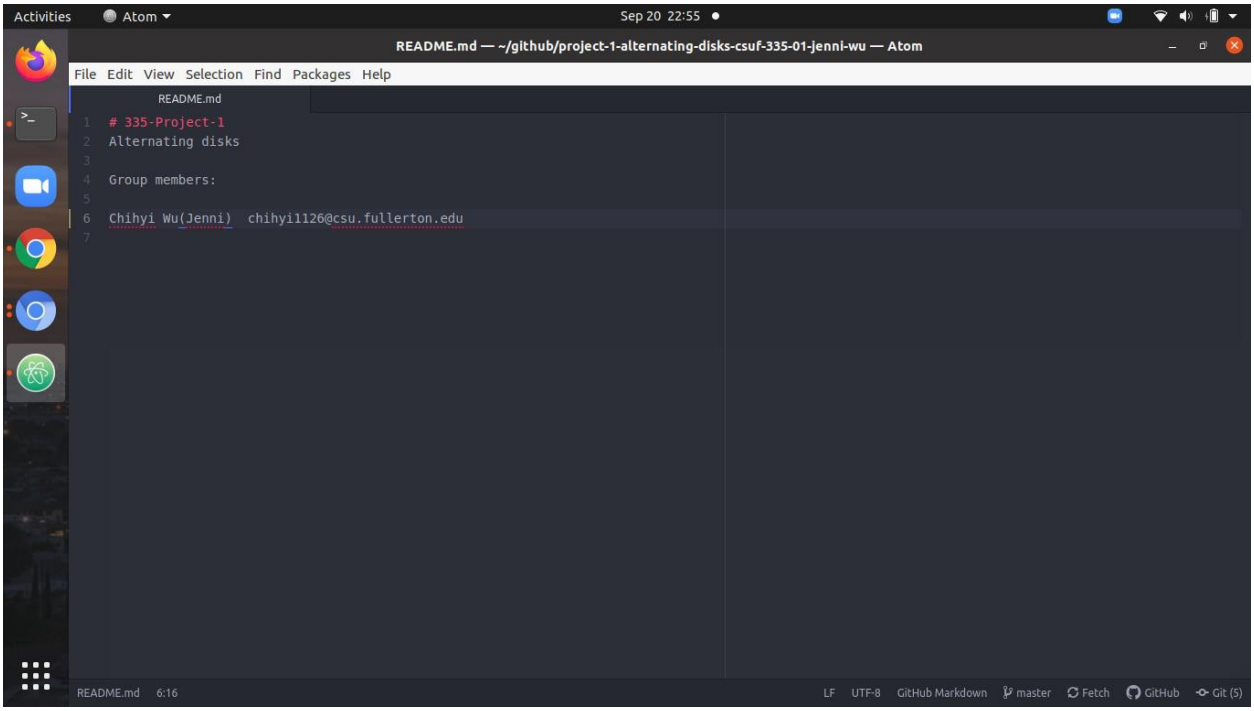
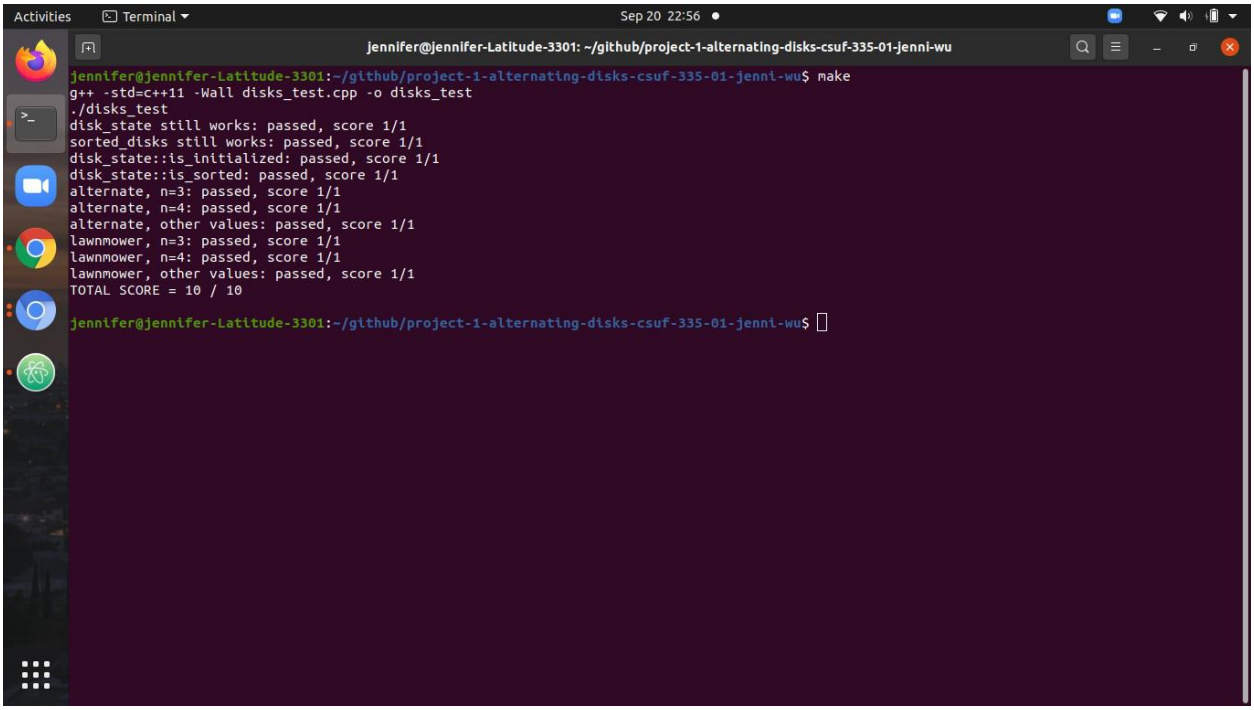
CSPS 335.01 Project 1





Alternate Algorithm

Pseudocode

```
for k= 0 to (n/2 - 1) step 1
        for i = 0 to (n – 2) step 2
                if color[i] == L && color[i + 1] == D
                        tmp = color[i]
                        color[i] = color[i+1]
                        color[i+1]=tmp
        for I = 1 to (n – 3) step 2
                if color[i] == L && color[i + 1] == D
                        tmp = color[i]
                        color[i] = color[i+1]
                        color[i+1]=tmp
```

$$sc = \left(\frac{n}{2} - 1 - 0 + 1\right) * (\left(\frac{n-2-0}{2} + 1\right) * \left(3 + max(3,0)\right) + \left(\frac{(n-3)-1}{2} + 1\right) * \left(3 + max(3,0)\right))$$

$$= \frac{n}{2} * \left(\frac{n}{2} * 6 + \left(\frac{n-2}{2}\right) * 6\right)$$

$$= 3\mathrm{n} * (n-1)$$

$$= 3n^2 - 3n$$

$\mathrm{TC} = \Theta(n^2)$

Proof: $3n^2 - 3n \in \Theta(n^2)$

$$\lim_{\mathrm{n}\to\infty}\left(\frac{3n^2-3n}{n^2}\right) = \lim_{\mathrm{n}\to\infty}\left(\frac{3n^2}{n^2}\right) - \lim_{\mathrm{n}\to\infty}\left(\frac{3n}{n^2}\right) = \lim_{\mathrm{n}\to\infty} 3 - \lim_{\mathrm{n}\to\infty}\left(\frac{3}{\mathrm{n}}\right) = 3 - 0 = 3$$

0

Which is non-negative and constant with respect to n

Lawnmober Algorithm

Pseudocode:

```
for k= 0 to (n/2 – 1) step 1
        for i = 0 to (n – 2) step 2
                if color[i] == L && color[i + i] == D
                        tmp = color[i]
                        color[i] = color[i+1]
                        color[i+1]=tmp
        for I = (n-3) to 1 step -2
                if color[i] == L&& color[i + 1] == D
                        tmp = color[i]
                        color[i] = color[i+1]
                        color[i+1]=tmp
```

$$sc = \left(\frac{n}{2} - 1 - 0 + 1\right) * (\left(\frac{n-2-0}{2} + 1\right) * \left(3 + max(3,0)\right) + \left(\frac{1-(n-3)}{-2} + 1\right) * \left(3 + max(3,0)\right))$$

$$= \frac{n}{2} * \left(\frac{n}{2} * 6 + \left(\frac{n-2}{2}\right) * 6\right)$$

$$= 3\mathrm{n} * (n-1)$$

$$= 3n^2 - 3n$$

$\mathrm{TC} = \Theta(n^2)$

Proof: $3n^2 - 3n \in \Theta(n^2)$

$$\lim_{\mathrm{n}\to\infty}\left(\frac{3n^2-3n}{n^2}\right) = \lim_{\mathrm{n}\to\infty}\left(\frac{3n^2}{n^2}\right) - \lim_{\mathrm{n}\to\infty}\left(\frac{3n}{n^2}\right) = \lim_{\mathrm{n}\to\infty} 3 - \lim_{\mathrm{n}\to\infty}\left(\frac{3}{\mathrm{n}}\right) = 3 - 0 = 3$$

0

Which is non-negative and constant with respect to n