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CPSC 335

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Pseudocode for the Algorithms

function sort_alterate(before):

```
after = copy(before) // n
swap_count = 0 // 1
swap_prior = true // 1
```

$$n+2 = n$$

```
while swap_prior: // 2 because of the constant iterating once
    swap_prior = false // 1
```

```
    for i = 0 to after.total_count() - 2 by 2: //  $(\frac{n}{2}-1) = n$ 
        if after.get(i) is DISK_LIGHT and after.get(i + 1) is DISK_DARK: // 1
            after.swap(i) // 1
            swap_count = swap_count + 1 // 1
            swap_prior = true // 1
            break // 1
```

→ n

```
    if not swap_prior: // 1
        for i = 1 to after.total_count() - 2 by 2: //  $(\frac{n}{2}) = n$ 
            if after.get(i) is DISK_LIGHT and after.get(i + 1) is DISK_DARK: // 1
                after.swap(i) // 1
                swap_count = swap_count + 1 // 1
                swap_prior = true // 1
                break // 1
```

→ n

```
return sorted_disks(after, swap_count) // 1
```

Time complexity: $O(n^2)$

function sort_lawnmower(before):

```
after = copy(before) // n
swap_count = 0 // 1
swap_prior = false // 1
```

$$n+2 = n$$

do:

```
    swap_prior = false // 1
```

```

for i = 0 to after.total_count() - 2: // 2
    if after.get(i) is DISK_LIGHT and after.get(i + 1) is DISK_DARK: // (n+1)
        after.swap(i) // 1
        swap_count = swap_count + 1 // 1
        swap_prior = true // 1

for i = after.total_count() - 2 down to 0: // (n+1)
    if after.get(i) is DISK_LIGHT and after.get(i + 1) is DISK_DARK: // (n+1)
        after.swap(i) // 1
        swap_count = swap_count + 1 // 1
        swap_prior = true

while swap_prior // 1

return sorted_disks(after, swap_count) // 1

Time Complexity:  $O(n^2)$ 

```

Step count for the Algorithms

//Alternate

```

sorted_disks sort_alternate(const disk_state& before) {
    disk_state after(before); // 1
    unsigned swap_count = 0; //1 step
    bool swap_prior = true; //1 step
    }
    while (swap_prior) { // 1
        swap_prior = false; // 1 step

        for (size_t i = 0; i < after.total_count() - 1; i += 2) //4 step  $\frac{(n-1)}{2} + 1$ 
        {
            if (after.get(i) == DISK_LIGHT && after.get(i + 1) == DISK_DARK) // 4 steps
            {
                after.swap(i); //1
                swap_count++; //1 step
                swap_prior = true; //1 step
                break; //After a swap, exit the loop
            }
        }
    }
}

```

```

if (!swap_prior) // 1
{
    for (size_t i = 1; i < after.total_count() - 1; i += 2) // 4 steps //  $\frac{n}{2} + 1$ 
    {
        if (after.get(i) == DISK_LIGHT && after.get(i + 1) == DISK_DARK) // 4 steps
        {
            after.swap(i); // 1
            Swap_count++; // 1 step
            swap_prior = true; // 1 step
            break; // After a swap, exit the loop
        }
    }
}

return sorted_disks(after, swap_count); // 1
}

```

7max

Step Count: $7n^2 + 21n + 16$

```

//Lawnmower
sorted_disks sort_lawnmower(const disk_state& before) {
    disk_state after(before); // 1
    size_t swap_count = 0; // 1 step
    bool swap_prior; // 1
    do {
        swap_prior = false; // 1 step
        for (size_t i = 0; i < after.total_count() - 1; i++) // 4 steps //  $\frac{(n-1)}{2} + 1$ 
        {
            if (after.get(i) == DISK_LIGHT && after.get(i + 1) == DISK_DARK) // 4 steps
            {
                after.swap(i); // 1
                swap_count++; // 1 step
                swap_prior = true; // 1 step
            }
        }
    }
    for (size_t i = after.total_count() - 2; i > 0; i--) // 4 steps //  $n-2$ 
}

```

7

```

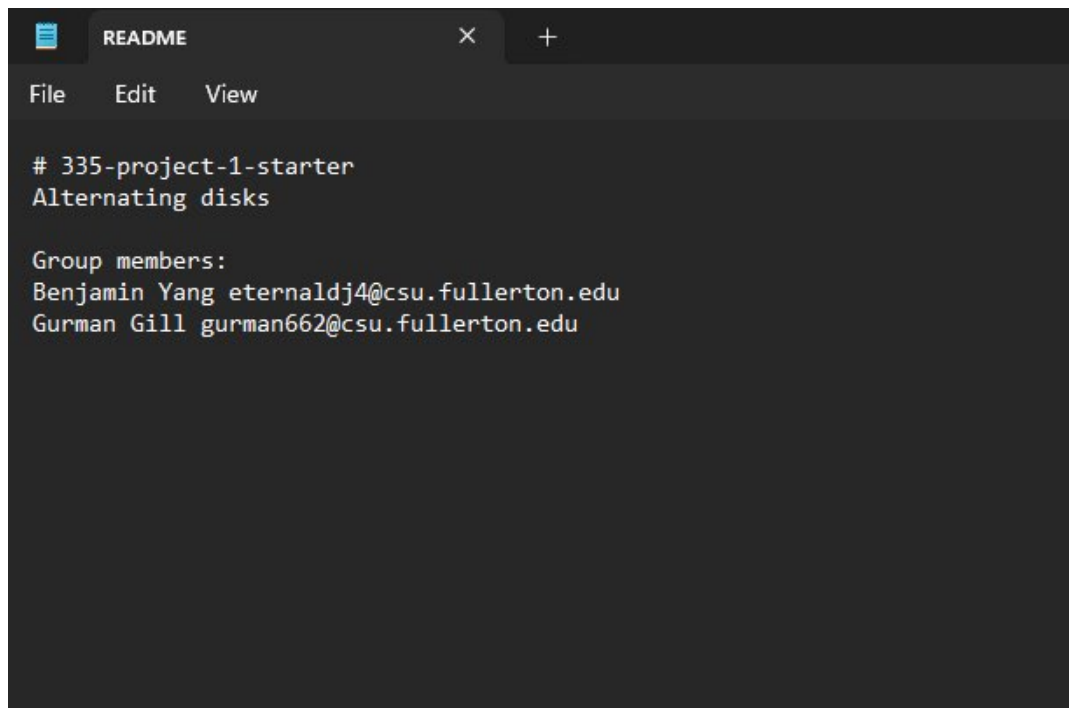
{
    if (after.get(i) == DISK_LIGHT && after.get(i + 1) == DISK_DARK) // 4 steps
    {
        after.swap(i); // 1
        Swap_count++; // 1 step
        swap_prior = true; 1 step
    }
}
} while (swap_prior);
return sorted_disks(after, swap_count); // 1
}

```

] 7max

Step Count: $(49n^2 - 49n - 96)/2$

Screenshot Readme:



The screenshot shows a code editor window with a single tab titled 'README'. The editor has a menu bar with 'File', 'Edit', and 'View'. The content of the README file is as follows:

```

# 335-project-1-starter
Alternating disks

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```