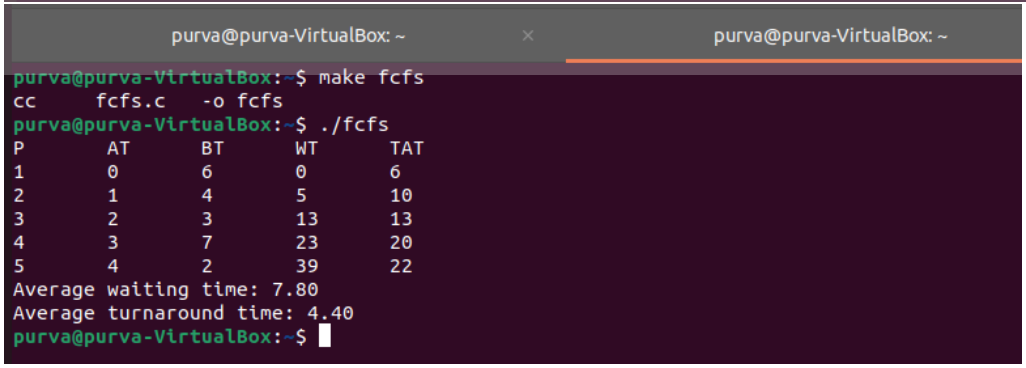
Simulation of CPU scheduling algorithms

i. FCFS

```
#include <stdio.h>
typedef struct process {
   int pid;
   int arrival_time;
   int burst_time;
} process;

void fcfs(process p[], int n) {
   int waiting_time = 0;
   int turnaround_time = 0;
   printf("P\tAT\tBT\tWT\tTAT\n");

   for (int i = 0; i < n; i++) {
      waiting_time += turnaround_time - p[i].arrival_time;
      turnaround_time += p[i].burst_time;
      printf("%d\t%d\t%d\t%d\t%d\n", p[i].pid, p[i].arrival_time, p[i].burst_time, waiting_time, turnaround_time);
   }

   float avg_waiting_time = (float)waiting_time / n;
   float avg_turnaround_time = (float)turnaround_time / n;
   printf("Average waiting time: %.2f\n", avg_waiting_time);
   printf("Average turnaround time: %.2f\n", avg_turnaround_time);
}

int main() {
   // Create an array of processes
```

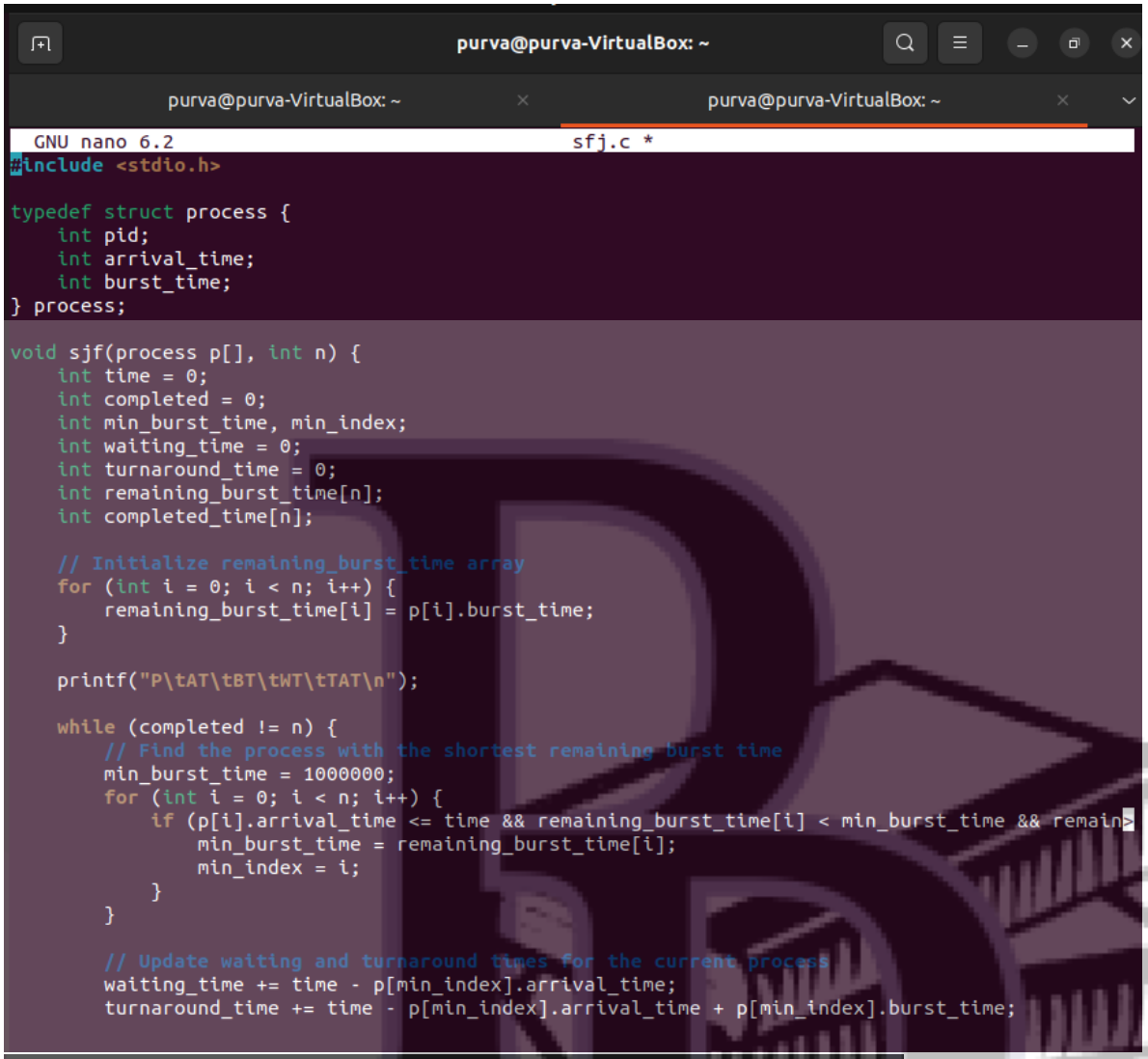
```
    process p[] = {
        {1, 0, 6},
        {2, 1, 4},
        {3, 2, 3},
        {4, 3, 7},
        {5, 4, 2},
    };
    int n = sizeof(p) / sizeof(p[0]);

    // Call the FCFS function
    fcfs(p, n);
    return 0;
}
```

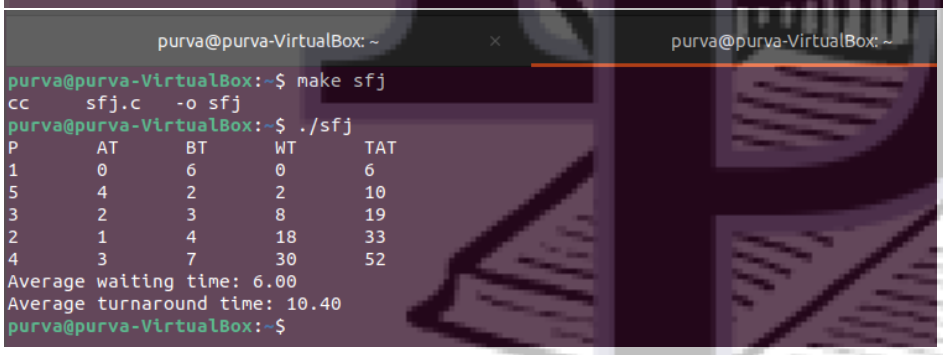


ii. SJF

```
#include <stdio.h>
typedef struct process {
    int pid;
    int arrival_time;
    int burst_time;
} process;

void sjf(process p[], int n) {
    int time = 0;
    int completed = 0;
    int min_burst_time, min_index;
    int waiting_time = 0;
    int turnaround_time = 0;
    int remaining_burst_time[n];
    int completed_time[n];

    // Initialize remaining_burst_time array
    for (int i = 0; i < n; i++) {
        remaining_burst_time[i] = p[i].burst_time;
    }
    printf("P\tAT\tBT\tWT\tTAT\n");

    while (completed != n) {
        // Find the process with the shortest remaining burst time
        min_burst_time = 1000000;
        for (int i = 0; i < n; i++) {
            if (p[i].arrival_time <= time && remaining_burst_time[i] < min_burst_time && remaining_burst_time[i] > 0) {
                min_burst_time = remaining_burst_time[i];
                min_index = i;
            }
        }

        // Update waiting and turnaround times for the current process
        waiting_time += time - p[min_index].arrival_time;
        turnaround_time += time - p[min_index].arrival_time + p[min_index].burst_time;
```

```
        // Update remaining burst time for the current process
        remaining_burst_time[min_index] = 0;

        // Update completion time for the current process
        completed_time[min_index] = time + p[min_index].burst_time;

        // Print the process ID, arrival time, burst time, waiting time, and turnaround time
        printf("%d\t%d\t%d\t%d\t%d\n", p[min_index].pid, p[min_index].arrival_time, p[min_index].burst_time, waiting_time, turnaround_time);

        // Update time and completed count
        time += p[min_index].burst_time;
        completed++;
    }
    float avg_waiting_time = (float)waiting_time / n;
    float avg_turnaround_time = (float)turnaround_time / n;
    printf("Average waiting time: %.2f\n", avg_waiting_time);
    printf("Average turnaround time: %.2f\n", avg_turnaround_time);
}
int main() {
    // Create an array of processes
    process p[] = {
        {1, 0, 6},
        {2, 1, 4},
        {3, 2, 3},
        {4, 3, 7},
        {5, 4, 2},
    };
    int n = sizeof(p) / sizeof(p[0]);

    // Call the SJF function
    sjf(p, n);

    return 0;
}
```





iii. Priority

```
#include <stdio.h>

typedef struct process {
    int pid;
    int arrival_time;
    int burst_time;
    int priority;
} process;


void priority(process p[], int n) {
    int time = 0;
    int completed = 0;
```

```
    int highest_priority, highest_priority_index;
    int waiting_time = 0;
    int turnaround_time = 0;
    int remaining_burst_time[n];
    int completed_time[n];
    // Initialize remaining_burst_time array
    for (int i = 0; i < n; i++) {
        remaining_burst_time[i] = p[i].burst_time;
    }
    printf("P\tAT\tBT\tPR\tWT\tTAT\n");

    while (completed != n) {
        // Find the process with the highest priority
        highest_priority = -1;
        for (int i = 0; i < n; i++) {
            if (p[i].arrival_time <= time && p[i].priority > highest_priority && remaining_burst_time[i] > 0) {
                highest_priority = p[i].priority;
                highest_priority_index = i;
            }
        }
        // Update waiting and turnaround times for the current process
        waiting_time += time - p[highest_priority_index].arrival_time;
        turnaround_time += time - p[highest_priority_index].arrival_time + p[highest_priority_index].burst_time;

        // Update remaining burst time for the current process
        remaining_burst_time[highest_priority_index] = 0;
        // Update completion time for the current process
        completed_time[highest_priority_index] = time + p[highest_priority_index].burst_time;

        // Print the process ID, arrival time, burst time, priority, waiting time, and turnaround time
        printf("%d\t%d\t%d\t%d\t%d\t%d\n", p[highest_priority_index].pid, p[highest_priority_index].arrival_time,
p[highest_priority_index].burst_time, p[highest_priority_index].priority, waiting_time, turnaround_time);
        // Update time and completed count
        time += p[highest_priority_index].burst_time;
        completed++;
    }
    float avg_waiting_time = (float)waiting_time / n;
```

```
    float avg_turnaround_time = (float)turnaround_time / n;
    printf("Average waiting time: %.2f\n", avg_waiting_time);
    printf("Average turnaround time: %.2f\n", avg_turnaround_time);
}
int main() {
    // Create an array of processes
    process p[] = {
        {1, 0, 6, 3},
        {2, 1, 4, 2},
        {3, 2, 3, 1},
        {4, 3, 7, 4},
        {5, 4, 2, 5},
    };
    int n = sizeof(p) / sizeof(p[0]);

    // Call the priority function
    priority(p, n);
    return 0;
}
```

```
purva@purva-VirtualBox: ~                    purva@purva-VirtualBox: ~
purva@purva-VirtualBox:~$ make priority
cc     priority.c    -o priority
purva@purva-VirtualBox:~$ ./priority
P       AT      BT      PR      WT      TAT
1       0       6       3       0       6
5       4       2       5       2       10
4       3       7       4       7       22
2       1       4       2       21      40
3       2       3       1       38      60
Average waiting time: 7.60
Average turnaround time: 12.00
purva@purva-VirtualBox:~$
```

iv. Round Robin

```
#include <stdio.h>
typedef struct process {
   int pid;
   int arrival_time;
   int burst_time;
   int remaining_burst_time;
} process;

void round_robin(process p[], int n, int quantum) {
   int time = 0;
   int completed = 0;
   int waiting_time = 0;
   int turnaround_time = 0;
   int remaining_time[n];

   // Initialize remaining_time array
   for (int i = 0; i < n; i++) {
      remaining_time[i] = p[i].burst_time;
      p[i].remaining_burst_time = p[i].burst_time;
   }
   printf("P\tAT\tBT\tWT\tTAT\n");

   while (completed != n) {
      // Traverse all processes
      for (int i = 0; i < n; i++) {
         // Check if the process has arrived and has remaining burst time
         if (p[i].arrival_time <= time && p[i].remaining_burst_time > 0) {
            // Update remaining burst time
            if (p[i].remaining_burst_time > quantum) {
```

```
            p[i].remaining_burst_time -= quantum;
            remaining_time[i] = p[i].remaining_burst_time;
            time += quantum;
          } else {
            time += p[i].remaining_burst_time;
            p[i].remaining_burst_time = 0;
            remaining_time[i] = 0;

            // Update waiting and turnaround times for the current process
            waiting_time += time - p[i].arrival_time - p[i].burst_time;
            turnaround_time += time - p[i].arrival_time;

            // Print the process ID, arrival time, burst time, waiting time, and turnaround time
            printf("%d\t%d\t%d\t%d\t%d\n", p[i].pid, p[i].arrival_time, p[i].burst_time, waiting_time, turnaround_time);

            // Update completed count
            completed++;
          }
        }
      }
    }
    float avg_waiting_time = (float)waiting_time / n;
    float avg_turnaround_time = (float)turnaround_time / n;
    printf("Average waiting time: %.2f\n", avg_waiting_time);
    printf("Average turnaround time: %.2f\n", avg_turnaround_time);
}
int main() {
    // Create an array of processes
    process p[] = {
        {1, 0, 8},
        {2, 1, 4},
        {3, 2, 9},
        {4, 3, 5},
        {5, 4, 2},
    };
    int n = sizeof(p) / sizeof(p[0]);
```

```
    int quantum = 3;

    // Call the round_robin function
    round_robin(p, n, quantum);

    return 0;
}
```