Task 2: First-Come, First-Serve (FCFS) Scheduler Simulation

Task Description:

The task involves simulating a simple First-Come, First-Serve (FCFS) process scheduler in `C`. The program should allow input of process details and display key scheduling outputs.

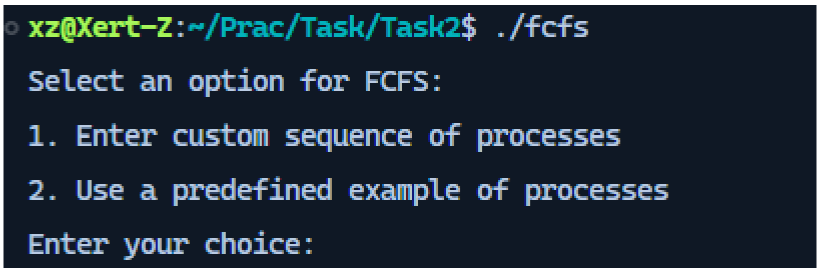
- Input Requirements:
  - Number of processes to be scheduled.
  - Each process's arrival time and burst time.
- Output Requirements:
  - A Gantt chart (or equivalent representation) showing the scheduling of processes.
  - “Waiting time” and “Turnaround time” for each process.
  - “Average waiting time” and “Turnaround time” across all processes.

Libraries/Header Files Used:

- `stdio.h`: For standard input and output functions like `printf()` and `scanf()`

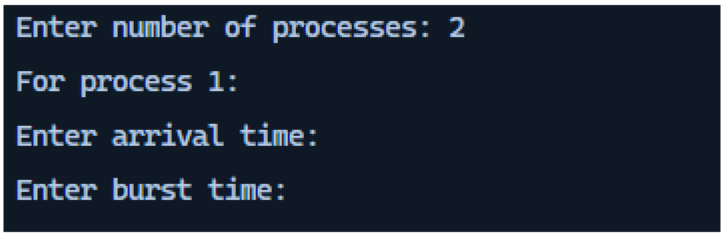
Detailed Explanation:

- `Struct Process` **definition**:
  - A structure `Process` is defined to hold process-specific data:
    - `int pid`: Process ID, a unique identifier.
    - `int arrivalTime`: stores time at which the process arrives in the queue.
    - `int burstTime`: stores the duration of the process’s execution.
    - `int waitingTime`: stores the value calculated as `turnaroundTime – burstTime`.
    - `int turnaroundTime`: stores the value calculated as `completionTime – arrivalTime`.
    - `int completionTime`: Stores the time when the process finishes execution at runtime.
- **Input**:
  - The user has to choose between a custom sequence of process or using a predefined example to apply FCFS algorithm.



```
xz@Xert-Z:~/Prac/Task/Task2$ ./fcfs
Select an option for FCFS:
1. Enter custom sequence of processes
2. Use a predefined example of processes
Enter your choice:
```

  - If the user wishes to provide custom sequence of processes then he must:
    1. Provide Number of Processes
    2. Arrival time for each process
    3. Burst time for each process



```
Enter number of processes: 2
For process 1:
Enter arrival time:
Enter burst time:
```

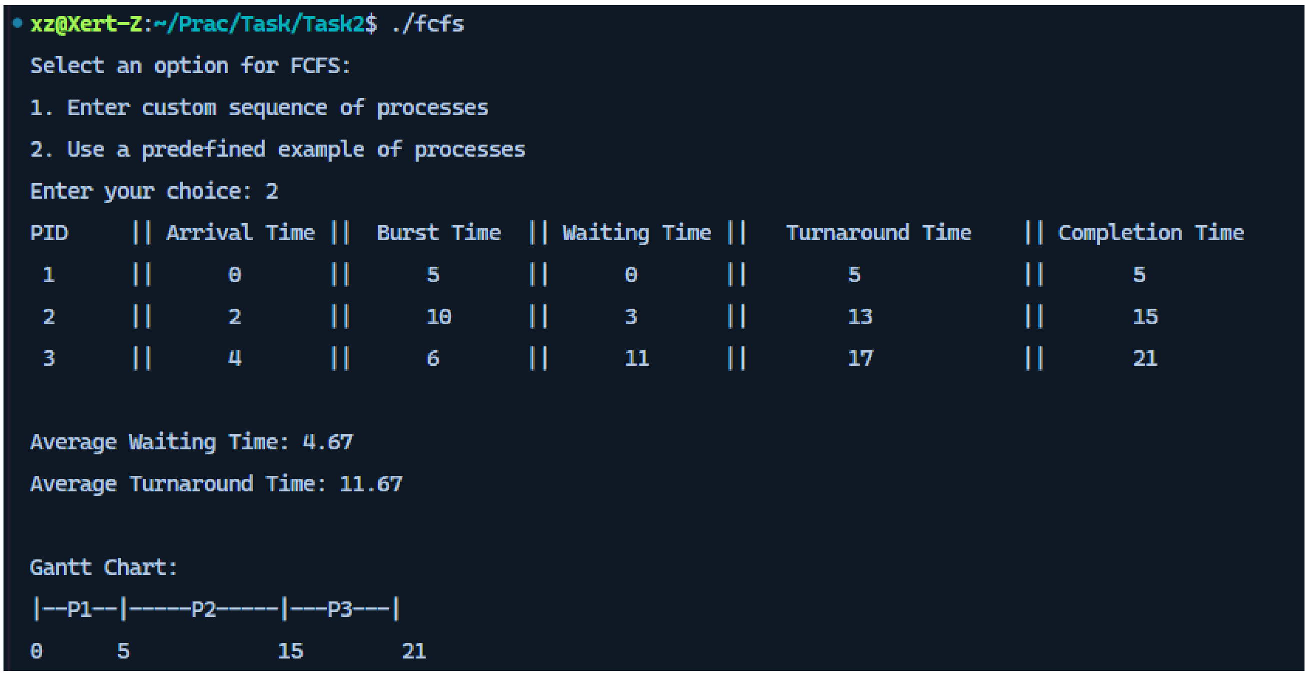
Figure 1: Custom Sequence of Processes

➢ **Functionality**:

1. `swap()`:
    - The program calls `swap()` function and based on the `arrivalTime` of the processes, the processes are sorted in ascending order with respect to their arrival times using a nested loop.
2. `FCFS_Scheduling()`:
    - The function `FCFS_Scheduling()` iterates through the `processes[]` and calculates the metrics based on the constraints of the FCFS:
        - **Waiting Time**: Time a process spends waiting in the queue of the `processes[].`
        - **Turnaround Time**: Total time of each process from its arrival to completion.
        - **Completion Time**: Calculated incrementally using `currentTime`.
    - Updates `avgWaitingTime` and `avgTurnAroundTime` to compute averages for the all the processes in the `processes[]`.
3. `DisplayResults()`:
    - `DisplayResults()` outputs a formatted table showing all relevant process data.
    - Average Waiting Time and Turnaround Time are displayed as floating-point values.
4. `GanttChart()`:
    - The function `GanttChart()` visually represents process execution, highlighting their IDs and respective times on a timeline.
5. **`CustomProcesses()` and `ExampelProcesses()`:**
    - `CustomProcesses()`: Prompts the user for process details (Includes the number of processes, arrival time and burst time for each process). *Validates input to ensure at least two processes are entered*.
    - `ExampleProcesses()`: Uses a predefined set of processes for simulation. Has a set of 3 Processes with predefined metrics.

❖ **Program Flow**:

- The user selects is provided a menu to select an option to define custom processes or use predefined data for simulation of FCFS Scheduling.
- The program invokes appropriate functions to schedule processes, calculate metrics, and display results.
- Same functions will be called for both Predefined sequence of processes and Custom sequence of processes
- A formatted table showing all relevant process data is printed after the FCFS algorithm is applied
- The Gantt chart is also drawn which provides a visual representation of the scheduling.
- Average waiting and turnaround times are computed and displayed.

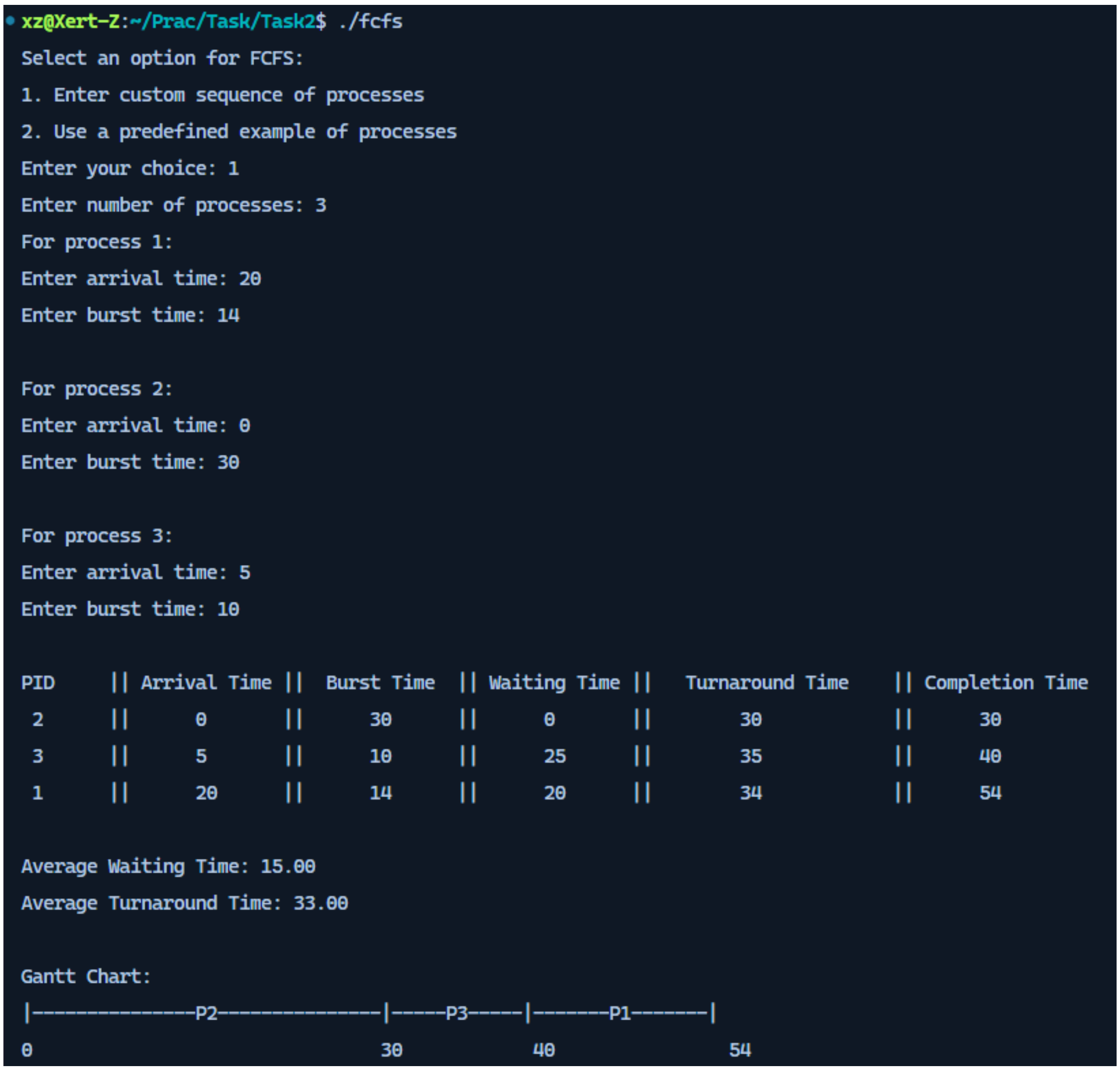


```
• xz@Xert-Z:~/Prac/Task/Task2$ ./fcfs
Select an option for FCFS:
1. Enter custom sequence of processes
2. Use a predefined example of processes
Enter your choice: 2
PID     || Arrival Time ||  Burst Time  || Waiting Time ||   Turnaround Time    || Completion Time
 1      ||      0       ||      5       ||      0       ||        5             ||       5
 2      ||      2       ||      10      ||      3       ||        13            ||       15
 3      ||      4       ||      6       ||      11      ||        17            ||       21

Average Waiting Time: 4.67
Average Turnaround Time: 11.67

Gantt Chart:
|--P1--|-----P2-----|---P3---|
0      5            15       21
```

Figure 2 Complete Execution of FCFS.c using Predefined sequence of processes



```
• xz@Xert-Z:~/Prac/Task/Task2$ ./fcfs
Select an option for FCFS:
1. Enter custom sequence of processes
2. Use a predefined example of processes
Enter your choice: 1
Enter number of processes: 3
For process 1:
Enter arrival time: 20
Enter burst time: 14

For process 2:
Enter arrival time: 0
Enter burst time: 30

For process 3:
Enter arrival time: 5
Enter burst time: 10

PID     || Arrival Time ||  Burst Time  || Waiting Time ||   Turnaround Time    || Completion Time
 2      ||      0       ||      30      ||      0       ||        30            ||       30
 3      ||      5       ||      10      ||      25      ||        35            ||       40
 1      ||      20      ||      14      ||      20      ||        34            ||       54

Average Waiting Time: 15.00
Average Turnaround Time: 33.00

Gantt Chart:
|--------------P2--------------|-----P3-----|-------P1-------|
0                              30           40               54
```

Figure 3: Complete execution of FCFS.c using Custom Sequence of Processess