OS lab 4

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1 Problem

Implement the schedulers Shortest Job First(SJF) and Round Robin(RR).

2 Shortest Job First(SJF)

Out of all available processes, CPU is assigned to the process having the **smallest** burst time.

Characteristics of SJF scheduling are as follows:

- **Non-preemptive** scheduling scheme.
- Aims to **minimize** the average **turnaround** and **waiting** time.
- **Higher response** time if long processes queues up before shorter ones.
- Long processes **starve** when shorter jobs continually arrive.

3 Round Robin(RR)

Each process gets a fixed time interval of the slice to utilize the resources or execute its task called time **quantum** or time slice.
Some of the round-robin processes are preempted if it executed in a given time slot, while the rest of the processes go back to the ready queue and wait to run in a **circular order** with the scheduled time slot until they complete their task.

Features of RR scheduling are as follows:

- **Preemptive** scheduling scheme.
- **Fair** in terms of CPU time allocation to each process.
- **Context switching overhead** may be dominant when the time slice is too small.
- **Response time** is lower compared to other scheduling schemes

4 Comparison

Metrics for each process in the input data files

4.1 Process1.dat

	SJF			RR		
pid	TAtime	Wtime	penalty	TAtime	Wtime	penalty
0	1224	803	2.98537	1429	1008	3.3943
1	1212	871	3.67273	1358	1017	3.9824
2	661	370	2.36071	1255	964	4.31271
3	550	349	2.89474	987	786	4.91045
4	119	106	13.2222	52	39	4
5	102	97	20.4	35	30	7
6	1419	1214	6.99015	1013	808	4.94146
Average	755.286	544.286	7.5037	875.571	664.571	4.64876
Throughput	0.00489853			0.00489853		

Table 1: Metrics for Process1.dat

4.2 Process2.dat

	SJF			RR		
pid	TAtime	Wtime	penalty	TAtime	Wtime	penalty
0	5	0	1	8	3	1.6
1	83	70	9.22222	17	4	1.30769
2	521	320	2.74211	706	504	3.51244
3	136	123	15.1111	76	63	5.84615
4	763	472	2.725	883	592	3.03436
5	161	148	17.8889	89	76	6.84615
6	938	597	2.84242	934	593	2.739
7	84	71	9.33333	108	95	8.30769
8	229	192	6.54286	255	218	6.89189
9	160	147	17.7778	115	102	8.84615
10	161	148	17.8889	119	106	9.15385
11	129	116	14.3333	120	107	9.23077
12	130	117	14.4444	121	108	9.30769
13	113	100	12.5556	125	112	9.61538
14	116	103	12.8889	128	115	9.84615
15	72	59	8	129	116	9.92308
16	74	61	8.22222	131	118	10.0769
17	75	62	8.33333	132	119	10.1538
Average	219.444	161.444	10.1029	233.111	175.056	7.01329
Throughput	0.0186722			0.01875		

Table 2: Metrics for Process2.dat

4.3 Process3.dat

	SJF			RR		
pid	TAtime	Wtime	penalty	TAtime	Wtime	penalty
0	788	560	4.14737	1600	1352	7.01754
1	2072	1778	7.14483	1904	1610	6.47619
2	1143	806	4.23333	1882	1577	6.19079
3	1675	1507	10.4688	1292	1124	7.69048
4	491	322	3.928	1301	1095	7.69822
5	2069	1687	5.50266	2069	1687	5.41623
6	833	590	3.96667	1635	1385	6.92797
7	6	0	1	58	52	9.66667
8	82	22	8.2	158	98	2.63333
9	1356	1256	13.56	864	764	8.64
10	18	9	2.57143	96	87	10.6667
11	1123	714	3.25507	2040	1651	5.24422
Average	971.333	770.917	5.66484	1241.58	1040.17	7.02236
Throughput	0.00574438			0.00574438		

Table 3: Metrics for Process3.dat

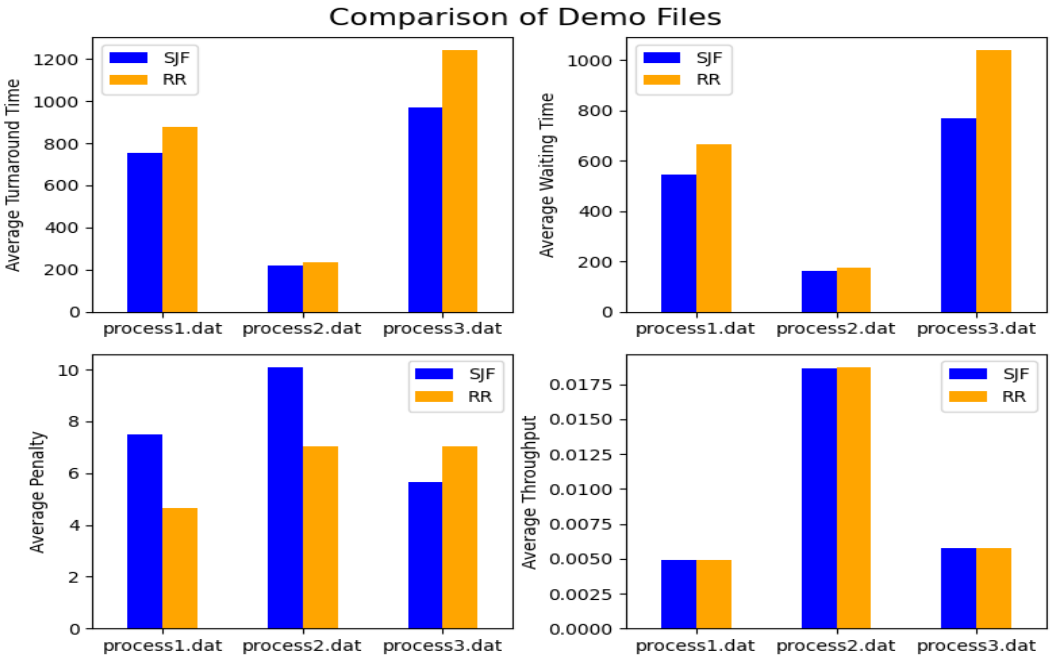

Figure 1: Demo files comparison

Here we compare the performance of both SJF and RR on the basis of Average Turn Around time, Waiting time, Penalty, and Throughput.

5 Custom Data

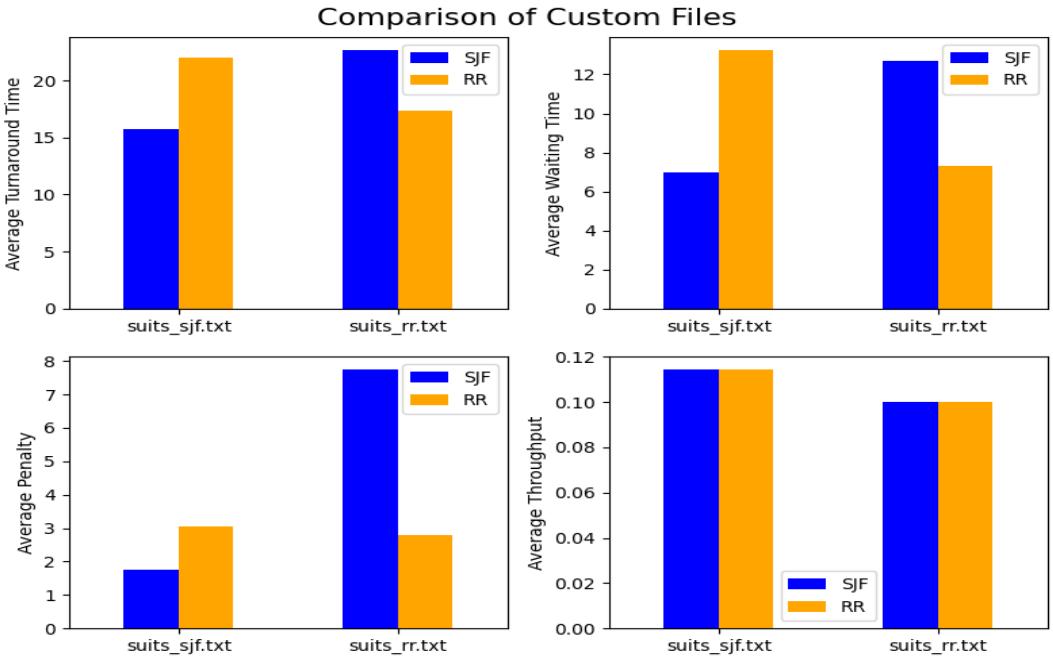

Figure 2: Comparison of Custom files

5.1 Suitable for SJF but not for RR

`suits_sjf.txt`

```
0 4 -1
0 20 -1
0 5 -1
0 6 -1
```

This test data favours SJF as multiple process arrive at the same point of time. So to minimize average turnaround and waiting time, it is better to schedule shorter jobs first. Whereas in case of Round Robin the shorter jobs will be delayed due to the longer job (convoy effect), hence here the average turnaround and waiting time is higher in RR scheduling.

5.2 Suitable for RR but not for SJF

`suits_rr.txt`

```
0 20 -1
1 9 -1
2 1 -1
```

This test data favours RR but not SJF as a shorter process arives right after a long process. So SJF will schedule the long process as it arrived earlier. This will drastically increase the waiting and turnaround time of the shorter jobs. On the other hand RR will be fair and make the scheduling more responsive. It will have lesser turnaround and waiting time for shorter jobs.