Lesson-17:
Task Cyclic Scheduling of Periodic Tasks
1. Common scheduling models
Common scheduling models

- Cooperative Scheduling of ready tasks in a circular queue. It closely relates to function queue scheduling.
- Cooperative Scheduling with Precedence Constraints
- Cyclic scheduling of periodic tasks and Round Robin Time Slicing Scheduling of equal priority tasks
- Preemptive Scheduling
- Scheduling using 'Earliest Deadline First' (EDF) precedence.
Common scheduling models

- Rate Monotonic Scheduling using ‘higher rate of events occurrence First’ precedence
- Fixed Times Scheduling
- Scheduling of Periodic, sporadic and aperiodic Tasks
- Advanced scheduling algorithms using the probabilistic Timed Petri nets (Stochastic) or Multi Thread Graph for the multiprocessors and complex distributed systems.
2. Cyclic Scheduling Periodic tasks
Time Periodic Scheduling in the cyclic order

- Assume periodically occurring three tasks
- Let in time-frames allotted to the first task, the task executes at $t_1$, $t_1 + T_{cycle}$, $t_1 + 2 \times T_{cycle}$, .., second task frames at $t_2$, $t_2 + T_{cycle}$, $t_2 + 2 \times T_{cycle}$ and third task at $t_3$, $t_3 + T_{cycle}$, $t_3 + 2 \times T_{cycle}$, ...
Time Period Scheduling in the Periodic tasks

- Start of a time frame is the scheduling point for the next task in the cycle.
- $T_{\text{cycle}}$ is the cycle for repeating cycle of execution of tasks in order 1, 2 and 3 and equals start of task 1 time frame to end of task 3 frame.
- $T_{\text{cycle}}$ is period after which each task time frame allotted to that repeats
Case: $t_{\text{cycle}} = N \times \text{Sum of the maximum times for each task}$

- Then each task is executed once and finishes in one cycle itself.
- When a task finishes the execution before the maximum time it can take, there is a waiting period in-between period between two cycles.
- The worst-case latency for any task is then $N \times \text{Sum of the maximum times for each task}$. A task may periodically need execution. A task period for the its need of required repeat execution of a task is an integral multiple of $t_{\text{cycle}}$. 
## Tasks C1 to C5 Cyclic Scheduling

<table>
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<tr>
<th>Task C1</th>
<th>Task C2</th>
<th>Task C3</th>
<th>Task C4</th>
<th>Task C5</th>
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<tbody>
<tr>
<td>Check Message at Port A Successive 20 ms</td>
<td>Read Port A and Place it At Queue</td>
<td>Decrypt Queue Messages</td>
<td>Encode Queue Messages</td>
<td>Transmit by Writing at Port B</td>
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</table>

**Task C1 to Task C5**
Example of Video and audio signals

- Signals reaching at the ports in a multimedia system and processed.
- The video frames reach at the rate of 25 in one second.
- The cyclic scheduler is used in this case to process video and audio with Tcycle = 40 ms or in multiples of 40 ms.
Orchestra Playing Robots

- First the director robot sends the musical notes. Then, the playing robots receive and acknowledge to the director.
- In next cycle, the master robot again sends the musical notes.
- The cyclic scheduler is used in this case to send and receive signals by each robot after the cycle period.
Summary
We learnt

- A cyclic scheduling is very efficient for handling periodic tasks and when the number of tasks is small
End of Lesson 17 of Chapter 8