

# SIT315- Seminar 2- Real-time Systems - part 2

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## Overview

Welcome to the third seminar of SIT315. Form a group of 5-6 students and work on the following activities.

## Submission Details

Each student should submit the answers in the onTrack individually. Please write the names of all of your group members in the first page of your submission.

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## Activity 1- Parallel and concurrent programming

During the week three lecture, we discussed several new terms and concepts. Based on what you have learnt, answer the following questions.

1. Provide concrete definitions and examples of the following terms/concepts and briefly discuss their differences: Concurrent programming, Parallel programming, and Distributed computing.
  2. What is Amdahl's Law?
  3. Floating point square root (FPSQR) is commonly used in graphical applications. Assume 20% of the total execution time of a program is spent in calculating FPSQR. Which is the better tradeoff?
    - Speedup execution of FPSQR by 10 times
    - Speedup execution of all floating-point operations by 2 times. Assume 50% of the total execution time of the program is spent in executing floating-point operations.
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## Activity 2 - Flynn's taxonomy

Flynn's taxonomy classifies available hardware into four classifications based upon the number of concurrent instructions (or control) streams and data streams available:

- Single-instruction, single data (SISD)
  - Multiple-instruction, single data (MISD)
  - Single-instruction, multiple data (SIMD)
  - Multiple-instruction, multiple data (MIMD)
1. Briefly explain the architecture of each of these classifications and provide an example for each category.
  2. Array Processor is a subcategory of SIMD. Briefly explain it and provide an example for it.
  3. MIMD can be subdivided into two subcategories, which are SPMD and MPMD. Briefly explain each of these subcategories and provide an example for each.
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## Activity 3 - Timers

Based on the Tinkercad circuit accessible from the link below, complete the following activities:

<https://www.tinkercad.com/things/c1qtxCkOuBW>

1. Complete the code in a way that LED blinks every 2 seconds.
2. Change the `startTimer` method to accept a double value called `timerFrequency`, which represents the frequency of the timer. Change the `startTimer` function so that it uses the value of this parameter to calculate and set the correct values for the `OCRx` and `TCCRx` registers.
3. Use the potentiometer sensor connect to pin A4 to enable users to configure the timer frequency.

After finishing these activities, use the remaining time of the seminar to work on TaskM1.T3C and TaskM1.T4D individually. You can find the task description from OnTrack.