Simulation Exercise #01: Continuous Simulation Models

INF301 – Systems Modeling and Simulation – W01

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Report Guidelines

Use a notebook on the Google Collaboratory platform to generate a report containing any explanations and comments you deem relevant, along with your code and figures.

The graphs in the figures should be self-explanatory, with axis names and data captions. Use a font size appropriate for presentation in a document.

The language to be used is Python. However, the use of pre-built Python libraries is not permitted, except for those used in the examples.

Submit a single notebook file in ipynb format, with the file name in the format SE0N_NameSurname.ipynb, where N is the SE number, Name is your first name, and Surname is your last name.

Remember that plagiarism will not be tolerated under any circumstances!

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Problem 1 (50 points)

Write a **function** that converts the temperature in degrees Fahrenheit (⁰F) to degrees Celsius (⁰C) and to Kelvin (K).

Using this function, plot a **graph** showing the variation in temperature in ⁰C and in K as the temperature in ⁰F varies from 0 to 250°F.

Make appropriate comments.

Tip: Python functions are defined using the `def` keyword.

Problem 2 (50 points)

Model, **using difference equations**, the trajectory (height x distance) of a projectile launched at an angle α_0, from a height h_0, and with a velocity v_0. Assume h_0 = 10 m and v_0 = 20 m/s. Perform the calculations for the scenarios with α_0 = 0, 30°, 45°, and 60°, neglecting air resistance.

Assume, for all four scenarios, time steps of 0.1, 0.5, and 1 seconds (three curves) and make appropriate comments.