Universität Bremen

FB3: Mathematik/Informatik

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Hands-on Tutorial on Optimization

Exercise Sheet: Chips Factory (23.09.2024)

Exercise 1 (Basic Structure)

Consider again the chips factory problem.

$$\begin{array}{lrcrcl} \max & 2x_p & + & 1.5x_m & & \\ \text{s.t.} & 2x_p & + & 4x_m & \leq & 345 \\ & 4x_p & + & 5x_m & \leq & 480 \\ & 4x_p & + & 2x_m & \leq & 330 \\ & x_p & , & x_m & \geq & 0 \end{array}$$

Implement the basic structure of your model in Python using Pulp. This should include

- declaring the variables
- defining the objective function
- giving the constraints
- solving the model

Exercise 2 (Add Flexibility)

Increase the flexibility of the model by implementing it as a Python function that takes the following arguments and solves the model for all (feasible) inputs:

- a list `chips` of the different categories of chips represented by their names,
- a list `process` for the different steps that happen during production represented by their names,
- a list `price` containing the prices for the different categories of chips,
- a list `max_time` indicating the maximum amount of time available for a process,
- a two-dimensional list `time` that contains the required amount of time the process need for the different chips categories.

Use loops to define the constraints and use the scalar product functionality of Pulp (`lpDot`) to define the objective function.

Exercise 3 (Data Input)

Separate your problem from the data in the following way:

- Keep the list representation of the chips and processes as in Exercise 2 but change the other arguments to dictionaries using the chips and/or processes as keys.
- Change your function to use the summation functionality of Pulp (`lpSum`) and the new input data structures to implement and solve the model.
- Test your model on the alternative data provided in the template file.