Computational Game Theory

Implementation Exercises on Linear Programming and its application for the identification of Strictly Dominated Strategies.

1. Linear Programming: Gas Production Example

Solve the Linear Programming problem:

$$\begin{aligned} Max \quad & Z = 150x_1 + 175x_2 \\ Subject\ to & \\ & 7x_1 + 11x_2 \leq 77 \\ & 10x_1 + 8x_2 \leq 80 \\ & x_1 \leq 9 \\ & x_2 \leq 6 \\ & x_1 \geq 0, \quad x_2 \geq 0 \end{aligned}$$

2. Linear Programming with Equalities and Greater Than or Equal Constraints

Solve the Linear Programming problem:

$$\begin{aligned} Min \quad & Z = 3x_1 + 2x_2 + 7x_3 \\ Subject\ to & \\ & -x_1 + x_2 = 10 \\ & 2x_1 - x_2 + x_3 \geq 10 \\ & x_1 \geq 0, \quad x_2 \geq 0, \quad x_3 \geq 0 \end{aligned}$$

3. Application to Strictly Dominated Strategies

Consider the following payoff matrix:

1\2	Left	Middle	Right
Top	3,8	2,0	1,2
Bottom	0,0	1,7	8,2

a) Define a Linear Programming problem to verify if Left is strictly dominated by a mixed strategy of Right and Middle. Solve the problem. What is your conclusion?
b) Define a Linear Programming problem to verify if Right is strictly dominated by a mixed strategy of Left and Middle. Solve the problem. What is your conclusion?