

Linear Programming Assignment

SC42055 Optimization in Systems and Control

D_1 , D_2 , and D_3 are parameters changing from 0 to 9 for each student according to the last three numbers of his/her Student ID (being D_3 the right-most digit).

AirRobotics manufactures two Unmanned Aerial Vehicles (UAV): Falcon and Condor. Each drone has different capabilities and requires a different number of Programmable Logic Controllers (PLCs), of which only $1000 + 20D_1$ can be obtained each week. Falcon uses 2 of them, and Condor 3 of them.

AirRobotics has 25 workers allocated to the manufacturing of Falcon and Condor drones (each one working $40 - D_2$ hours per week). The salary cost of each worker is $500 + 10D_3$ euros per week. The construction of each Falcon consumes three working hours and for a Condor five working hours are required. Direct profits (without considering salaries) are 60 and 110 euros for each Falcon and Condor that is manufactured, respectively. AirRobotics has signed a contract with a major customer to make and supply 200 Falcons each week.

Tasks:

1. Formulate the AirRobotics optimization problem in order to maximize profit and transform it into a standard form of the linear programming problem considering the number of Falcons and Condors as continuous variables.
2. Find the optimal solution to the LP problem using MATLAB. What is maximum achievable profit and the optimal number of Condors and Falcons manufactured? (Now take account that the actual number of Falcons and Condors are integers).
3. AirRobotics is considering to increase the number of workers allocated to the manufacturing of Falcon and Condor. Moreover, a study has shown that each additional worker decreases with 3 minutes the time needed for the construction of each UAV. Formulate the new AirRobotics optimization problem in order to maximize profit. Is it possible to formulate the new optimization problem as a single LP problem?
4. Find in MATLAB the optimal number of workers, Falcons and Condors using LP. (Advice: You can solve as many LP-problems as necessary).
5. Consider that AirRobotics has signed a second additional contract to make and supply 400 Condors each week. How many workers will be necessary to fulfill both contracts?

The written report on the practical exercise, including the MATLAB code used, should be emailed to José Ramón Domínguez Frejo (j.r.dominguezfrejo@tudelft.nl) before Monday, September 25, 2017 at 17.00 p.m. as one pdf file. Please note that you will lose 0.5 point from your grade on the report for each (started) day of delay in case you exceed the deadline.