UNIVERSITY OF ZAGREB

Faculty of Electrical Engineering and Computing

Master Programme

Heuristic Optimization Methods

Second lab assignment

Fantasy football draft problem

Ac. year 2023/2024

Lab 2 deals with the Fantasy Football draft problem. The problem, constraints, and problem instance format are described in the scope of Lab 1.

An additional constraint that was not explicitely stated in Lab 1 but which must be met is that each **player is allowed to appear only once in the final line-up (i.e., we cannot pick the same player multiple times)**.

Complete the following tasks:

1. Design and implement a **tabu search (TS) algorithm** to find a solution to the given problem.

    a) Start with an initial solution obtained by the greedy algorithm you implemented in the scope of Lab1. Execute your TS algorithm for the given instances of the problem. For each instance, save the best acquired solution as the value of the objective function (overall score for the ''best eleven''), and the list of drafted players, as well as the list of players in the first team lineup.

    b) Start with an initial solution obtained “randomly”, i.e., players were selected in such a way that the solution is feasible, but no greedy heuristic is used. The goal here is to start with a (likely) worse solution than in a), and thus more clearly see how the TS algorithm can improve the solution. Execute your TS algorithm for the given instances of the problem. For each instance, save the best acquired solution as the value of the objective function (overall score for the ''best eleven''), and the list of drafted players, as well as the list of players in the first team lineup.

    c) Additionally, for both tasks given in a) and b) try different tabu tenures. Compare and comment on the impact of tabu tenure with respect to the solution quality. Answer all questions indicated in the report template.

2. Design and implement a **simulated annealing (SA) algorithm** to find a solution to the given problem.

    a) Start with an initial solution obtained by the greedy algorithm you implemented in the scope of Lab1. Execute your SA algorithm for the given instances of the problem. For each instance, save the best acquired solution as the value of the objective function (overall score for the ''best eleven''), and the list of drafted players, as well as the list of players in the first team lineup.

    b) Start with an initial solution obtained “randomly”, i.e., players were selected in such a way that the solution is feasible, but no greedy heuristic is used. Execute your SA algorithm for the given instances of the problem. For each instance, save the best acquired solution as the value of the objective function (overall score for the ''best eleven''), and the list of drafted players, as well as the list of players in the first team lineup.

    c) Additionally, for both tasks given in a) and b) try different initial temperatures and different temperature decrement functions. Compare and comment on their impact with respect to the solution quality. Answer all questions indicated in the report template.

3. Write a report that describes your implemented algorithms. The report should include the following:

    a) Best obtained result for each instance: the value of the objective function, the list of drafted players, as well as the list of players in the first team lineup.

    b) Programming language used for the algorithm implementation.

    c) The pseudocode of the implemented algorithms.

    d) A description of the implemented tabu search and simulated annealing algorithms.

    e) Analysis (**both** textual and graphical) of the impact of different algorithm parameters (tabu structure and tabu tenure for tabu search, and initial temperature and temperature decrement functions for simulated annealing) on the solution quality.

The lab assignment is due on **December 18, 2023 at noon (strict deadline!).** Additional information regarding the report and code submission will be provided on the course website.

In addition to submitting your code and report via Moodle, you will be given a link to an online Google form to enter your best results per instance.