CSE 202 Project Proposal

Objective

Scheduling tennis tournaments is contingent upon several crucial constraints (as outlined below). Our group aims to probe different optimization techniques to determine the most optimal schedule for each knockout stage of the tennis tournament, yielding maximum revenue. The rest of this paper will provide a brief overview of the problem we are trying to solve.

Background

Tennis tournament viewership has increased significantly over the past few years. “The 2021 US Open in New York averaged 881,000 viewers in prime time, up 33% over last year” (ESPN). There are multiple tennis tournaments throughout the year, however the Grand Slam tournaments are considered the most popular amongst enthusiasts and players alike. These tournaments span across two weeks and matches are played in a *knockout* (single-elimination) format, i.e, the loser of the match is immediately eliminated from the tournament. Every tennis tournament begins with a draw that assigns the players into four separate quarters based on their ranking. This ensures that the higher ranked players compete against each other only during the latter portion of the tournament.

In a Grand Slam tournament, a total of 128 players enter the draw. Intuitively, half the players are eliminated every round of the tournament, leaving the remaining two finalists to play all seven matches. Scheduling such a tournament introduces multiple constraints that the organizers have to address. We aim to design a generic algorithm that outputs the most optimal schedule for each knockout stage in the tournament such that the organizers can generate the maximum revenue. This algorithm will be bounded by a list of hard and soft constraints delineated below.

Constraints

Hard Constraints:

1) The first major constraint to be considered is the size of the tennis centre at our disposal, i.e. the number of courts and the seating capacity of each court.
2) The tournament should conclude in 14 days, i.e. the final of the tournament should be played on the 14th day.
3) A player should not be scheduled to play two consecutive days (An exception would be extreme situations like match delays due to bad weather. In such situations, there may be

a possibility of a player playing two consecutive days, however that should not affect the original scheduling)

4) There can be at most four matches played on a court in a given day.

Soft Constraints:

1) The matches will be divided into two sessions - day session and night session.
2) Night sessions are considered favorable among players due to cooler weather conditions. To maintain fairness among players, no single player should hog all the night sessions.

Input

Our algorithm to determine the most optimal schedule will require the following input:

- Players with their ranking information
- Courts with their seating capacity information
- Ticket prices for each court (corresponding to seating capacity)
- Player popularity (this will be useful to determine their crowd attraction)
- A valid fixture (appropriate pairing by rating of players) for the tournament

Output

The output would be the best possible schedule for each knockout stage with a given match fixture. The best possible schedule means a schedule that generates the maximum revenue for the organizers for the knockout stage.

Strategy

1) We would initially create a draw as mentioned above to get the fixture of matches.
2) Given the necessary input and constraints, our algorithm would return the best possible schedule that maximizes revenue for each knockout stage.
3) We repeat this process until the end of the tournament.
4) Once we design an efficient algorithm that works for 128 players and 14 days, we aim to develop a generic approach where we will firstly determine if scheduling a tournament is feasible given the constraints, *n* players and *d* days. If it is possible, we would then devise an algorithm to find the optimal schedule for each knockout stage.

References

https://espnpressroom.com/us/press-releases/2021/09/us-open-viewership-up-33-in-prime-time-13-overall/

https://www.itftennis.com/media/2495/grand-slam-rulebook-2020-f.pdf