The Tournament Scheduling Problem with Absences

Uwe Schauz (Xi'an Jiaotong-Liverpool University)

We study time scheduling problems with allowed absences as a new kind of graph coloring problem. One may think on a sport tournament where each player (each team) is permitted a certain number t of absences. We then examine how many rounds are needed to schedule the whole tournament in the worst case. This upper limit depends on t and on the structure of the graph G whose edges represent the games that have to be played, but also on whether or not the absences are announced before the tournament starts. Therefore, we actually have two upper limits for the number of required rounds. We have $\chi^t(G)$ for pre-scheduling if all absences are pre-fixed, and we have $\chi^t_{OL}(G)$ for on-line scheduling if we have to stay flexible and deal with absences when they occur. We conjecture that $\chi^t(G) = \Delta(G) + 2t$ and that $\chi^t_{OL}(G) = \chi'(G) + 2t$. The first conjecture is stronger than the Total Coloring Conjecture while the second is weaker than the On-Line List Edge Coloring Conjecture. Our conjectures hold for all bipartite graphs. For complete graphs, we prove them partially. Lower and upper bounds to $\chi^t(G)$ and $\chi^t_{OL}(G)$ for general multigraphs G are established, too.