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How to Play Optimally for Regular Objectives?

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Abstract: This paper studies two-player zero-sum games played on graphs and makes contributions toward the following question: given an objective, how much memory is required to play optimally for that objective? We study regular objectives, where the goal of one of the two players is that eventually the sequence of colors along the play belongs to some regular language over finite words. We obtain different characterizations of the chromatic memory requirements for such objectives for both players, from which we derive complexity-theoretic statements: deciding whether there exist small memory structures sufficient to play optimally is NP-complete for both players. Some of our characterization results apply to a more general class of objectives: topologically closed and topologically open sets.

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