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Games, walks and grammars: Problems I've worked on

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Overview

As the title indicates, this part of the dissertation is about random walks. Specifically, it is about recurrence in so-called *reinforced* random walks, where edges in a graph are traversed with probabilities that may be different (reinforced) at second, third etc. traversals.

We start by reviewing some general theory of random walks, in Chapter 6. Chapter 7 is a brief digression to a problem involving gambling and related to random walks, namely the problem of calculating the expected time until one of the players is broke. In Chapter 8, we introduce reinforced random walks. After some general results, we focus on the case where the probability for any edge only changes once, after its first traversal. As a special case, we show that the once-reinforced random walk on the infinite ladder is almost surely recurrent if reinforcement is small, extending a result by T. Sellke from an at this time unpublished article[31]. In Chapter 9, we briefly review the basics of nonstandard analysis and its application to graph theory. We use this in Chapter 10 to show that for a class of graphs which generalizes the infinite ladder, recurrence holds for sufficiently *large* reinforcements.

