Optimizing Run-and-Tumble Searches

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Search problems are widespread in nature and technology. They occur on vastly different scales reaching from the search for castaways in the open sea, animals searching for food, Bacteria looking for a favourable environment to intracellular transport of cargo along the cytoskeleton. Because searchers in biological context are often provided with only limited or no mental capacities (foarging animals or bacteria) or being driven by the environment (cellular transport) these searches often happen to be random searches. Succeeding in the search is crucial for the survival of the species or proper function of the organism, thus rendering the efficiency of the applied search strategy an vital issue. To describe and analyse the observed searching behaviour several models have been proposed. Most of them falling either into the category of Lévy walks or two-state search patterns where the searcher switches between states of fast and slow motion. In this contribution we will focus on a Run-and-Tumble Searcher belonging to the latter category: A random walker with two states of different persistency with no temporal and short term directional memory. We will analyse the dependency of the mean search time obtained by Monte Carlo simulations on the persistency, mean duration of the phases.