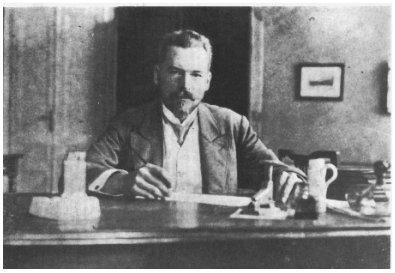

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Generalised 'Arcsine' laws for run-and-tumble particle in one dimension

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The 'Arcsine' laws of Brownian particles in one dimension describe distributions of three quantities: the time t_m to reach maximum position, the time t_r spent on the positive side and the time t_l of the last visit to the origin. Interestingly, the cumulative distribution of all three quantities are the same and given by Arcsine function. In this paper, we study distribution of these three times t_m, t_r and t_l in the context of single run-and-tumble particle in one dimension, which is a simple non-Markovian process. We compute exact distributions of these three quantities for arbitrary time and find that all three distributions have a delta function part and a non-delta function part. Interestingly, we find that the distributions of t_m and tr are identical (reminiscent of the Brownian particle case) when the initial velocities of the particle are chosen with equal probability. On the other hand, for t_l, only the non-delta function part is the same as the other two. In addition, we find explicit expressions of the joint distributions of the maximum displacement and the time at which this maxima occurs.

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