



# Revisit the large deviations rate function for the stationary distribution of a two dimensional SRBM: Geometric interpretation and related results

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We revisit the large deviations rate function for the stationary distribution of the two dimensional SRBM, which is determined by a drift vector and covariance matrix of the Brownian motion and a reflection matrix. This rate function has been obtained under a certain extra condition on the reflection matrix by Avram, Dai and Hasenbein (2001). They solved the variational problem for the sample path large deviations due to Majewski (1998).

On the other hand, Dai and Miyazawa (2011) recently obtained the convergence domain of the moment generating function of the stationary distribution of the SRBM without any extra condition. This domain has been used to get the tail asymptotics of the marginal stationary distribution in an arbitrary direction. Furthermore, they showed that the domain gives a lower bound for the rate function. This lower bound has a nice geometric interpretation.

The purpose of this paper is to make a bridge between those two results. We show that the rate function is not always identical with the lower bound of Dai and Miyazawa (2011), but can be uniquely determined by the convergence domain and two extra points. Thus, we have a geometric interpretation of the large deviations rate function. Here, the extra condition is needed.

We derive two more results concerning the rate function. One is to sharpen it for the coordinate direction. For this, an exact tail asymptotics is obtained for the stationary boundary measures on the coordinate axes. Another is to geometrically characterize the product form stationary distribution, equivalently, the skew symmetric condition. Both do not require any extra condition.

This is joint work with Jim Dai, Georgia Tech.

## References

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