

Documentation for MFPT code (Matlab)

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1 Overview of functions

solve_mfpt.m: This function takes the scale factor **k** (scales with cell aspect ratio, values stored in **kValsCtrlAR1p06to2.mat**) and solves the corresponding boundary value problem for the mean first passage time (**symmetric** energy landscape). There are several possible outputs. The first is **Y1**, the solution to the BVP. The second is **Y2**, which is the mean first passage time function (i.e. **Y1** divided by the splitting probability). The third is **splitProbs**, which is the splitting probability. All of these outputs are vectors that represent the values of the respective functions evaluated at starting angles α (denoted by the vector **x** = `linspace(0,pi)`).

solve_mfpt_new.m: This function takes the scale factors **k** and **j** (scale with cell aspect ratio, values stored in **AsymmValsAR1p06to1p67.mat**) and solves the corresponding boundary value problem for the mean first passage time (**asymmetric** energy landscape). It has the same possible outputs as **solve_mfpt.m**.

BVPplot.m: This function plots the desired output from **solve_mfpt.m** or **solve_mfpt_new.m** for starting angles α from 0 to π .

solve_SAB.m: This function plots the analytical solution of the single absorbing boundary problem for an absorbing boundary at $b = \pi/2$. It plots it for all possible starting angles $\alpha \in (0, \pi/2)$.

1.1 Inputs & parameters

k (solve_mfpt.m): Scale factor, = $k_1 * W_{\max} = 0.001 * W_{\max}$

k (solve_mfpt_new.m): Scale factor, = W_{\max}

j (solve_mfpt_new.m): Scale factor, = W_{\min}

Y: Function (in vector form) to plot via **BVPplot**

1.2 .mat files

SplitProbctrl.mat: Contains a 6×100 matrix whose rows are the splitting probabilities (evaluated from $\alpha = 0$ to $\alpha = \pi$) for the on-center, symmetric spindle (AR = 1.07, 1.133, 1.2, 1.27, 1.33, and 1.4).

SplitProbasymm.mat: Contains a 7×100 matrix whose rows are the splitting probabilities (evaluated from $\alpha = 0$ to $\alpha = \pi$) for the off-center, asymmetric spindle (AR = 1.07, 1.133, 1.2, 1.27, 1.33, 1.4, and 1.47).

BVPctrl.mat: Contains a 6×100 matrix whose rows are the mean first passage time functions (evaluated from $\alpha = 0$ to $\alpha = \pi$) for the on-center, symmetric spindle (AR = 1.07, 1.133, 1.2, 1.27, 1.33, and 1.4).

BVPasymm.mat: Contains a 7×100 matrix whose rows are the mean first passage time functions (evaluated from $\alpha = 0$ to $\alpha = \pi$) for the off-center, asymmetric spindle (AR = 1.07, 1.133, 1.2, 1.27, 1.33, 1.4, and 1.47).

kValsCtrlAR1p06to2.mat: Contains a 1×15 vector **kvec**, which contains the scale factors k for the on-center, symmetric spindle (AR = [16:30] ./15).

AsymmValsAR1p06to1p67.mat: Contains two 1×10 vectors, **kvecAsymm** and **jvecAsymm**, that contain the scale factors k and j (respectively) for the off-center, asymmetric spindle (AR = [16:25] ./15).