ACTIVE BROWNIAN PARTICLES PERFORMING TARGET SEARCH

Eq. of motion (Itô discretization) in 2D

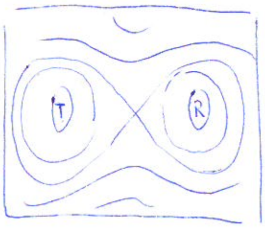
$$\begin{cases} \vec{r}_{t+dt} = \vec{r}_t + v\,\hat{u}_t\,dt + \sqrt{2D\,dt}\;\vec{\xi}_t \quad \left(+\mu\vec{F}(\vec{r}_t)\,dt\right) \\ \vartheta_{t+dt} = \vartheta_t + \sqrt{2D_{rot}\,dt}\;\eta_t \end{cases}$$

$\hat{u}_t = (\cos\vartheta_t, \sin\vartheta_t)$

$\xi_{xt}, \xi_{yt}, \eta_t$ Gaussian distributed random variables with zero mean and unit variance

$$\vec{F} = -\nabla U$$

target-search in heterogeneous environments. Example

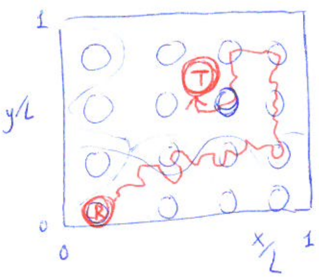


$U(x,y) = k_x\,(x^2 - x_0^2)^2 + \dfrac{k_y}{2}\,y^2$

one can investigate the following observables

- distribution of transition path times
  (time required to go from R to T without going back to R before reaching T)
- reactive probability density (probability of being in a given position conditioned to the fact that we consider only the reactive paths)
- reactive currents
- rates of going from R to T (or average time to find the target)

$U(x,y) = k\left[\sin\left(\dfrac{8\pi x}{L}\right) + \sin\left(\dfrac{8\pi y}{L}\right)\right]$



Potential : such that a passive particle stay in the minima with rare jumps from one minimum to the other

Activity (v) : such that it is easier for the particle to travel around in the landscape but still feels the potential.

- what if target is on a maximum? a minimum? randomly placed?
- what happen changing the activity or the persistence of the particle?
- chiral ABP? $\left(\vartheta_{t+dt} = \vartheta_t + \omega\,dt + \sqrt{2D_{rot}\,dt}\;\eta_t\right)$