Movie captions

Movie 1: Here we consider a suspension of immotile particles ($\beta = 0$) with rotational diffusion fixed at $D_R = 0.0125$. The movie begins with low translational diffusion, so the uniform isotropic state is very unstable. As D_T is slowly increased toward the bifurcation value $D_T^* = 0.2$, the system relaxes into the steady state depicted in figure 6. The movie ends at $D_T = 0.18$.

Movie 2: Here we consider the subcritical Hopf bifurcation occurring for initial perturbations in x and y at $\beta_T = 0.63$ when $D_T = 0.02$ is fixed and D_R is small. Movie 2 depicts the nematic order parameter $\mathcal{N}(\boldsymbol{x}, t)$ and direction of local alignment along the hysteretic upper solution branch at $\beta = 0.75$, well above the bifurcation value. Note in particular the quasiperiodic nature of the dynamics along this upper branch.

Movie 3: We again consider the subcritical Hopf bifurcation occurring at $\beta_T = 0.63$ for initial perturbations in x and y when $D_T = 0.02$ and D_R is small. Movie 3 depicts the particle concentration field $c(\boldsymbol{x}, t)$ along the hysteretic upper solution branch at $\beta = 0.75$.

Movie 4: When the initial perturbation is in the x-direction only, the Hopf bifurcation at $\beta_T = 0.63$ is supercritical. Movie 4 documents a few periods of the stable limit cycle which arises for β just below β_T. The alignment among particles is very weak, but they display a clear preferred direction which oscillates over time.

Movie 5: Here we see the nematic order parameter $\mathcal{N}(\boldsymbol{x}, t)$ and direction of local alignment over a few periods of the stable limit cycle which arises following the supercritical Hopf bifurcation at $\beta_T = 0.40$ ($D_T = 0.075$) for an initial perturbation in x and y.

Movie 6: Here we again see the stable limit cycle which arises following the supercritical Hopf bifurcation at $\beta_T = 0.40$ ($D_T = 0.075$) for an initial perturbation in x and y. Movie 6 depicts the vorticity field $\omega(\boldsymbol{x}, t)$ and direction of the fluid velocity over a few periods of the limit cycle.

Movie 7: Here we depict the dynamics just below the subcritical pitchfork bifurcation for perturbations in x and y at $\beta_T = 0.19$ ($D_T = 0.13$). In contrast to the supercritical setting, the system does not settle into a stable nontrivial steady state but instead reaches what appears to be a stable limit cycle.