Title:	Chaotic nature of bacterial colonies
Authors:	Bansal, Abhinav
Keywords:	Chaotic bacterial colonies/
Issue Date:	Apr-2022
Publisher:	IISER Mohali
Abstract:	In this thesis we wanted to address the following question : whether truly predictive models of bacterial colonies are possible ? To be more specific, we wanted to know if the movement of cells in a colony can be predicted, at least for a fraction of a bacterial generation, provided that we have a good understanding of the initial conditions (positions, orientations, etc.). To answer the above questions, we considered a well characterized simulation model of a bacterial colony and applied perturbation to all cells in the colony. We compared the movement of cells in the perturbed and unperturbed colony. To understand how the pertur- bation of the initial condition affects cell movement in the colony, we first calculated how much individual cells deviated in their trajectories compared to the unperturbed condition. The average deviation increased approximately exponentially in time until the deviation becomes comparable with cell size when the rate of increase slows down. This signifies the chaotic nature of the colony. We checked if the deviation of individual cells correlated with local properties of the colony, such as density, local order parameter, and topological charge density. We did not observe any significant correlation. We also used single-cell perturbation, where we perturb the single random cell of the colony by changing its position coordinates. We observed reason- able correlation between the radial distance of cell and deviation of a single cell and also between the total force acting on bacterial cell and the deviation of single cell. We used periodic boundary conditions (PBCs) to find out whether there is a correlation between the total resultant force acting on the bacterial cell and the deviation of individual cells in the bacterial colony. We observed a correlation albeit less than what we observed in the case of radially expanding bacterial colony.
URI:	http://hdl.handle.net/123456789/4131
Appears in Collections:	MS-17

Files in This Item:

File	Description	Size	Format	
Yet to obtain consent.pdf		144.56 kB	Adobe PDF	View/Open

Show full item record