Title:	Explosive death in nonlinear oscillators coupled by quorum sensing
Authors:	Verma, U.K. (/jspui/browse?type=author&value=Verma%2C+U.K.) Chaurasia, S.S. (/jspui/browse?type=author&value=Chaurasia%2C+S.S.) Sinha, Sudeshna (/jspui/browse?type=author&value=Sinha%2C+Sudeshna)
Keywords:	Chemical systems Oscillators Environment Cells
Issue Date:	2019
Publisher:	American Physical Society
Citation:	Physical Review E, 100(3).
Abstract:	Many biological and chemical systems exhibit collective behavior in response to the change in their population density. These elements or cells communicate with each other via dynamical agents or signaling molecules. In this work, we explore the dynamics of nonlinear oscillators, specifically Stuart-Landau oscillators and Rayleigh oscillators, interacting globally through dynamical agents in the surrounding environment modeled as a quorum sensing interaction. The system exhibits the typical continuous second-order transition from oscillatory state to death state, when the oscillation amplitude is small. However, interestingly, when the amplitude of oscillations is large we find that the system shows an abrupt transition from oscillatory to death state, a transition termed “explosive death.” So the quorum-sensing form of interaction can induce the usual second-order transition, as well as sudden first-order transitions. Further, in the case of the explosive death transitions, the oscillatory state and the death state coexist over a range of coupling strengths near the transition point. This emergent regime of hysteresis widens with increasing strength of the mean-field feedback, and is relevant to hysteresis that is widely observed in biological, chemical, and physical processes.
URI:	https://journals.aps.org/pre/abstract/10.1103/PhysRevE.100.032203 (https://journals.aps.org/pre/abstract/10.1103/PhysRevE.100.032203) http://hdl.handle.net/123456789/1869 (http://hdl.handle.net/123456789/1869)
Appears in Collections:	Research Articles (/jspui/handle/123456789/9)

Files in This Item:

File	Description	Size	Format	
Need to add pdf.odt (/jspui/bitstream/123456789/1869/1/Need%20to%20add%20pdf.odt)		8.63 kB	OpenDocument Text	View/Open (/jspui/bitstream/12345

Show full item record (/jspui/handle/123456789/1869?mode=full)
(/jspui/handle/123456789/1869/statistics)