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Oscillations via Excitable Cells

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OSCILLATIONS VIA EXCITABLE CELLS

1. ABSTRACT

In this talk, I will study pairs of oscillators that are indirectly coupled via active (excitable) cells. We introduce a scalar phase model for coupled oscillators and excitable cells. We first show that one excitable and one oscillatory cell will exhibit phase locking at a variety of $m : n$ patterns. We next examine the dynamics when the oscillators are coupled via two excitable cells and we study the same phase locking patterns. Further, we look at pairs of oscillators coupled via long chains of excitable cells and relate this to travelling waves. Next, we investigate a family of coupled excitable cells using a Kuramoto model with added white noise. We then study the dynamics of this model by varying parameters and showing that, with enough noise, this system can exhibit oscillations. Later, we use the Ott-Antonsen ansatz to reduce the dimension of our model and use quenched noise instead. By taking noise from different densities, we can show that sometimes the noise will be enough to give rise to oscillations and sometimes it will not.

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