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Frequency Enhancement in Coupled Noisy Excitable Elements: The effect of excitability, system size and topology[1] WEI-YIN CHIANG, PIK-YIN LAI, Dept. of Physics and Center for Complex Systems, National Central University, Chungli, Taiwan 320, R.O.C., C.K. CHAN, Institute of Physics, Academia Sinica, Nankang, Taipei, Taiwan 115, R.O.C. — The oscillatory dynamics of coupled noisy excitable FitzHugh-Nagumo elements is investigated as a function of the coupling strength g. For a system consists of coupled noisy excitable elements, the synchronize frequency will be higher than the uncoupled frequencies of each element. As g increases, there is an unexpected peak in the mean of frequency distribution before reaching synchronization at the optimal coupling strength. This enhancement level is investigated systematically on depending on hypercubic lattices in different dimensions, Erdos-Renyi random graphs and random networks with fixed coordination numbers. It is found that the maximal enhancement coupling and enhancement level depend on the connection topology and spatial dimensions, the enhancement level and the frequency distribution widths follow scaling laws as verified by different lattices(honeycomb, square, and hexagonal) in two-dimensions, suggesting some sort of universality in frequency enhancement.

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Wei-Yin Chiang
Dept. of Physics and Center for Complex Systems,
National Central University, Chungli, Taiwan 320, R.O.C.

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