Pattern Formation in a Two Dimensional Network of Interacting Neurons BILL MAIER, BRUCE N. MILLER, Texas Christian University — We employ a realistic mathematical model of the neuron to study neural networks as dynamical systems. The nonlinear model, which consists of two coupled phase variables, was introduced by Izhikevich and is able to simulate the major types of nerve cells through an appropriate choice of parameters. The dynamics of a pair of interacting neurons was simulated to investigate their mutual properties. In order to gain insight into the propagation of signals in the brain, we constructed a two dimensional, two layer, grid of 90,000 neurons consisting of both excitatory and inhibitory elements. Simulations were carried out under various conditions to explore different types of firing patterns. Under special circumstances regimes of strong synchronization, reminiscent of seizure, were observed.

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