Abstract

In this thesis, we explore the emergence of persistent infection in a closed region of space. Here the disease progression of the individuals is given by the SIRS model, namely Susceptible-Infected-Refractory-Susceptible disease cycle. An individual be- comes infected on contact with another infected individual within a given neighbour- hood. We focus on the role of synchronization in the persistence of contagion. Our key result is that higher degree of synchronization inhibits persistence of infection. We demonstrate this result through di erent order parameters, re ecting both global and local synchronization of the phases of the disease in the individuals. We consider both asymptotic as well as nite time measures of the synchronization parameters. Our analysis of the synchronization in the disease cycle of individuals in a popula- tion shows that early asynchrony in the population, both globally and at the local level appear to be a consistent precursor to future persistence of infection. This is an important indication, since it can provide valuable early warning signals for a higher degree of persistence of infection in a population, thus enabling us to take suitable early action.