Abstract

ON ONE-DIMENSIONAL SIR EPIDEMIC MODEL

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The aim of this thesis is to introduce the discrete-time SIR epidemic in the village model and investigate its behaviour in long run.
In the first chapter, we will introduce the basic definitions and notations of the village model: Assume we have infinitely many villages indexed by the integers, each village has n inhabitants and between every two inhabitants living in the same village or living in adjacent villages, there is a "possible contact" with probability $p = \frac{1+\epsilon(n)}{3n-1}$. We are interested in the supercritical model when $\epsilon(n)$ is positive.
In the second chapter, we will study on the derivation of partial differential equations (PDE) regarding details about how this pandemic model behaves when the time parameter is large enough.
In the third chapter, we will non-rigorously find the solutions of the system of PDEs which are constant in space and the travelling waves solutions by transform PDEs to the ordinary differential equations (ODE). Based on these solutions, we can predict the shape of travelling wave of the pandemic as well as the speed of the wave.
The last chapter will show the computer simulation results of our model so that we can compare between the practical simulations and predictive conjectures which were mentioned in previous chapters.