Optimal Strategies for Vaccination using the Stochastic SIRV Model
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Despite the advanced medical technology, infectious diseases remain a continuing threat to mankind. Hence, a prevention of prevalence of infectious diseases is one of important problems in epidemiology. In the past, the public health system has prepared for some strategies such as antibiotics and vaccines to control the infectious disease development. In order to build up more effective strategies, we need a precise theoretical analysis of infectious diseases. From a theoretical viewpoint, the mathematical model which describes the spread of the infectious disease has a very important role. In this paper, we study the stochastic modeling of the infectious disease process in populations consisting of four groups: susceptible, infected, recovered and vaccinated. We consider the optimal vaccination strategy under the framework of the stochastic optimal control problem. Applying the stochastic maximum principle and the four-step scheme to the considered stochastic optimal control problem, we construct a feasible optimal vaccination system.