A Spread Model of COVID-19 With Some Strict Anti-epidemic Measures

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Abstract

In the absence of specific drugs and vaccines, the best way to control the spread of COVID-19 is to adopt and diligently implement effective and strict anti-epidemic measures. In this paper, a mathematical spread model is proposed based on strict epidemic prevention measures and the known spreading characteristics of COVID-19. The equilibriums and the basic regenerative number of the model are widely analyzed. As a validation, the model is used to simulate the spread of COVID-19 in Hubei Province of China for a period of time. The model parameters are estimated and the model is validated by the actual data related to COVID-19 in Hubei. Simulation results show that the

model can accurately describe the spread dynamics of COVID-19. Sensitivity analysis of the parameters is also done to provide the basis for formulating prevention and control measures.

Full Text

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Figures

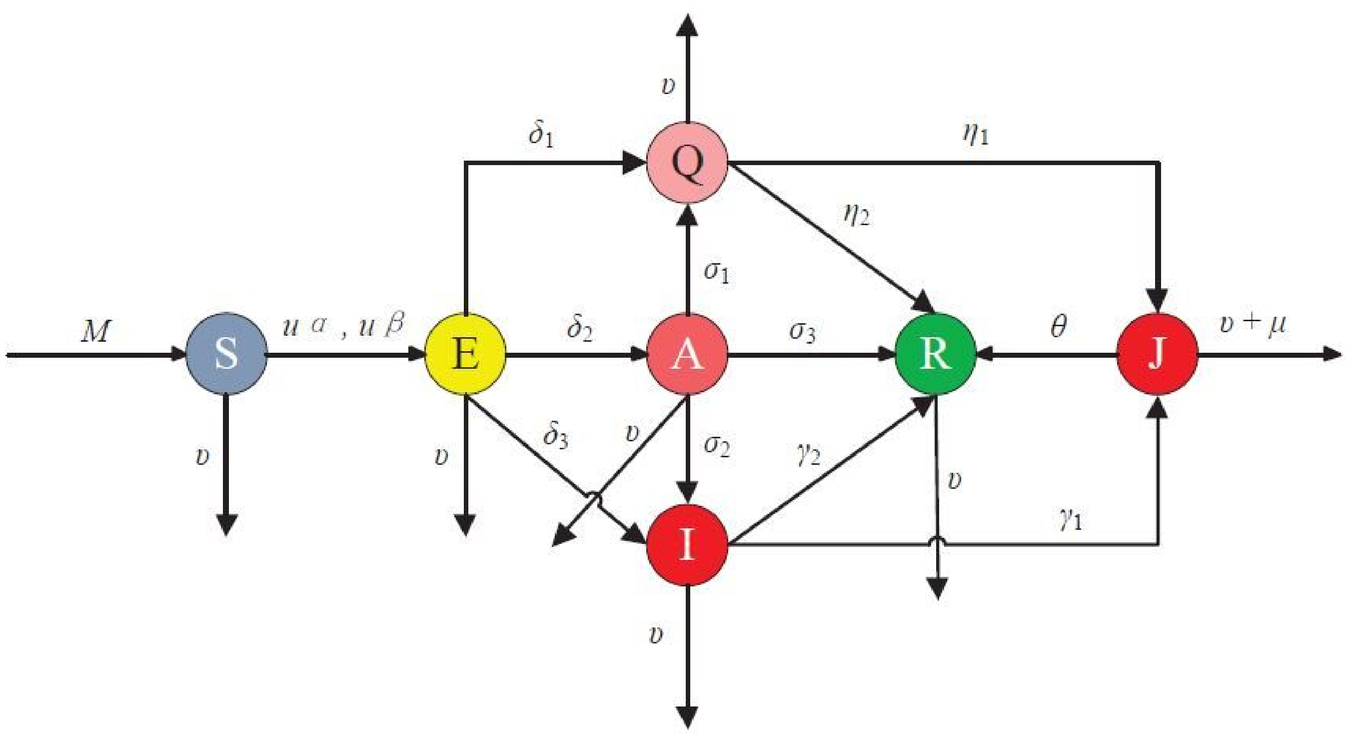
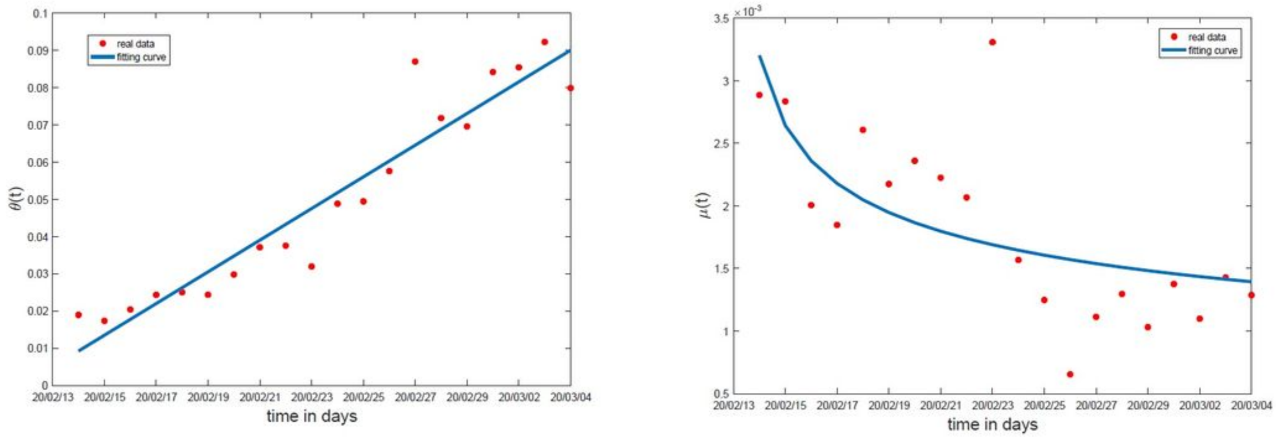


Figure 1

The state transformation process of individuals.



(a) Relative cure rate per day.

(b) Relative case fatality rate per day.

Figure 2

Fitting of θ(t) and μ(t).

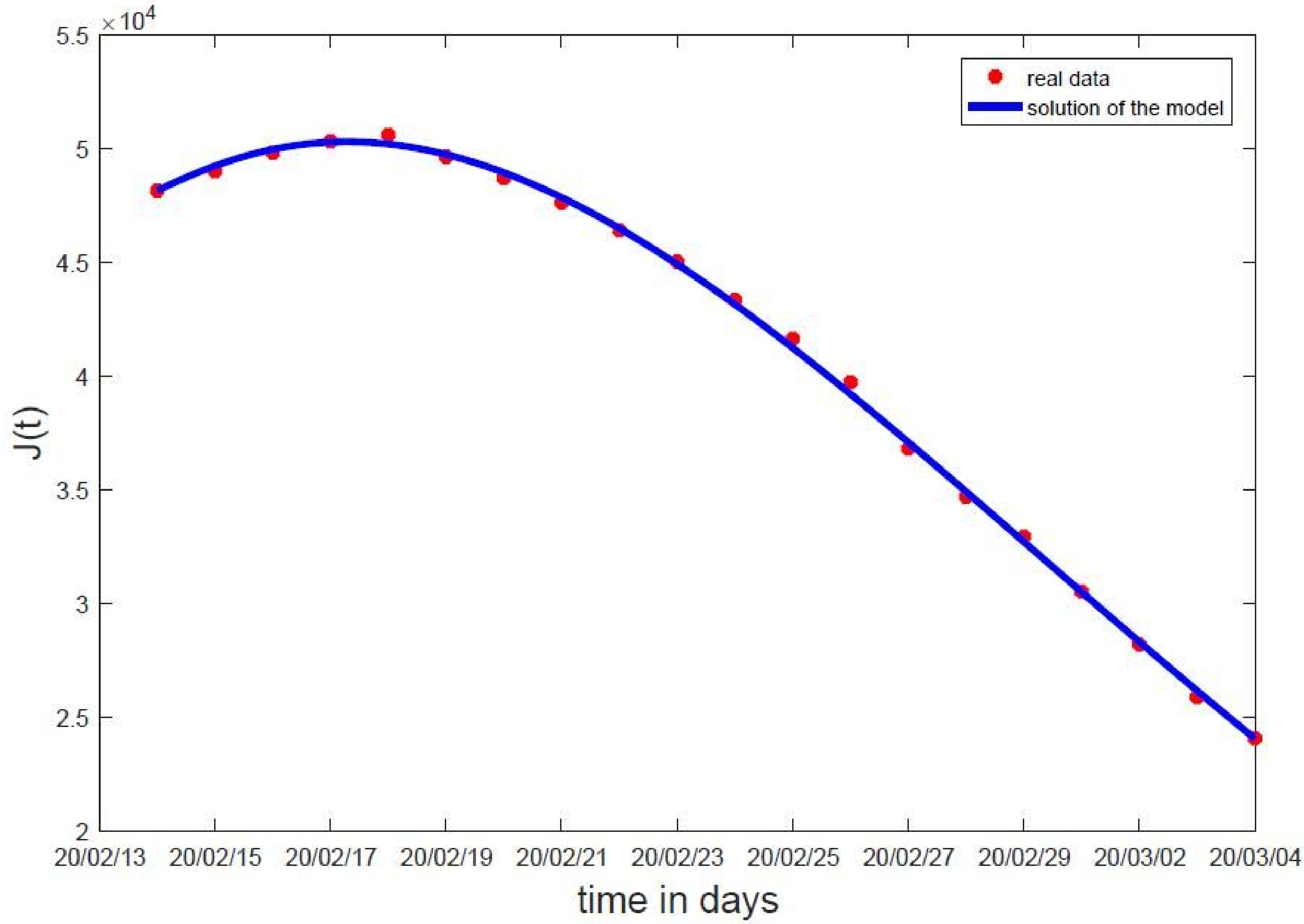
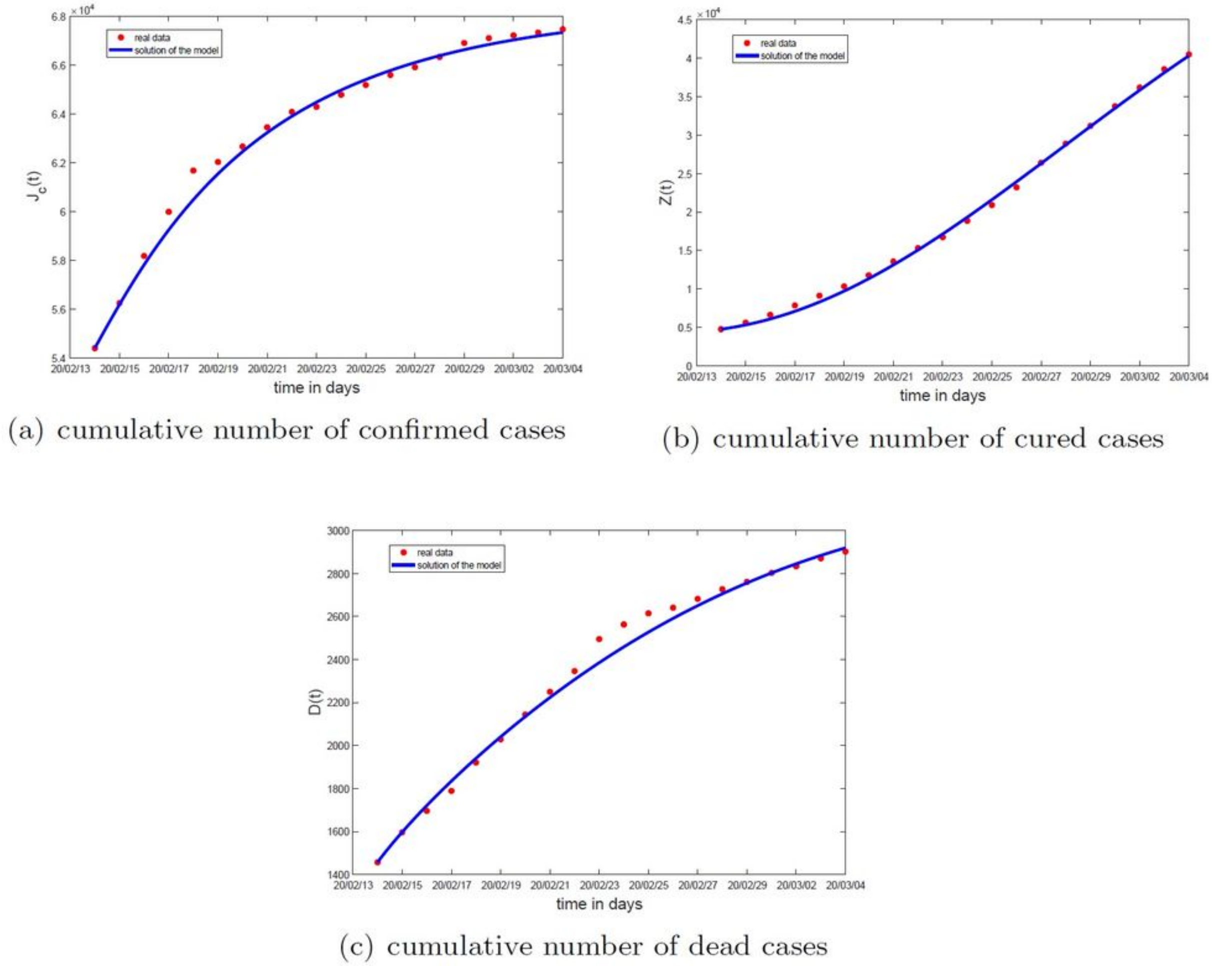


Figure 3

Currently confirmed cases



(a) cumulative number of confirmed cases

(b) cumulative number of cured cases

(c) cumulative number of dead cases

Figure 4

Simulation and verification. The points are the real reported data, and the curves are the solutions of differential equations (9) associated with system (1).

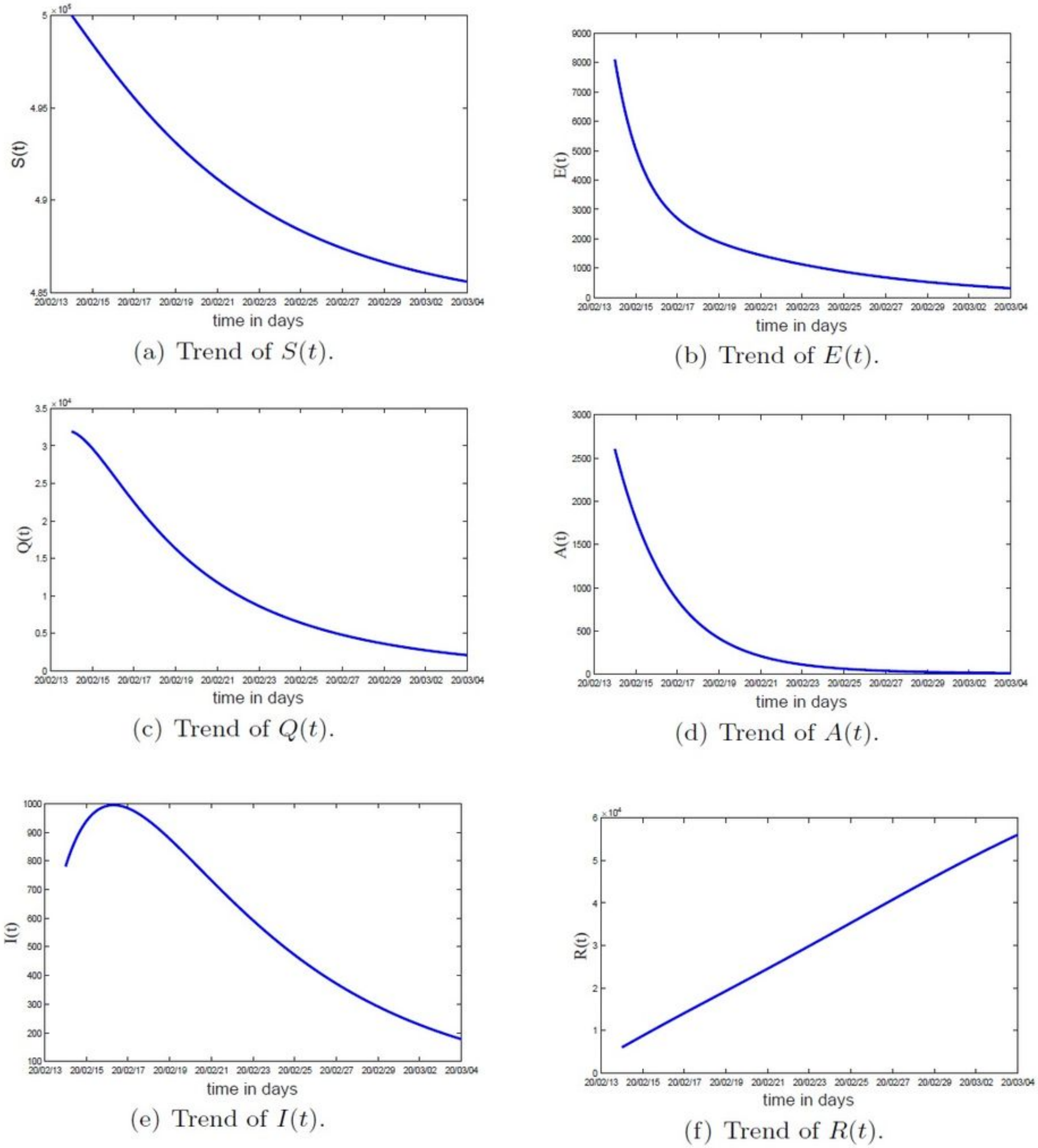


Figure 5

Change trends of state.