Applying Jacobian Free Krylov Solvers to Model Epidemics

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Sixteen percent of all deaths every year are caused by infectious diseases. Currently, many models over or under-predict the long term progression of diseases, and provide little information on their geographical spread. We developed a Java code and built a model to address both of these issues by using a nonlinear, diffusion SIR model. To investigate our model's validity, we compare our simulated results against field data from the 2014 Ebola outbreak both geographically, by mapping the diffusion pattern, and cumulatively over time. The results suggest that our model has a reasonable accuracy, and can provide insight into where and how many resources should be allocated to contain an outbreak. We will continue our project to include nonlocal disease transmission, and expand our model to the global scale so that the full impact of an epidemic can be captured.

Awards Won:

Fourth Award of $500