ME685 HW8

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1. The Psuedo Code for the Runge-Kutta 4 Method in the current problem is as follows. In this case, there are two simultaneous equations, so we update the RK-4 constants together for both the equations:

Algorithm 1: Runge Kutta 4 Method

The array $p(n,:)$ which has the initial values supplied to the subroutine.

for $i = 1,n$ **do** ▷ Looping through the number of iterations

  $u[i,:] = p[i,:]$ ▷ RK-1 Step

  for $j = 1,2$ **do** ▷ Looping through the two equations for RK-1 Step

    $k(j,1) = rhs(j,u,beta,gamma)$ ▷ Settings k based on governing equation

  end

  $u[i,:] = p[i,:] + dt * k(:,1)/2$ ▷ RK-2 Step

  for $j = 1,2$ **do** ▷ Looping through the two equations for RK-2 Step

    $k(j,2) = rhs(j,u,beta,gamma)$ ▷ Settings k based on governing equation

  end

  $u[i,:] = p[i,:] + dt * k(:,2)/2$ ▷ RK-3 Step

  for $j = 1,2$ **do** ▷ Looping through the two equations for RK-3 Step

    $k(j,3) = rhs(j,u,beta,gamma)$ ▷ Settings k based on governing equation

  end

  $u[i,:] = p[i,:] + dt * k(:,3)$ ▷ RK-4 Step

  for $j = 1,2$ **do** ▷ Looping through the two equations for RK-4 Step

    $k(j,4) = rhs(j,u,beta,gamma)$ ▷ Settings k based on governing equation

  end

  $p[i+1,:] = p[i,:] + dt * (k(:,1) + 2 * k(:,2) + 2 * k(:,3) + k(:,4))/6$ ▷ Calculating the Next Term

end

2. The code is attached with the submission.

3. The following is the plot for the model.

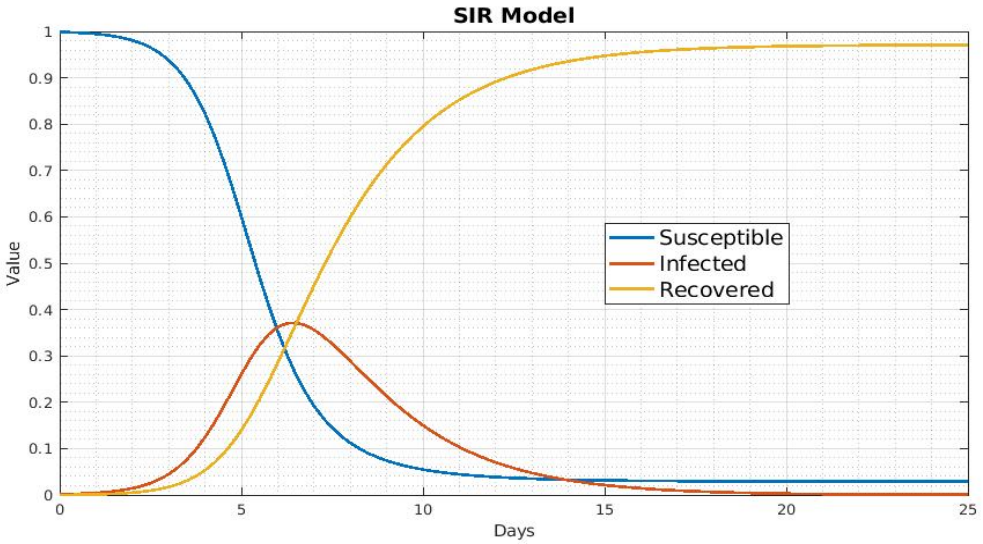

Figure 1: Plot of S, I, R vs. Time

4. Results for the Maximum Value of I and the time taken for it to reach 1% of the maximum:

```
aman@xps ~/ME685 ./a.out
Maximum Value of I = 0.37131158
Days Required for Infections to Reach 1% of Maximum = 19.750
```