Analyze for part two

An Jihai

2015-11-24

The result meets the expectations. The approximate solutions obtained are very close to the exact solution, with an error on 10^-5 – 10^-6 scale, showing our tolerance control was successfully implemented.

The reason why Jacobi’s method aggregated at the top part is that Jacobi usually takes much more steps than the Gauss-Seidel does. The average ratio of iteration times between Jacobi and Gauss-Seidel was 4.063, which is an evidence to show that the Gauss-Seidel method is much faster than the Jacobi. The average iterations of Jacobi was around 32.25 and 8.00 for Gauss-Seidel. This also corresponds with our average ratio 4.063.

The density of Gauss-Seidel’s points is also higher than the Jacobi’s. Since Gauss-Seidel keep refreshing new values for x1, x2 and x3 during each iteration whereas the Jacobi’s method only takes the old solution frame from the previous iteration. Also, from the density we can conclude that the further the initial vector away from the exact solution, the more steps we need to go over during one single iteration.

In the plot we can see that the dots are nearly distributed in the middle of the chart. This may result from our randomly picking of initial vectors in the interval [-1, 1]. Because the initial error is basically the distance from initial value to the exact solution.