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CS3010
Project 1

In this project I implemented 3 different ways of solving linear equations: Gaussian Elimination, Jacobi Iterative Method, and Gauss-Seidel Method. I ran the tests for n = {10,20,40,50,100,200,500} and took the average run time for ten thousand random matrices. Below are the results.

n	Gaussian	Jacobi	Gauss-Seidel
10	3063.89972	8019.93038	9328.59474
20	7172.26805	21861.67594	25868.97236
40	26712.70062	77435.70178	93973.41363
50	42461.74884	119474.74282	144263.64639
100	201246.43857	484839.1391	580660.53565
200	1111049.36627	1926952.94486	2283161.98282

Fig 1. Raw data from experiment

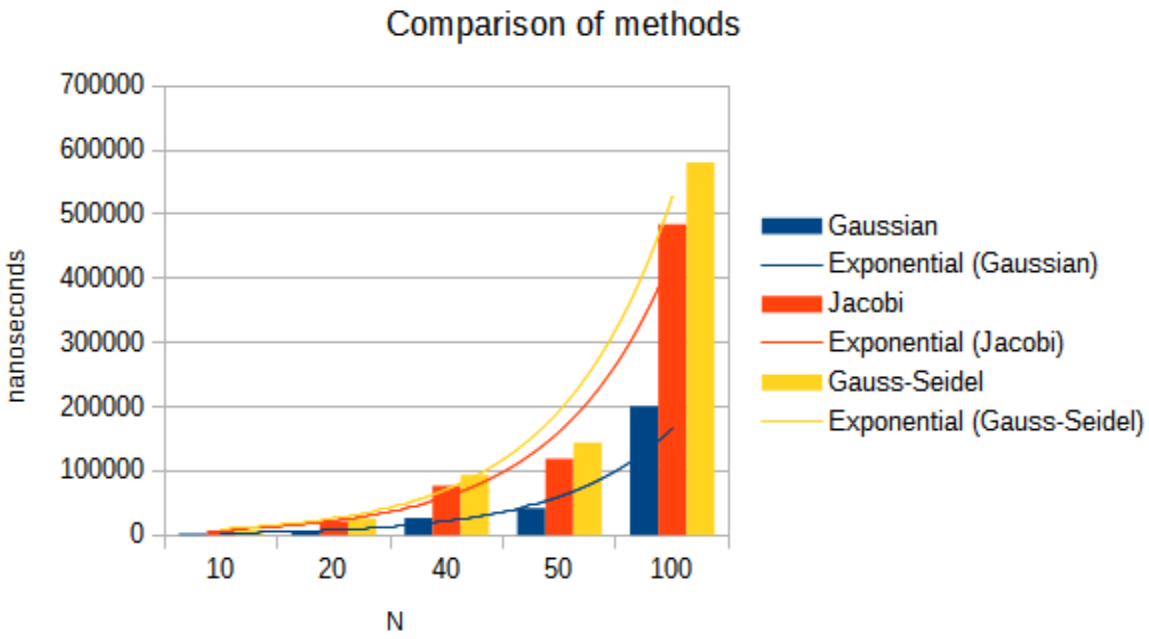

Fig 2. Graphed values of Fig 1

As you can see the Gaussian method is much more efficient, than the two iterative methods. While similar the Jacobi version is slightly faster, however I believe this is just because the code is more efficient. Normally Gauss-Seidel find the solution in fewer iterations, so if the matrices were solvable (see below) then I would expect it to operate faster.

Some issues I found: generating random matrices doesn't not often generate diagonally dominant matrices, which is a requirement for solving with either iterative method, so the time is essentially the time it takes to do 50 iterations.