Journal of Vittal Pai: Spring 2009

Vittal Pai

July 19, 2009

1 April 01 - April 07: Testing times!!!

The first task we started with this quarter is to thoroughly test the Multiparticle Schrödinger Equation for the communication between 3 groups. During the Winter 2009 quarter we had implemented a generalized test routine which takes goup sizes n_1, n_2 and n_3 and calculate the determinant value using the Multiparticle Schrödinger Equation and using the normal routine. Thus we tested the equation for a range of values (variuos combinations) for n_1, n_2 and n_3 to make sure equation gives us the desired result.

2 April 08 - April 14: Rank base acceleration method-I.

This week I spent some time refrehsing the Sigular Value Decomposition (SVD) concepts. Then later started with implementing the first rank based acceleration method (that is dependant on SVD method) to remove the dependency on n_3. Spent time figuring out what inbuilt Python routines to use and how to structure the code itself. I could successfully implement the method and could integrate iot with the formula implementation we have.

3 April 16 - April 21: Testing SVD acceleration method.

This week I tested the modified formula that has the SVD based acceleration integrated. The simple test carried out was with values $n_2 < n_3$ such that

the last $(n_3 - n_2)$ rows and columns would not add anything to the determinat value, so, ther could be dropped. Then on Dr. Martin's suggestion, I implemented a small routine that would perform SVD on the randomly generated D metrices (D is a smaller matrix within the bigger matrix) and pass the (U*S) product as new D matrices. This method would make sure that for any values of n_1, n_2 and n_3, there will be few rows and columns that would not add any thing to the determinant value and thus the SVD rank based acceleration method could be tested for working.

4   April 22 - April 28: One more acceleration technique and change in strategy...

As part of the second acceleration method that removes the dependency on n_2, we were supposed to implement Householder reflection method. I started with reading about Householder reflection method, but then while during our meeting, Dr. Martin did some "Magic" and came up with a new and easy method that again is based on the SVD method and asked me to test if it works (though he showed me as to why and how it WILL work).

5   April 29 - May 05: Linear Algebra's basics are WRONG!!!

During this week, I spent time working on the new method suggested by Dr. Martin. The is method basically simple and involves basic Linear Algebra principles like Rank of a matrix, linear dependency and stuff like that. While making sure I almost proved that the these basics of LA are wrong!!! wow I must have worked hard to do that...

But after discussing the same with Dr. Martin, I was convinced that this method really works and also that LA principles are Correct.

6 May 06 - May 12: New method implementation and testing.

This week I started with implmenting this second rank based acceleration method that would remove the dependency on n_2. I also implemented a test routine and made sure that the formula that has both the acceleration methods incorporated works properly. After implementing these two methods there is a major improvement in the execution time of the formula.

7 May 13 - May 19: Too many Zero minros.

This week Benigno, Chelsie and I worked together on the formula that deletes or does not include zero minors which do not add anything to the determinant value.

8 May 20 - May 26: TWO "many" methods to drop Zero minros.

This week I and Chelsie started on implementing the formula (different from the one implemented initially) that was given in the paper. And at the same time I started on implementing a method which when generates α_1 and the subsets of α_1, would omit the subsets that would come under zero minors.

9 May 27 - June 02: Debugging the bugs.

This week I and Chelsie spent loads of time debugging what we implemented!!! I spent quite some time making Chelsie's code compile. But when both the versions of the code started executing, it did not give us the proper results. We spent time figuring out what could be wrong and tried all possible things that we could think of. But unfortunately we could not fix the problem.