Project Diary

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- Team Meet 1 : 9:15 - 10:45 10th October 2014
  Our first team meeting was for 1.5 hours, in it we discussed the scope of our project, and which features to include.
  We discussed the general concept behind each facet of our project, such as the functionality of the parser, the advantages of methods of numerical definite integration over symbolic indefinite integration, the different computational methods of differentiation, Cramer's rule to solve linear equations, Runge - Kutta methods for solving differential equations etc.
  We distributed the workload amongst ourselves, Sandesh had to create the parser, Anuj had to create the integration function(s), and I had to create the differentiation function.

- 13:15 - 13:45 11th October 2014
  I did some research about expression parsing.There are 3 forms of writing an expression with binary operators and operands- infix (operator in between),prefix/polish notation (operator before) and postfix/ reverse polish notation (operator after). These conversions are necessary because in our normal infix form, there are certain rules and preferences as to which operator should be performed first. This can lead to lots of confusion, which I found out first hand. In prefix and postfix notations, there is no such confusion and it is easier to understand. Out of the two, postfix is the one with simpler algorithms, so we would like our expression in this format before we begin calculating.

- 20:30 - 22:30 14th October 2014
  CS Lab Diary report was submitted. Sandesh said he'll work on a parser to convert the input string into a form easier for the computer to understand. Then assuming we are given a function namely double f1.eval(double x) that would accept a value of x as input and compute and return the value of f(x). I had to diffrentiate the function and calculate its slope using nearby points x+h and x-h.

- Team Meet 2 : 10:30 - 12:30 15th October 2014
  At our second meeting, we made a definite schedule for our work in the following weeks, but also left some extra time to add on more features to our program.
  We also talked about the Project Report and its format, and then wrote each of our parts as decided in Team Meet 1 of the project Report, where we explained our topic and the concept behind it.

- Team Meet 3 : 9:00 - 11:30 19th October 2014
  The team meet was of 2.5 hours in which we discussed about the documentation needed for Stage 1 submission.
  We distributed the task writing the project report wherein Sandesh had to write about the Fast Fourier Transfrom, Anuj had write about the Root finder and I had to work on methods of solving simultaneous equations.

- 8:40-10:10 : 21st October 2014
  Sandesh showed us how the parser works and how the input function can be evaluated at any point. Then Anuj and I were asked to add our functions to the program. I researched for a few more methods of differentiation and found out that the value obtained by using near point method that takes only 1 point next to the given point is approximate to the power of h. The central approximation method that takes two points symmetrically away from the given point has an order of approximation of the second power of h. The most accurate method so far has an order of approximation of the fourth power of h and is the 5 point method. This method takes 2 sets of points symmetrically away from the given point at distances of h and 2h from it. I wrote down the functions to calculate the derivative of the user-input functions at a given point. It still requires some work though.

- 12:30- 2:45 : 23rd October 2014
  I made small changes to the differentiate function and figured out the algorithm that would help to solve for the special cases of solving simultaneous equations. I intend to write the intended code for that this weekend. It should be able to work for a square matrix of any size without using the earlier model of recursive functions to calculate the determinant. That was just unnecessarily complicating things. I'll have to talk to Sandesh about the input format of the matrix later.

- 12:30- 1:15 : 29th October 2014
  I spent all this time trying to fix my repository and update it according

to the changes made on the master repository. I have saved a few links on how to do the same for future reference. Sandesh added one of the differentiation functions I gave him though that was not the most accurate one. So it will probably have to be changed. I wrote down the other two methods also but now it is showing as a merge conflict. We intend to get this fixed later.

- `2:00- 3:45 : 30th October 2014`
  I scanned through the chapter on linear algebra that Sandesh asked me to checkout but that is about how to use the vector and matrix classes and I will have to do some background reading to understand it properly. I shall summarize the LU factorization method of solving simultaneous equations that I found during research in a document. And I also found out the importance of using define statements.

- `8:30-9:45 : 4th November 2014`
  Sandesh asked me to test the program in its current state for any bugs. So far, the most significant bug was that –ve integers were not being stored in a file. Otherwise it seems to be working fine. I also will have to finish the algorithm on solving simultaneous equations within a week.

- `10:20-11:30 : 6th November 2014`
  I updated the class sim_eqn so that it can now transform the matrix into an upper triangular one and can calculate the values of the variables and print them. So far, it should be able to work on a square matrix of a user inputted size. It seems almost done. Just a few parts have to be added and then we should check whether it can be called from the main function.

- `2:30- 5:00 : 17th November 2014`
  To solve for the special cases, after making some sort of a flow-chart, I found that it can be done if we can recursively call the solve function. Then I can remove some unnecessary parts of code. But it was showing some errors in the recursive part, so I have to keep the code as back-up in case the recursive won't work. I had searched for what could cause this error on google. Sudden brainwave- replacing all 0's with start and 1's with start+1 in the solve function would enable us to easily call the function recursively by just changing the value of start from 0 (initially) by slowly increasing it. This simplifies the code a lot. I made drastic changes to the code, only minor stuff left.

- `11:00- 12:30 19th November 2014`
  I added the remaining part of the sim_eqn.cpp. Now only the set function is left. It should work fine. I am finding no other special cases and conditions to include in this.
  `6:00- 8:00`
  I tried my program for various values and found a bug. Experimenting with values, found the fault and fixed the bug. Must keep checking for various sets again.

  http://math.cowpi.com/systemsolver/2x2.html

  on testing some of the answers I tried here, a lot of the sets are showing wrong answers. I must find out why.

- `5:30- 7:30 20th November 2014`
  Found the error and fixed it finally. Now it should work just fine.

- `4:00- 4:50 22nd November 2014`
  Sandesh asked me to make a partial differential function for 2D and 3D domains. I made a less accurate version though using the default differentiation formula.

- `3:15- 4:30 23rd November 2014`
  I improvised the function to make it more accurate using the 5 point differentiation method.

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