

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, I had to create the integration function(s), and Sanjana had to create the differentiation function.

- 16:00 -18:00 12th October 2014

I researched multiple types of numeric integration online, especially the variations of Riemann integration. I also read up on different algorithms for computationally solving differential equations.

- 20:30 - 22:30 14th October 2014

CS Lab Diary report was already submitted. I was comparing the efficiency and accuracy of subtypes of Riemann Integration, by writing some preliminary code.

- 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.

- 22:00 - 00:00 17th October 2014

I continued researching different methods of accurate integration, such

as Monte Carlo and Romberg integration, and compared them with Riemann integration.

- **19:00 - 20:00 18th October 2014**
Researched methods for root finder and tested out some preliminary code.
- **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 Transform, I had write about the Root finder and Sanjana had to work on methods of solving simultaneous equations.
- **21st October 2014**
We met up in our CS Lab session and discussed how the parser would implement the routines such as integrate and differentiate by passing the vector of arguments, and how we would evaluate a function value within our routines. I made the corresponding changes in my integrate function.
- **24th October 2014**
I expanded upon my basic integrate function which used Riemann integration, and added 2 more methods of integration, and made corresponding changes in the header file and the parser file.
- **28th October 2014**
I finished writing 2 functions which found a root of the given function, one using Newton's method, and one using the bisection method, which I proceeded to add to the routines, making the other necessary changes.
- **16th November 2014**
We decided to implement MPFR, a library which enabled us to deal with arbitrary precision, which was a huge bonus since our project must include quickly working with large or miniscule values seamlessly. Thus we researched about it and learnt how to use it.
- **20th November 2014**
I finished implementing the MPFR library into my integrating and root finding functions, and had finished debugging them, after running multiple tests to achieve the balance of speed and accuracy.

- **21st November 2014**
Added multiple integrating functions, which could integrate over higher dimensions, perform line integrals and also integrate over type 1 or type 2 regions, and co-ordinated the necessary changes in the rest of the program. Did a lot of debugging to ensure these functions were running perfectly.
- **22nd November 2014**
Helped in utilizing MPFR's numerous functions and constants, and allowing the user to access them. Wrote up the individual help for each of my routines and for the functions, constants and routines being used.
- **23rd November 2014**
Wrote a function to compute surface integrals for a given parametrisation, using Sanjana's new partial differentiation function. Went through the code of the parser to have a better understanding of it.
- **24th November 2014**
Made the User Manual, which acts as a complete guide to use our numerical library, including tips on how to utilize the most from it.