

Journal of Rob Vanyo for Fall 2007

Rob Vanyo

Fall Quarter 2007

Week of September 3, 2007

This Week's Progress

This week I read 3 chapters of "Dive Into Python." I understand it so far, but the progress is slower than I had anticipated. I also began studying how to use \LaTeX from "Formatting Information" by Peter Flynn, and I can now type simple documents, such as this journal.

At the first meeting with Dr. Mohlenkamp and my group I was reminded of the basics of the project, and assigned the task of presenting them at the Monday meeting. To this end, I have endeavored to understand the various aspects of the project. I read about the basics of the Tensor Product online, and did my best to read and understand "Algorithms For Numerical Analysis in High Dimensions." While I feel that I understand some of it at a most basic level, there is much to it (such as examples) that is beyond my experience and needs further consideration. As far as the specific vector and its separated representation that we are using in the project, I now know my initial confusion was caused mainly by notation. I had never seen a vector represented with indices in such a way as to have d directions, but have M entries in each direction.

I met with Krishna to discuss the project prior to the Monday meeting. We seem to share the same understanding of the project, and we came up

with a couple of questions, mostly pertaining to the reasoning and thought behind the projection of points onto a plane.

Next Week's Plans

Next week I plan to dive further into the Python language. I hope that I can gain some useful ability in Python by the end of next week. I also plan to learn more about \LaTeX , mainly how to start inserting mathematical diagrams, graphs, etc. Finally, I plan to ask Dr. Mohlenkamp some questions concerning the project that Krishna and I had thought of during our meeting this week.

Week of September 10, 2007

This Week's Progress

This week I started off by meeting with my team to discuss how we might begin our project. We decided that our plane should probably bisect the graph of S_1 and that therefore, the origin should be one of the three points we use to define the plane (if that is how we are going to define the plane). We also resolved to review some older topics to better equip ourselves for the project. So, I reviewed inner products, projections, and the formulas involved with them and angles between vectors. I also read "Trigonometric Identities and Sums of Separable Functions" again, and tried to see if any of it could apply to point generation for the project. I had some trouble understanding the paper, however. Also, I still have doubts as to whether or not some of the ideas we will apply (such as planes, projections, and angles) will behave the same way as we expect in R^8 .

I familiarized myself with some of the mathematical uses of \LaTeX this week as part of my assignment. I typed up an old, simple proof I had completed as part of a project back in my freshman year of college, and I am glad to say that once I really have the commands memorized, \LaTeX will be much faster and easier than Microsoft Word to type mathematical things.

I decided that "Dive Into Python" was not quite my speed as tutorials go, so I found another Python tutorial by Guido Van Rossum. This one seems more like something that can get me programming faster, and I have learned how to define functions, call functions, and use loops. I already wrote a couple of example function programs.

Next Week's Plans

Next week I hope to learn more Python, as usual, and hopefully I will be writing more complex programs than simple callable functions. I also hope to work out or find out some of the geometric and dimensional concerns with the project, as well as come up with an algorithm with my team for the actual program we will eventually be writing. I will also try again to read and understand both of the papers I have received.

Week of September 17, 2007

This Week's Progress

This week I was assigned the task of writing the subroutine that will generate random points using angles and tensor products, and that will generate 3 random points for our plane. I also had to write the subroutine that uses the points to generate the matrix A and the vector b . So, after some review of the Python Tutorial, I wrote the two subroutines, and tested to make sure they work.

Next Week's Plans

I am sure there are some things that need clarification with regard to the subroutines I wrote, mainly, what order should the point elements be after a 3-way tensor product? I just guessed in the program. Otherwise, I suppose that we will have to streamline, or continue on with making the program to generate images of our vector representation.

Week of September 24, 2007

This Week's Progress

This week I just went through the subroutines I wrote last week and re-made them so that they generate and use points that are in the form of the tensor product of three 2×1 vectors, instead of expanded out as an 8-part point. I also wrote a subroutine that finds the angle between two of the plane vectors, and uses that along with coefficients generated from our method to make a plottable ordered pair.

Next Week's Plans

Next week I believe we will be ironing out any kinks from the program that will generate plot-points, and will actually focus more on the program that will produce the picture. In the course of reviewing the whole program that I received via email this week, I also plan to look further into the workings of Python (such as how to effectively and efficiently organize and implement subroutines) because it is clear that there is still much I am missing.

Week of October 1, 2007

This Week's Progress

This week I believe we accomplished pictures, but I have been a bit out of touch because my internet died for a couple of days. Anyhow, I used a viewer called GSview and a text file provided by Dr. Mohlenkamp to choose the ten colors that we would use in our pictures to represent how close the points are to our plane by their angle. Dr. Mohlenkamp, at the last meeting, had expressed how one color in various shades would make it difficult to tell between adjacent shades, and also a gradient involving two colors is still hard to tell apart at times. So, I cycled from black to white, through dark blue to yellow, naturally passing through shades of

green as well. This way, there is enough color variety to easily know that two points are not the same color, but one can still tell which is supposed to have a higher angle.

Next Week's Plans

Well, I seem to somehow not have one of the required modules that the setmaker program uses, so I was unable to actually run the program from here. Anyhow, this week I plan on seeing some of these pictures, and hopefully there is some useful information to be extracted from them.

Week of October 8, 2007

This Week's Progress

This week we had some pictures to look at. Unfortunately, I have had trouble actually producing pictures here on my computer. Nevertheless, I have no clue what to make of them. Also, this week, I modified the point generating subroutine and the inner product subroutine to work for any rank and resolution.

Next Week's Plans

I would like to be able to generate pictures at home, and I also hope to gain some understanding of them. I think we will have rank-2 pictures this week, as well.

Week of October 15, 2007

This Week's Progress

This week I wrote a subroutine that produced n points nearby to a given point p . I was also unable still to produce pictures on my computer, the program takes a very long time to try.

Next Week's Plans

This week I believe we will be trying to make sense of our pictures, and interpret the many tests and new subroutines that were implemented to help us determine some useful information from them.

Week of October 22, 2007

This Week's Progress

This week I read about Delaunay triangulation and minimum spanning trees with hope of finding some way to apply them to the problem of covered plot points. Basically, we want to eliminate points in our plot that will be covered up by darker points anyway. This way fewer points are plotted and the program runs faster. Unfortunately, I was unable to come up with a way to apply Delaunay triangulation or minimum spanning trees to finding a minimum cover of a plotted disk. While both methods seem useful in this case, they are truly intended for other applications.

Next Week's Plans

Next week we plan to eliminate covered points from our plot and make the program as efficient as possible so that we can then run it repeatedly and mass-produce plots for the purpose of drawing conclusions about our sets.

Week of October 29, 2007

This Week's Progress

This week I started work on my part of the presentation. I do not yet have any concrete slides made, as I had some trouble getting all the necessary packages installed for \LaTeX . I am to present the basic idea of the curse of dimensionality and the separated representation, and introduce the motivation behind the project.

Next Week's Plans

Next week I will be finalizing my part of the presentation of the Sets project, and then presenting with the group on Wednesday. Before that, I plan on discussing conclusions with my fellow group members.