

REFLECTIVE ESSAY

Approach to the project

Interaction with the team

Our team comprised of Greg, Ryan (Sungjae) and myself. We were easily able to agree on who would take which part of the project. Greg took the database and data access tier, Ryan the business logic tier and I chose to construct the web front end. My aim was to challenge my programming skills and molecular biology capability incrementally as I built up the website by incorporating greater functionality as I proceeded. We concluded our initial meeting by Greg kindly accepting the proposal that he should be the team leader.

Throughout the project Greg was an outstanding team leader. At our weekly meetings, Greg always took an interest in the programming issues of the team members and how he might be able to help. He had a great oversight of the whole project. Both Ryan and Greg were excellent team members. Despite being full-time students, they always gave our project their highest priority, which meant that the development cycle kept its momentum going. Every time a piece of code was needed it was always ready for the next meet-up. Other than my code, I tried to bring my organisational skills to the project by scheduling and booking our group meetings. As the web developer, I quickly realised that the project needed a name (title). I called it GSR3 as a working name (after the initials of our first names and the chromosome) which we changed to RGR3 after I learnt that Sungjae preferred to be known as Ryan. On a personal level, Greg and Ryan were both incredibly supportive of my contribution. It was a great pleasure to work with them both.

Overall project requirements

We agreed that the genome browsing project would require a user to be able to access the chromosome 3 database from a summary list of genes presented on the homepage. Additionally, the user required access to the database by searching on any of gene identifier, gene name, GenBank accession, protein product name and chromosome locus, where available. A restriction sequence search was a feature that we wished the user to be able to have. The project necessitated that codon usage frequencies and three sticky end restriction sites were calculated and displayed in a presentable format.

Requirements for my contribution

My task was to organise and present the information that was calculated by the business logic tier and accessed from the data access tier or directly accessed via the database. The website required a homepage with a gene summary list and options for the user to select how they wished to search the database. A further option from a separate linked page was for the option of a restriction sequence search. I needed to return the results from a user input form in such a way that made sense to the end user. A codon usage frequency table had to be created. We decided that two tables would be useful to the user, one detailing the average codon usage for chromosome 3 and a second table showing how the searched gene codon usage compared against the average for the chromosome.

A help page was required for the user to gain extra information on how to navigate the site by putting their search experience in a biological context. In designing a user-friendly website that included users new to molecular biology, I wanted to create a website that helped the user answer some of the questions that I had asked myself in creating this project. Why would I want such data, and what meaning did it have? For both the experienced and inexperienced user alike, what were the limitations of the website and its database?

I considered that an important requirement for the genome browser was for a relatively novice user to have a self-contained website experience, avoiding looking to an external website for explanations. There is a danger that if the user leaves the website in search of additional help and information, then they might not return. A genome browser that can give the user as much well presented information as they wish to access is a site that they will return to time and again. The visual presentation of information could not be understated in the website. An About page, linking to the MSc. course, provides the *raison d'être* for the website. Finally, we decided against a contact page in case the site could not to be maintained in the future.

Performance of the development cycle

The development cycle worked very well within the group. There was a strong desire from all group members that regular meetings would be the primary force pushing ahead the development of the project. The initial meetings concentrated on the general outline of what the project requirements were. As each individual

team member proceeded with their code and advanced their part of the project the development cycle was able to continually morph to refining the brief. As one member of the team improved their code it frequently raised questions as to how that then effected another part of the project and another team member's code. The development cycle thus became iteratively refined.

The development cycle was never formally defined and that was its strength. Not all members were available to attend all meetings but this presented itself as an opportunity and not a cause of frustration. Some meetings were concentrated on the business logic/data access interactions whilst other project development meetings developed the website interface with the database. As the project developed, the different strands (including the website interface with business logic tier) which had been interwoven from the outset were starting to become increasingly closely tied together.

Once the core requirements had been achieved the project started to look beyond the basic functionality. The development cycle was consequently able to include optional aspects of the brief as it progressed within the time period available. All team members instantly supported every other member's advancement of the project. When the opportunity presented itself for additional features to be added to the project, a mini subsidiary development cycle would automatically initialise itself whereby other team members would adapt their code in accommodation. This was only possible due to the dedication that all team members displayed to their colleagues and the ultimate goal of creating a good project.

The development process

1. Initial meeting - Brief discussion of project requirements.

2. Inter-meeting period - Individual progress with code and problems noted for discussion at the subsequent team meeting.

3. Subsequent meetings

1. Individual problems resolved as first point.
2. Discussion of how the project could be improved.
3. Discussion of how different parts of the code would interact with each other.

4. Final meeting - Putting together all the different parts of the code and testing.

Code Testing

As the front end developer, I was able to test my code visually by uploading my HTML and CSS code onto the Birkbeck web server. The code was checked for HTML5 and CSS3 (or css2.1) standards with an online validation website. This was helpful in flagging up errors. The CGI codon script was tested first by writing it in HTML and then marking it and embedding it as a Python script with single quotations. If other code was unavailable at the stage that I was writing my code then I was able to use dummy data in the CGI script so that it would present accordingly when the code became available.

Known Issues

None identified as at time of writing.

What worked and what didn't

The group interaction worked exceptionally well as detailed previously. In hindsight I would have spent more time planning the website from the outset, a discipline I learnt from the Data Management module. I was very pleased with the photograph and video on the website. Although seemingly simple, they were not immediately straightforward for me to present them on the website. We took a group photo on my iPhone but what I didn't realise was that the image was actually upside down. I tried to rotate the image to remedy the problem but with no luck. Not wanting to give up, I discovered that it was a feature that could be solved by saving the image with the photo editing software, GIMP. This resolved the problem. Using NoMachine also presented its own problem as, it involved capturing the image, emailing it to myself, opening my gmail account in Google Chrome through NoMachine and downloading the file to where I could then use it. Had it not been for the Department Computer Manager resolving my crashed account so many times, then I would almost certainly have given up. On the one occasion that I had a team meeting and I was briefly without NoMachine, I asked Greg to teach me how to use his preferred text editor, VIM, from the command line so I was able to continue with another part of my programming. Solving the photo problem however inspired me to try video. I recorded a video using Quicktime but this saved the file with .mov extension and I needed to have the file in .mp4 extension which I

achieved through converting it in Adobe. By this time I was no longer crashing NoMachine and the process was a lot easier. So, my greatest personal moment on this project was achieved out of perseverance and assistance.

Alternative Strategies

The code for the codon table was very long so I might consider looking at web frameworks that might make short work of this task, if I was under time pressure. However, the total control over the code was a positive. I used Bootstrap for the FAQ section of the Help page. Initially, I was reticent to leave the security of the HTML coding that I had become familiar with but I am glad that I took the opportunity as it lets the user interact with the webpage. I would like to learn Javascript going forward for added website functionality.

Personal insights in Biocomputing

I had not worked on a group project in over 30 years. It was fun. I thank my team members for providing lots of laughs, support and assistance throughout this project. Dr. David Houldershaw provided both email and in-office support at crucial moments for this project. Due to his incredible patience, I am able to use NoMachine with considerably more confidence than previously. Dr. Andrew Martin's lectures provided me with a solid foundation from which I could then discover more about web programming. I really enjoyed building up the website for this project. I think that I have learnt many valuable skills that I will be employing and refining for my individual project and beyond.

I would like to broaden this section into insights from not only this module but all the biocomputing modules that I have taken since October. When I began Biocomputing, I was totally new to both biology and programming. I have enjoyed the challenge of biocomputing immensely. The problems that I have overcome have been the most rewarding to solve and I have become a far more independent programmer. Ana, a PhD student that assisted in tutorials, taught me to really analyse each line of Python code and that served me extremely well for this project. She has been a role model for me in the department. Finally, the generous support of Dr Adrian Shepherd has been invaluable to me. I have always felt that I could ask any question of him. The confidence that I am now beginning to find for myself has come from his support and confidence in my ability to succeed as a programmer.