Design Report

Website Design & Implementation Assessment

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Introduction to Web Design (DECO1400/7140)
Semester 1, 2019

~ Part A ~

Introduction

This Design Report will document the process of designing and constructing this webpage for use as a reference in the future and for markers to assess and mark the activities that were engaged in. Hopefully this will serve in the future as a basis for making other interactive websites and using javascript and web related technologies.

The following pages are a relatively honest appraisal of what actually occured during my experience with this subject. There is a discussion on design, navigation, the actual design choices, user testing, and discussions about the process of making it. Hopefully some "best practice" techniques have been internalised during the course of this subject.

I am a 3rd year electrical engineering student who is casually employed with an internet of things startup company where I prototype sensors which displays sensor information on websites. I also tutor maths and piano.

Have coded as a hobby for many years. I have made some javascript-based toys using canvas. I may very well have picked up a lot of bad habits during the years. I don't have much experience with JQuery.

I am interested in user interface design, programming languages, and generally clever and beautiful designs that are a pleasure to use and experience.

I hope to get the most out of this course with a "Learn by doing / making the website" kind of approach. I wish to mine the learning resources to break bad habits and learn new HTML, javascript, and JQuery habits and techniques.

Target Audience

The primary audience being targeted is adults, probably young adults. Perhaps 13 years and up. I would hope that they are able to get different things out of the website.

I intend to use optional elements that can be selectively shown to allow people who are interested in more detailed information to access it without intimidating other readers.

Some examples of the target audience might be a young adult who is interested in this field or in the fictional story where the visual elements might be taken. Or perhaps a child that has been told to use this learning resource to learn something, vaguely against their will.

These people are all notionally trying to learn about the subject matter.

I feel that is important not to use too much jargon; no soaring rhetoric. Perhaps bright colors, vibrant characters, simple language might appeal to a wide range of audience members. Clear, direct, and interesting explanations if possible will generally appeal to everyone who is interested in learning.

Chosen Educational Content

The chosen educational field is mathematics, space, and space flight. I feel that lots of children and adults are interested in space and space travel. I feel that this interest is current growing again after a period of waning. Dry technical information gains interest when it is contextualised. Although mathematics has some of the broadest applications, that broadness is also what makes it seem irrelevant. By couching the mathematics in the setting of space travel hopefully it can be made to be more interesting and engaging.

Equations, for instance, could be portrayed in an interactive way, for example Euclids elements as interactive geometry game

https://www.euclidea.xyz/

Another good example is the youtube channel "ThreeBlueOneBrown" which has visualizations that show how matrix transformations warp space and how the chain rule relates the ratios of differentials.

Graphing may be made more interesting by interactively changing numbers with the scroll wheel for instance, where the graphs are modified continuously as values are changed. I feel that if the interface is designed properly then most interactive things can be made interesting.

Chosen Story

Given the subject matter the comic "Valerian" seemed like a good fit. But there were also the options of more wistful or perverse options.

The Little prince

- Charming and contains lovely imagery
- Appeals to adults and children alike

The Twits or some other Roald Dahl book

- Interesting imagery
- Darker themes - potentially more interesting.
- Apparently suited for children

The book "The Enormous Crocodile" by Roald Dahl was eventually chosen with the hope that the scene where an elephant jettisons the crocodile into space could somehow be integrated to the overall story. Zany humour with some personality might be able to liven up the somewhat serene idea of the blackness of space. The novel connection would be interesting to readers.

Navigation & Organisation - Card Sorting

The card sorting activities frankly did not seem to amount to a great deal of interest. The cards produce by myself and others were easily categorizable and did not seem to provoke a lot of cross-polination of ideas. A fellow student had decided to make cards relating to ancient and modern wonders which grabbed my interest. The categorisation task was fairly meaningless in my view but I found the discussion of the wonders to be very interesting. My cards were basically separated into functional web design elements versus subjects relating to mathematics or space travel.
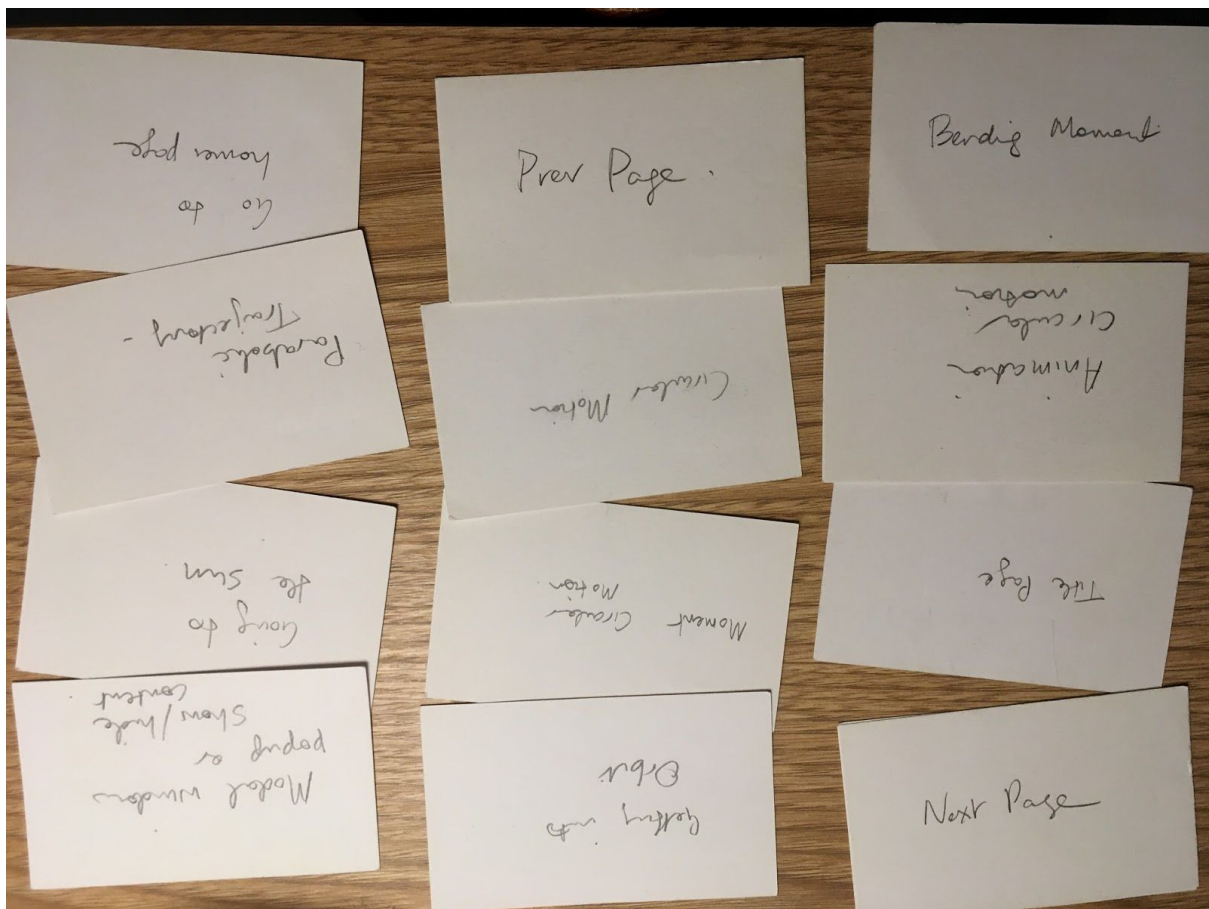
Disorganised cards (above). Different card organisation results (below)

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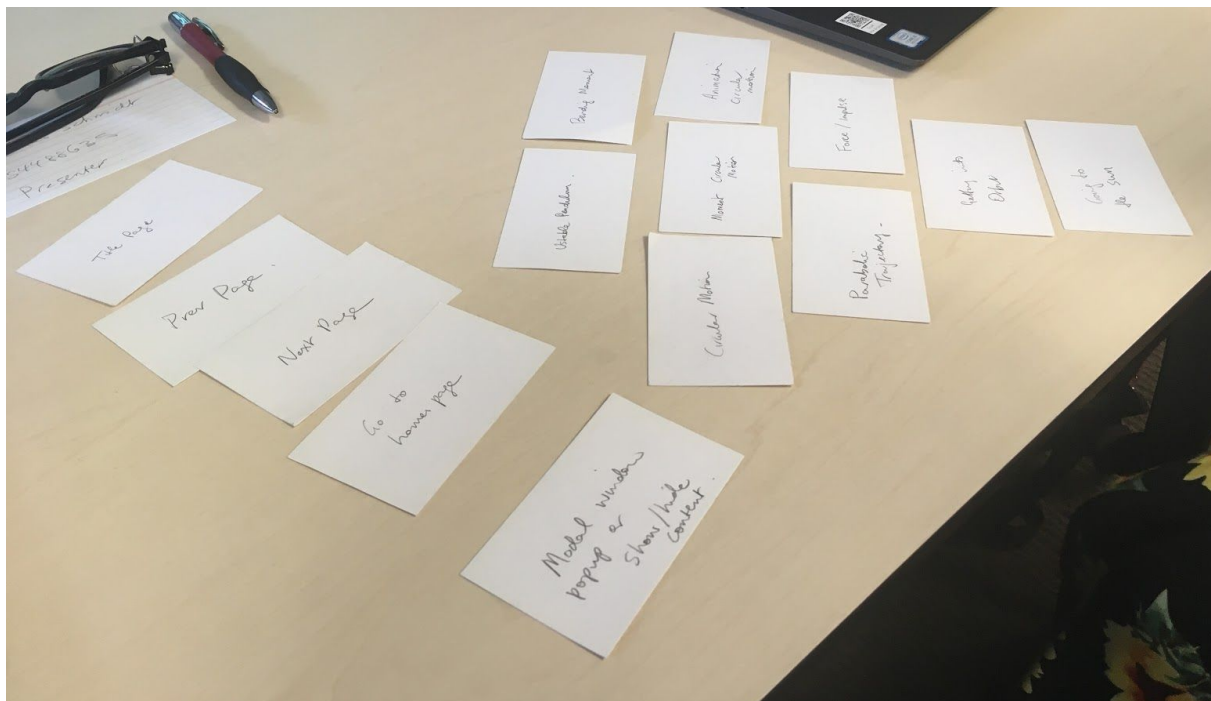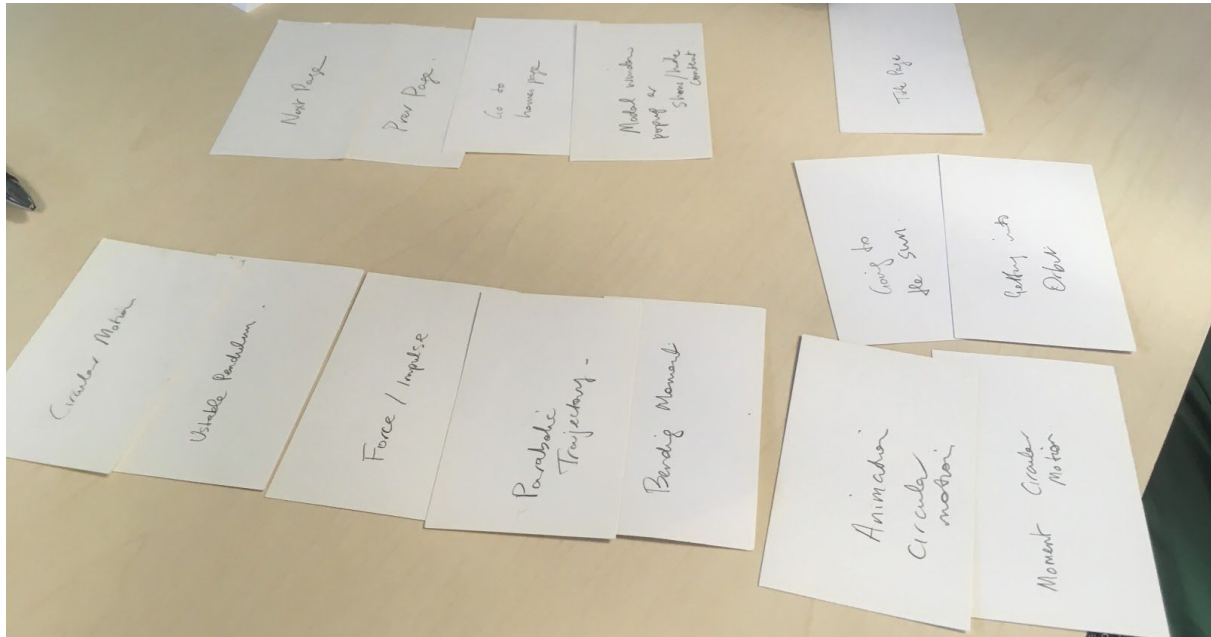
Navigation Systems

I gave a talk on the subject of navigation systems available here. In it I covered the rudiments of navigation systems and being able to locate and orient yourself in a mental space within a website. I criticized at length the navigation systems of UQ Blackboard as well as rotten tomatoes. Battlefield 1942 was given as an example of a good navigational interface. This is not a particularly fair comparison given the constraints of web design and web technologies. The talk seemed to be well received by the other students. As of this point I am unsure about whether a dynamic side menu or a top menu system is more appropriate. The side menu has the advantage of being more flexible to a large number of pages being added whereas the top menu is simpler, I feel, from a responsive web design point of view.

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Site Map

The site is laid out in a linear fashion. The page order has been optimised to be first of all relatively logical in its sequence but secondly to be most gripping and interesting in the prior pages. The later pages are more wordy and technical.
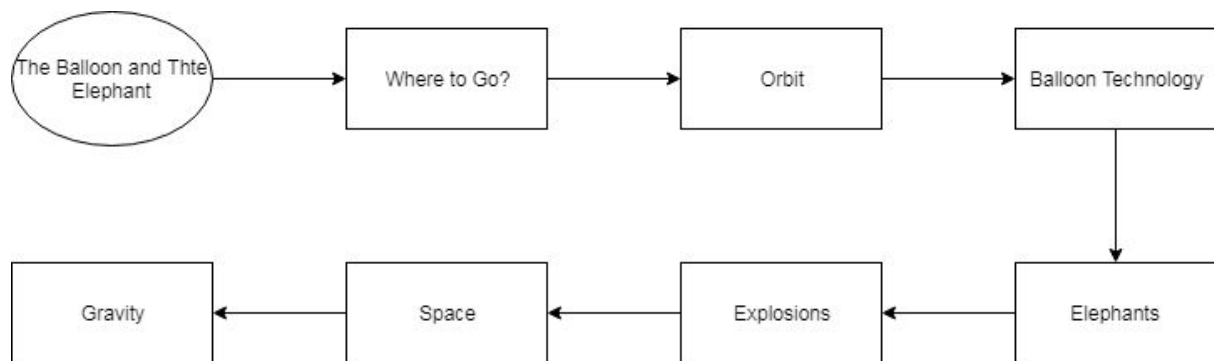
The order of the pages is as follows.

1. The Balloon and the Elephant
2. Where to Go?
3. Orbit
4. Balloon Technology
5. Elephants
6. Explosions
7. Space
8. Gravity

Visual Organisation

The functional perspective on visual organisation seems to be to try to maximize the usage of the space by putting a large number of documents in a kind of gridded array. However this can be visually exhausting. The way that eyes actually track over web sites is very telling about the way that people actually "read" or absorb information on the internet. Skimming is the new norm and is the expected modality for absorbing information.

Visual organisation seems to be a balance of simplicity and functionality like many things. Although nothing can replace engaging content the visual organisation of content is no doubt very important. The actual focused region of human vision is remarkably small so users will generally absorb the layout in a blurred fashion then their eyes will dart around to the regions that they assume from prior experience are the most important. Top left and across then scanning down, perhaps looking at an image or another heading.

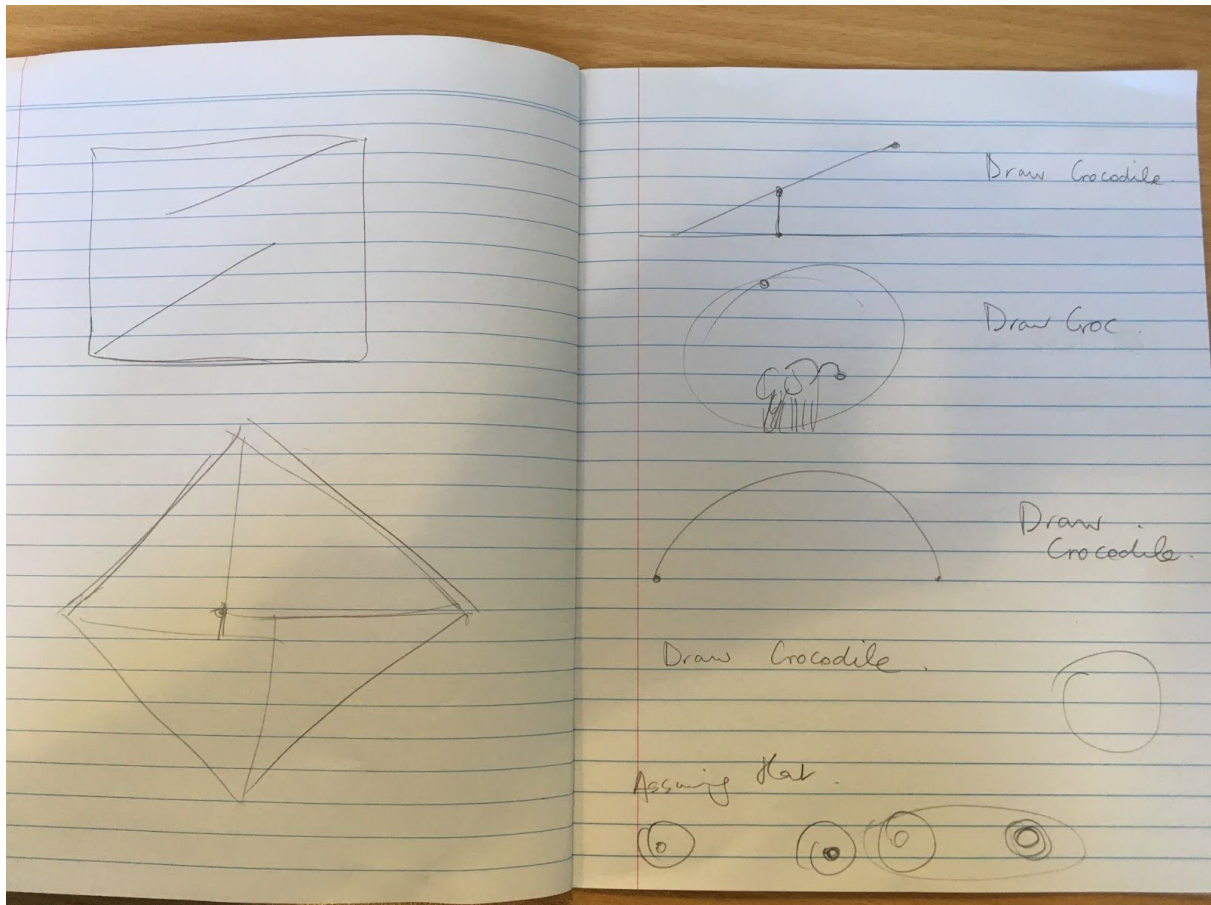https://www.nngroup.com/articles/f-shaped-pattern-reading-web-content/

It is difficult to know what to do with this information. I feel that it implies that information should be set out in a logical way given the visual paradigms that currently exist.
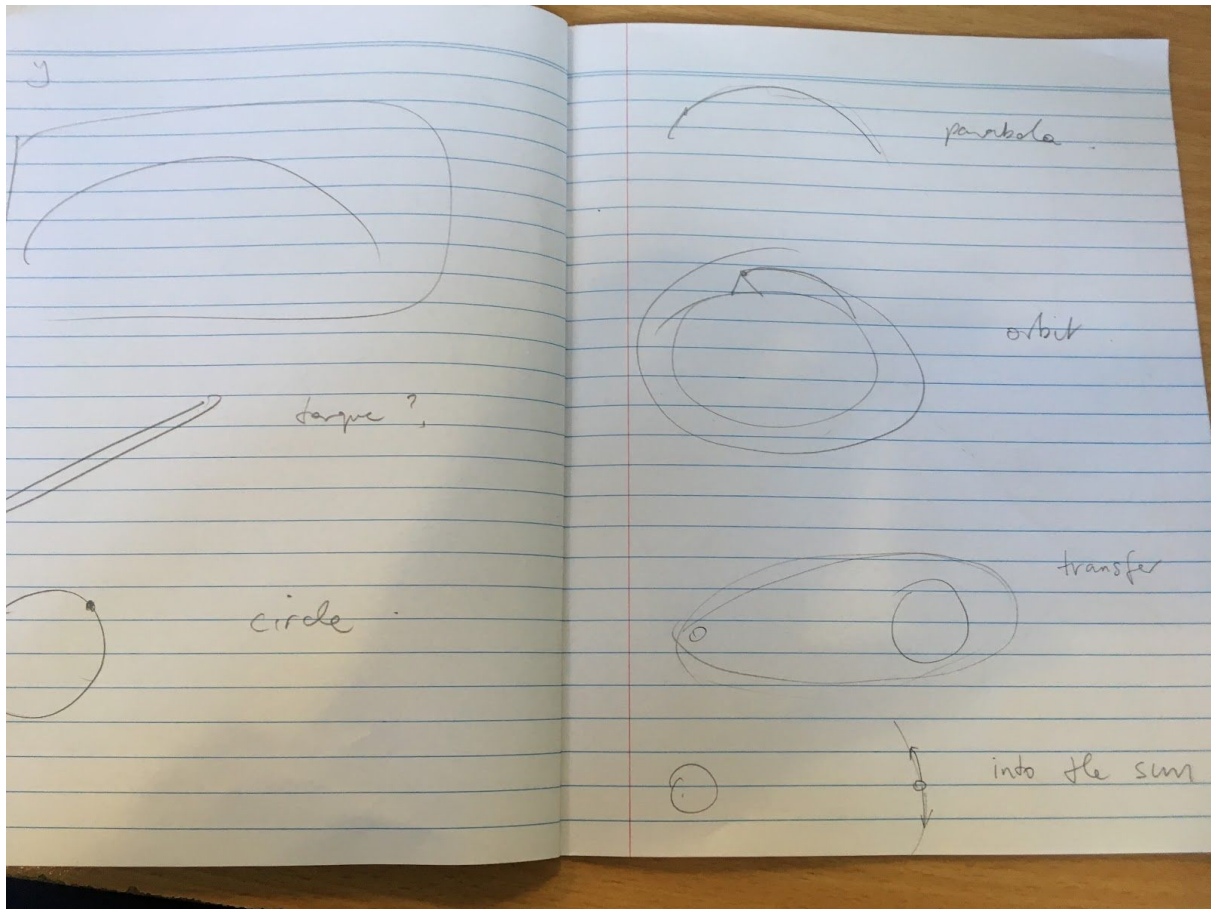
Interactivity & Functionality

The danger with interactivity is interactivity for its own sake. The original idea for interactive content was to draw curves using canvas and form elements however this idea was scrapped as being too ambitious. The current implementation uses javascript in convenient ways to make the experience of viewing the website more enjoyable and easier. Javascript is used for hotkeys and to show and hide elements. It is used to expand and contract the widths or certain elements. A plot.ly graph has also been inserted to show the logarithmic relationship between the mass ratio of a space ship and its potential change in velocity. This could be expanded in the future to use a sliding scale which dynamically modifies the graph however that is beyond the scope of the current implementation.

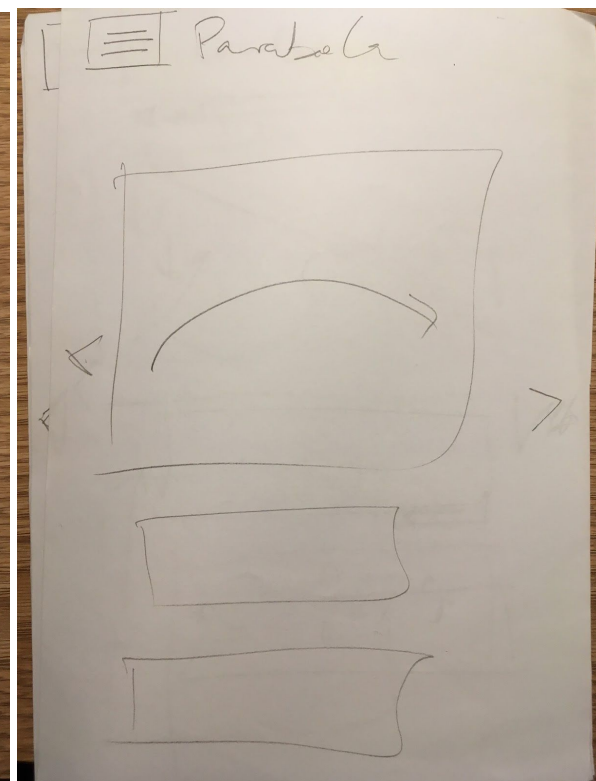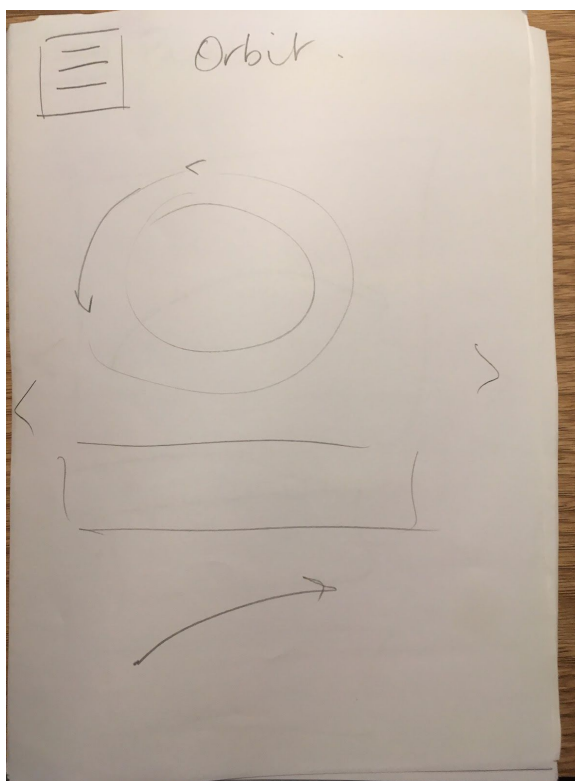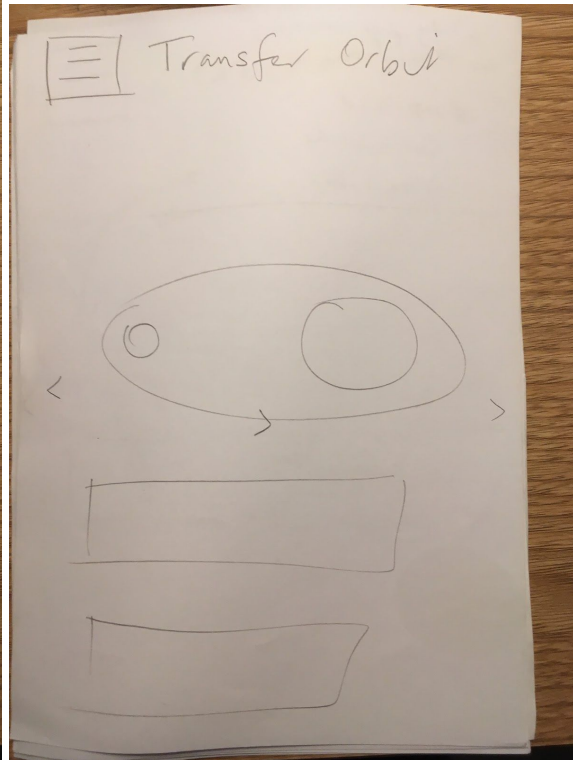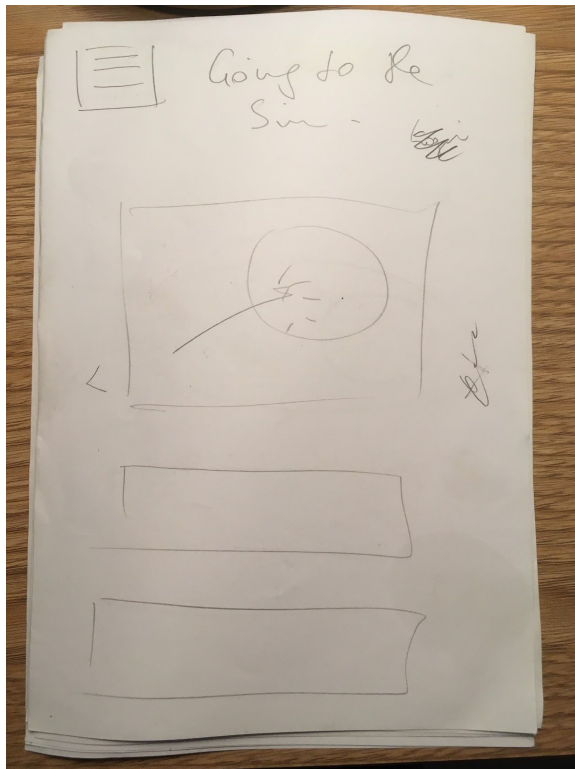Design Report for Website Design & Implementation Assessment

Paper Prototyping and Wireframes

Early Paper Prototyping

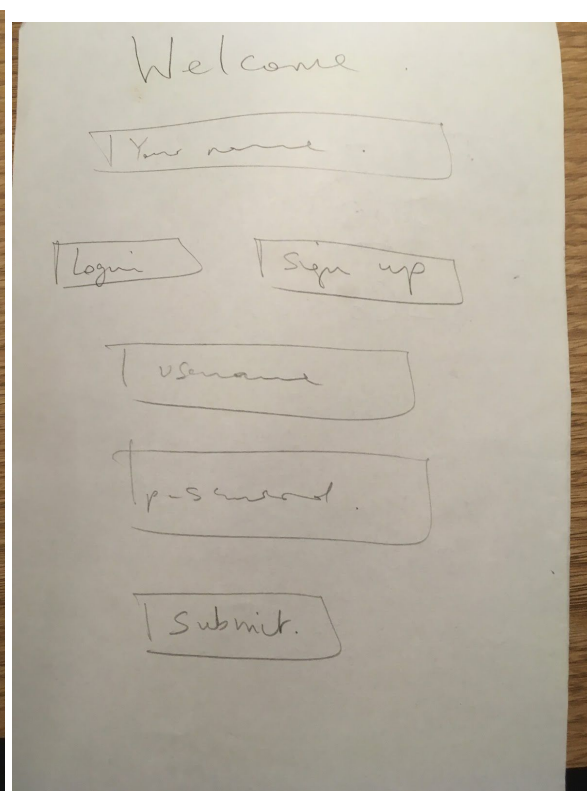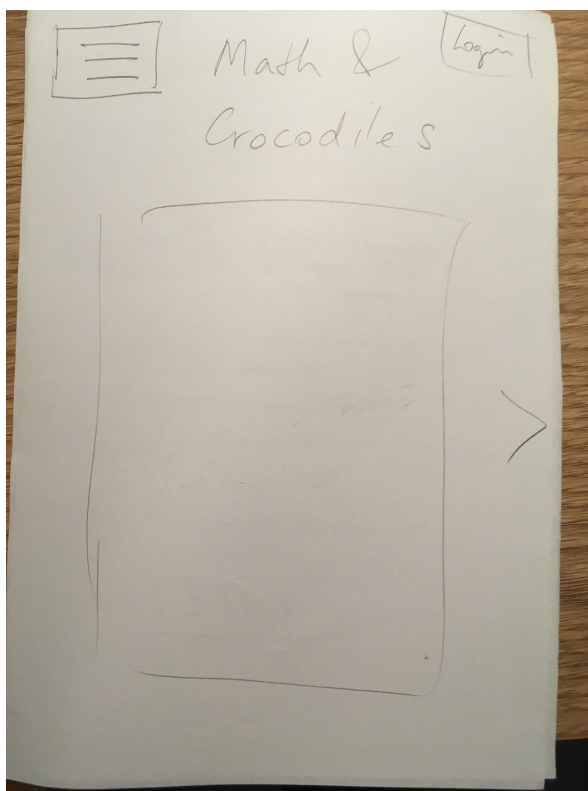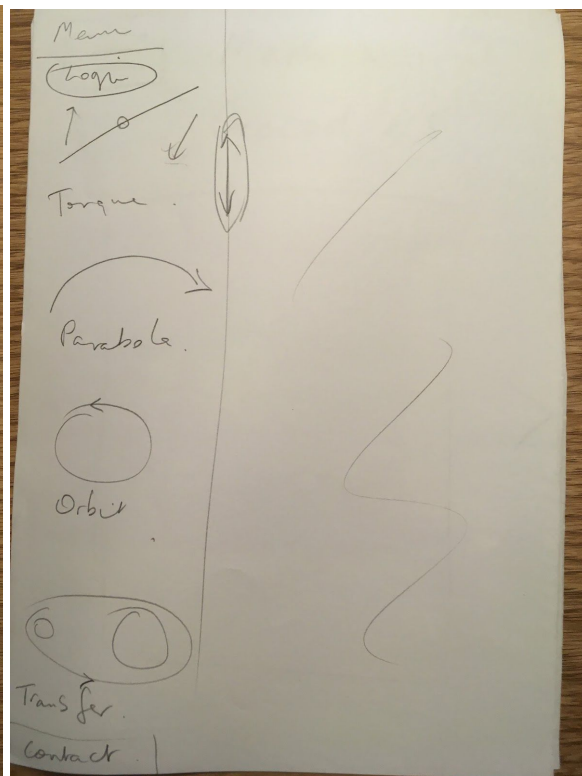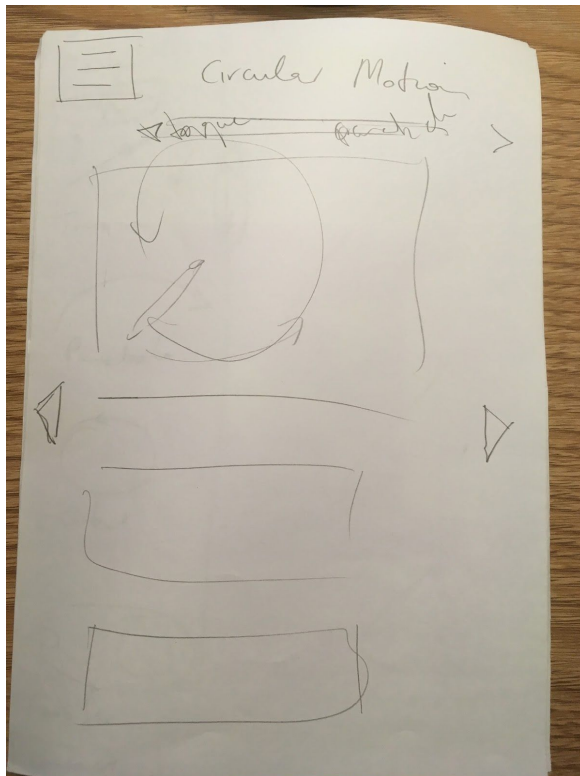Design Report for Website Design & Implementation Assessment

Early ideas focused more on being able to generate geometric objects related to various spacial orbits (above). Later attempts separated ideas into pages with navigational elements and wire frame layouts. Navigational elements include the top left menu item (rediscovered later during testing) and the left and right chevron elements. Notice the inclusion of a crude side bar design and a welcome page - concepts which were deleted finally.

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Feedback generally revolved around a general confusion on what the ordering of the webpage elements would be and a general intrigue in what crocodiles might have to do with mathematics.   The ordering of the pages remained a vague notion even in the later stages of development.

~ Part B ~

Style and Aesthetics

The basic style of the site is minimalistic. I would prefer the work to speak for itself and the interface and navigational systems to be as removed as possible without being impractical.

Header and Menu System

After a lengthy testing period a menu system was found that was relatively easy to code and expand as the number of pages increased while it maintained an uncluttered style as well as being compatible with the needs of mobile browsers. The menu is essentially the what is a defacto standard menu icon to be as clear as possible. It is situated to the left of the main title of the page and it toggles a menu which contains all the top level links of the pages.

Here it is in its default state

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After clicking on the menu icon the menu is displayed

I feel that the main semantic element of a page should actually be the title or some kind of content for clarity or ease of absorbing the content rather than as is often the case, the menu. This was the best way that I could find to reduce the clutter of a top menu without loosing too much functionality. Hopefully the fact that this icon represents a menu will be evident to the vast majority of users. User testing will indicate whether that is actually the case.

The menu uses a fixed height flexbox in column configuration. A media query toggles the height of the flexbox to a tuned amount to allow the normally three column menu to change to a two column layout when the width of the page is below a threshold.

Footer

The footer contains next and previous icons to click on. These are also activated with the left and right buttons on a keyboard for accessibility and ease of navigation. The website is intended to be read in fairly linear way.

We also have the standard dark full width background with white text affair. Since there isn't any real functionality in putting an email address or an address as is usually the case, links to the pages of the site were put here instead. This allows for navigation to an arbitrary page once the user has reached the bottom of the page without scrolling up - for desktop users. It is also almost expected given the design language that people have absorbed over the years. This is not intended as a primary means of navigation and so is quite small. It is not intended for use on mobile.
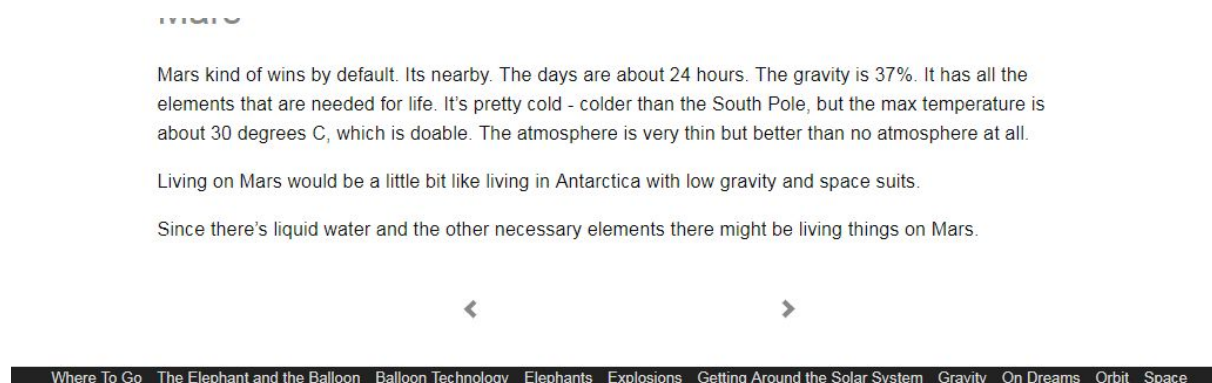
The site features select full width elements with the aid of nested div elements. The video toggles play/pause when clicked on. Whether this will be a natural interface remains to be seen. A small snippet of explanation might be required.
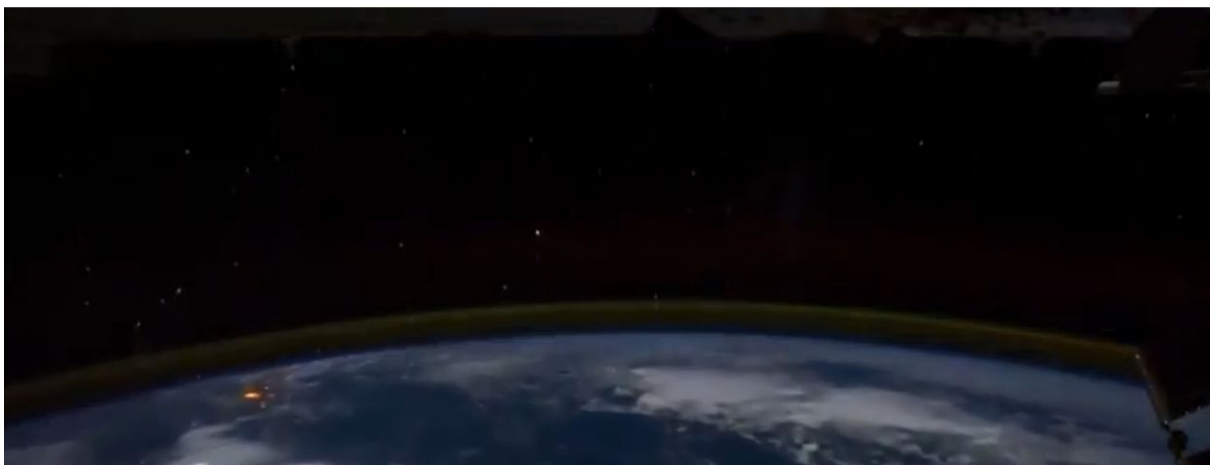
Here is the full width video with the toggled menu

These full width elements can be a bit visually overpowering. As a result the margins on the full width objects can be toggled if desired

Fonts

The primary font is off-black #111 Helvetica with a slightly lower font weight and slightly increased character width. The standard line height was set at 1.6 to improve readability. The maximum page width was also set at a relatively standard 800px to improve readability, it being assumed that it is slightly harder and more irritating for eyes to scan across a full-screen width arc to find the beginning of the next line on single spaced full width text.

Links are styled with an innoffensive light blue color #3b8bba ; without any text decoration. There is no hover effect to experiment with the idea that the color along with the cursor change is adequate visual indication that it is a link.

The use of the sans-serif font felt like it was a bit too sophisticated and might not appeal to younger children so it was avoided. The effect of large sans-serif font can be slightly comical but levity is not the worst thing in the world, specially when your subject material runs a little dry at times.

Hopefully the lack of overt style elements will not bore the audience.

Toggle Full Screen   Play/Pause

Toggle Margins

When $a \neq 0$, there are two solutions to $ax^2 + bx + c = 0$ and they are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Temperature of the Moon at the South Pole

Hopefully there's some water in craters so we can do our laundry and take luxurious showers.

Another problem is that there's no carbon or nitrogen which you need to make people (wiki).

Venus

Venus is one of the two planets closest to the Earth but it's 400 Degrees which is a bit of a show stopper.
Venus also boasts an atmosphere which is about 100 times thicker than Earth's. (wiki).
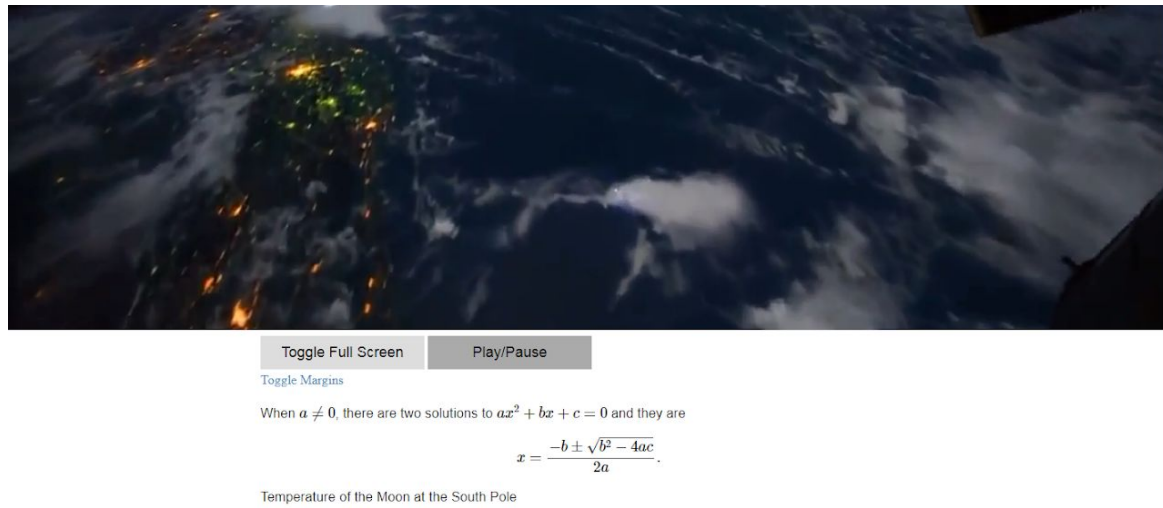
(Please ignore the toggle margins label)

Square buttons that toggle to a slightly darker shade were chosen for non-link interactive elements. Although the basis of their inclusion seems questionable at times.

Math is represented on the site using a mathjax library which is loaded from a content delivery network (CDN). This library is loaded asynchronously. It scans for text which is enclosed in dollar signs or double dollar signs and compiles the enclosed latex code into attractive looking equations.

The hotkeys previously mentioned are implemented using a jquery hotkeys library which provides easy to use APIs that link functionality with all kinds of hotkey combinations.

The left and right navigation chevron buttons in the footer are generated using CSS which is transformed by rotation to form the other chevron directions.

The menu button itself is implemented using a unicode character.

User Testing

Informal testing indicated that the main navigational elements seemed to operate by the principle of least surprise in that people would assume that the element was clickable given its color and that it was a menu given the ubiquitousness of the icon on the internet. Whether this is true in the future when the symbol might mean something else remains to be seen. But the basic usability elements seem solid if somewhat sterile given the earlier aspirations towards fun engagement.

As might be surmised from the design images throughout this document, the goals of this project have changed considerably over the past months. The final creation seems interesting, if somewhat limited in its scope, and far more limited in its functionality than the original grand vision. User testing immediately prior to submission revealed generally positive reactions from a limited target audience. It also indicated that there were no problems involved in using the navigation system. It was initially a concern that the menu location might not be obvious. The simple and irreverent explanations were well received.

Accessibility, Graceful Degradation & Progressive Enhancement

Accessibility is of extreme importance to those who are missing or have significant impairment of senses. It is therefore important to create content that can be appreciated by those who are visually impaired for instance. Since the website is essentially read out to the visually impaired the use of alt-codes for visual elements is essential for the visual material to be communicated in some way. The logical ordering of links using the tab index property of links might also be of importance for those who might not be able to use a

mouse. The website is designed to be navigated using the arrow keys. More shortcuts could be added for toggling the margins or pausing the video for instance.

The website basically takes a progressive enhancement approach. It is essentially a one column layout designed for mobile platforms at its core. Complications like side menus that cause layouts to become complicated have been avoided. This style is somewhat reminiscent of twitter which sticks to its one column layout philosophy for the most part.

Javascript is used for dynamic elements like changing layouts, hiding and showing elements, playing and pausing video, and potentially in the future using sliders to manipulate variables in equations which give rise to interactive mathematical graphs.

Advanced CSS features have been used sparingly. Media queries basically toggle only one variable. Not being able to find adequate free and free-use SVG icons for the footer navigation, they were generated using CSS transforms instead which seems to work fine.

Hotkeys

Several hotkeys were implemented to enhance the desktop viewing experience.

```
$(document).bind('keyup', 'left', prevPage);

$(document).bind('keyup', 'right', nextPage);

$(document).bind('keyup', 'f', toggleMargins);

$(document).bind('keyup', 'm', showHideMenu);

$(document).bind('keyup', 'shift+p', prevPage);

$(document).bind('keyup', 'shift+n', nextPage);
```

```
$(document).bind('keyup', 'p', togglePlayPause);
```

It is quite enjoyable to be able to slide through a linear webpage a bit as if it was a slideshow. The mobile experience seems to be a bit lacking and is more enjoyable when in landscape view. CSS zoom was experimented with as a way of retrofitting a better mobile experience however support was patchy and it was dropped due to this and time constraints.

Conclusion & Reflection

Design and the user experience of using a largely visual element online is a fascinating subject. It is very subjective and yet there are elements of usability and human psychology which are very common to everyone and experiences of using websites which the vast majority have which are left unverbalised. That is the subject that I find most fascinating which is related to this course.

My own visual style has remained largely unchanged. I hope to experiment more with artistic flair in the future, perhaps with painting.

At the beginning of this course I believed that it would be quite focused on javascript and interactivity however I slowly came to understand that it was more focused on CSS and design. I enjoy design and have been a bit lacking in artistic flair in recent years so I welcome the chance to revisited style elements that have been bubbling away in the back of my mind.

If I could restart I would begin the site earlier and get more input from the tutors about it specifically but that generally is what I seem to learn from almost all university courses. The most helpful thing in this course that I learned was when a tutor introduced me about how to specifically modify the design of a website in realtime using the developer mode tools in the browser. I had known about this before but the way that the tutor did it opened my mind to how it could be used to pinpoint a majority of the specific functionality of how CSS codes actually work. I also learned again the value of putting borders around all elements to understand how the greater box model of the site works.

References

- F-shaped Pattern Of Reading on the Web: Misunderstood, But Still Relevant (even on Mobile) https://www.nngroup.com/articles/f-shaped-pattern-reading-web-content/
- Euclidea https://www.euclidea.xyz/
- Linear Transformations and Matrices | Essence Of Linear Algebra, Chapter 3 3Blue1Brown https://www.youtube.com/watch?v=kYB8IZa5AuE&feature=youtu.be&t=135
- Eloquent Javascript3rd Edition https://eloquentjavascript.net/
- Full Width Background with Fixed Width Content (css) LearnWebCode - https://www.youtube.com/watch?v=KYT_Ch3dTB8
- Nasa Live: Earth From Space - Nasa Live Stream | Iss Live Feed : Iss Tracker + Live Chat Space Videos - https://www.youtube.com/watch?v=4993sBLAzGA
- The Shapes Of Css | Css-tricks https://css-tricks.com/the-shapes-of-css/
- User Centre Testing Plan https://drive.google.com/open?id=1cnHA0F7KuKOTmp8FHI9ONrhZlAf5MTjCtgo7jlq87MQ
- Navigation Systems https://drive.google.com/open?id=1Eg3Voy3JBy9emu-ijWa8g9MC5ELzn3qcBf4bZ7A96eQ