Coursework Report

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1   Introduction

It is known that the design of a web page can be challenging to develop. With the correct implementation of features it can provide a rewarding user experience. The aim of this assignment is to present various ciphers with different types of text encryption in a website.

The first cipher is the Caesar cipher, chosen because it is a very simple cipher, easy to code therefore great to start with.

The Morse cipher was chosen because it is a known code, different from most of the other ciphers since it does not use letters or numbers, but instead, a series of on-off tones that represent the different characters. Hence making the website have more variety for the user.

The Binary cipher works by representing each character in its binary value. It is very useful to encipher messages since the answer will contain only 1s and 0s, and not many people would think that those numbers are representing text, that is the main reason why it is very efficient.

Finally, the Atbash cipher was chosen because it is similar to the Caesar cipher and it involves maths (using the ASCII codes of each characters).

To be able to do the coursework I did a course on StackSkills [1] called "The Full Stack Web Development" which includes video lectures about HTML, CSS and JavaScript that helped me to begin designing my coursework and know what I was able to do using them.

I also read the first chapters of the book recommended by the lecturer Simon Wells "Practical Web Design for Absolute Beginners" [2] which helped me have an understanding on how a common web page is divided (header, footer and columns in the main body) and from there I started coding the HTML.

2   Software Design

The design of this website was first approached by sketching a basic diagram representing how the website should look. It was influenced by Google to be minimalistic, and since enciphering messages is similar to translating different languages, the first sketch looked similar to the Google translation website:
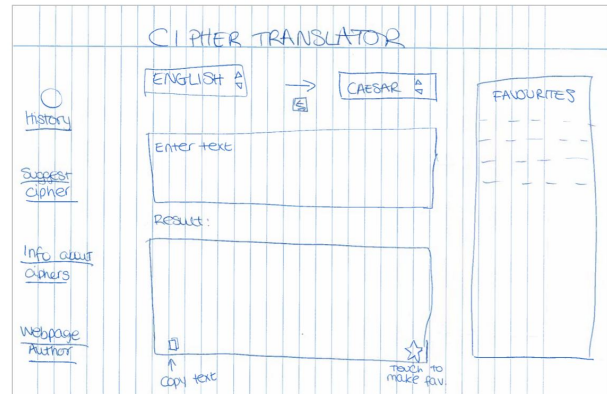

Figure 1 Brief sketch

However, the final decision was to leave all the ciphers in one page, one after the other, instead of having links from the home page to every cipher, since that is how most of the websites I searched for ciphers inspiration look [3].

The inspiration to leave all the ciphers in the same page came from a different website [4] and the format of my final website design is similar to that one, with plain different background colours for each different part, each part being a different cipher.

The website will be divided in 3 parts. The first part is the main title and navigation part, the next one contains the ciphers and the last one is the contact page. All of the ciphers will follow the same design format:
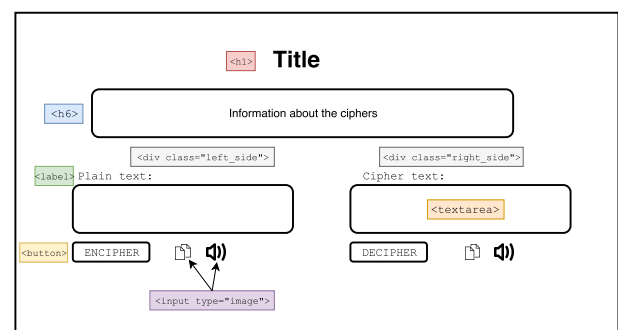

Figure 2 Basic layout

The screen is divided in three parts, the header, which includes the title and the information about the cipher; the left side, where the plain text is and the right side, where the enciphered text is. An audio option is available to the user if they prefer to have the message recited to them, as well as the ability to copy the message with one button.

The colours of each different parts are difficult to choose. Since you want colours that go well together and not look like

a vulgar website. For inspiration, I had a look at some websites that provide palettes of colours that go well together. [6]

The font choice was clear since the beginning: Courier New, since it is similar to the font that old type writers machines used to have and it is a font that is always related to computers or programming.

The font of the title, however, has to be different. For inspiration I looked at a few websites [10].

I did not start coding until I was sure of how the web page was going to look, since HTML has to follow the display.

3   Implementation

The files all follow the designated format: a JavaScript file for each cipher and decipher, as well as others for features of the page (like copying text or reading it), one single CSS file, and a single HTML that contains all ciphers.

The homepage has a background image of a Morse code machine [5] with the title on top (Cipher Translator), which had to be changed to display a title background colour, since the title was not very readable on its own on top of the image. The colour of the title is the same as the colour of the navigation bar, a green-blueish pastel tone, which suits the image perfectly.

The Navigation bar has five elements, the four ciphers and the follow me part. Each being 20% of the width of the page so it fits perfectly any dimensions. Every element of the navigation bar changes colour when the user hovers over them so they know where they will be going if they click it. Once clicked, the window will move to the cipher selected.

For each cipher, there are two images used as buttons, a sound button used to produce a woman's voice reading the text in the textareas, and another one used to copy the text. Both images were retrieved from links in the References area [8].

In the last part, there are three images representing the social media people can find me in, Instagram, LinkedIn and Facebook. All images were retrieved from links in the References area too [9].

3.1   Caesar Cipher

The Caesar Cipher was the first thing to be finished, even before starting to code the main HTML document, to see if I was able to make it work. After I finished it, I started setting up the main HTML.
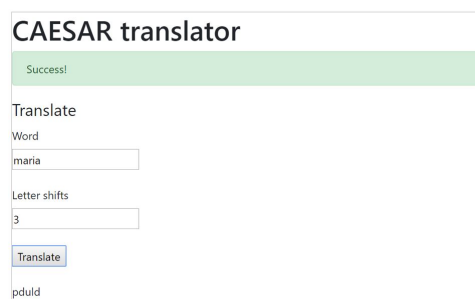

Figure 3 first try of Caesar cipher

The first try at it was very simple, just finding the ASCII code of each letter and adding the amount shifted to it, and then finding the new letter that appeared from that code. The problem was that for the last letters of the alphabet, once you surpass the numbers of the letters, the program prints the code of other ASCII characters, so I added 'if statements' to make sure it would only work with letters and it would ignore the other characters, as well as going back to A once it reached Z. The decipher is the same but changing the '+' to a '-' in the amount. It is very easy to use once you have the ciphering code. The final design was added to the HTML document and with some CSS this is how it looks:
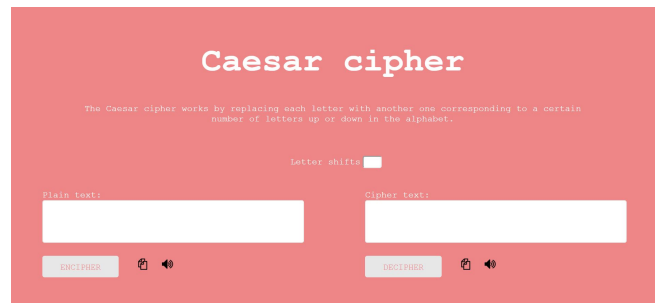

Figure 4 Caesar cipher in main HTML

3.2   Morse Code Cipher

The Morse cipher is easy to implement if a dictionary is used to translate each letter to Morse. A 'for loop' goes through each letter of the original text translating it. As an additional feature, I added the sound that the Morse code would produce, so in this cipher, if the user clicks the sound button it wouldn't hear a woman's voice, but the sound of dots and dashes.
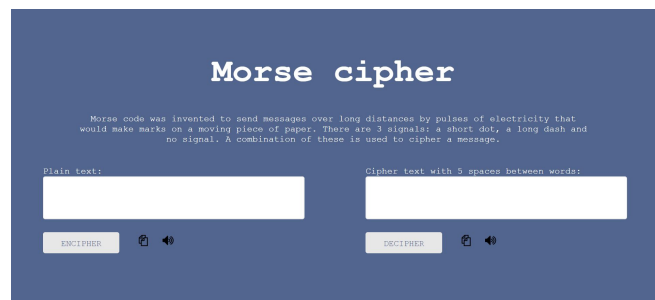

Figure 5 Morse code cipher in main HTML

Deciphering is a bit more difficult due to the fact that there is a backwards slash between each letter and 5 spaces between words, so the code has to split the words and then the letters and look for the translation of each letter in an array of key:value pairs.

3.3   Binary Cipher

Translating characters to binary in HTML was be done using the function '.toString(2)' which turns a number into its binary value. Therefore, finding the ASCII code of each character and turning it into binary outputs a ciphered text of the plain text. The display is the same as the others but with a different background colour:
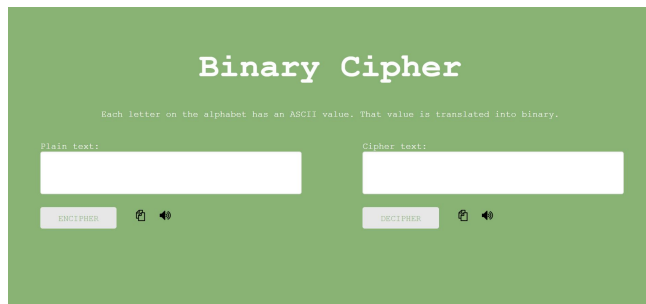
Figure 6 Binary cipher in main HTML

To decipher, the same is done but using 'parseInt(letter, 2);' which parses a binary number to an integer.

3.4 Atbash Cipher

The Atbash cipher works by taking the alphabet and mapping it to its reverse, so that 'A' is now 'Z' and so on. The way to code it is very similar to the Caesar cipher, it uses the ASCII codes of each letter and by using some simple mathematics it finds the corresponding letter, then just converts that code to the actual letter.
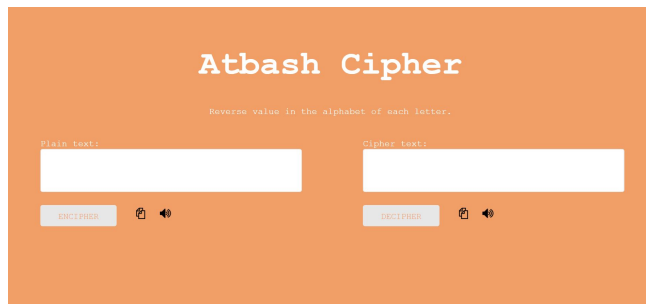

Figure 7 Atbash cipher in main HTML

As every letter has a corresponding value, the same exact code can be used to decipher the message, with no alternations needed.

4 Critical evaluation

4.1 Comparison against requirements

The requirements for this assignment are to design and implement a website with a couple classical ciphers using HTML, JavaScript and CSS. Another requirement was to evaluate the design using appropriate techniques.

As Matera (2013) studied [7], a way to evaluate a website is by looking at its usability. If any software fails to meet the user's needs and satisfaction, then the user will lose interest and the website is considered less usable.

The first thing to look at is learnability, how easy it is to navigate through the web page and how easy it is to get the job done. The start of this site is a simple image with a title and a navigation bar with the names of the ciphers so it is quite easy to navigate through it.

The next point to take into consideration is how efficient it is, or in this case, how long it takes to encipher and decipher the messages. As it is a very simple website, the translation is almost instant and easy to read as well as being able to hear the ciphered message by clicking the sound button.

Memorability is also important when evaluating a website, how easy it is to remember how to navigate through it after a period of non-use without needing to learn again how to use it, but as the point before said, it is a very simple website so it does not have much to remember.

Therefore, the purpose of this website is met.

4.2 Possible improvements

There is always room for improvement, even if the website meets its requirements, updates can always make it better. In this case, I feel some features could be added to different parts of the website.

Regarding CSS (the design of the website), the homepage could be altered by giving it a different touch, instead of making the typical website homepage. Also I would like to add a blending visualization effect between the different colours of the cipher backgrounds, to make it look like they are all together, sliding into each other. As well as adding more movement to the web page, make it more dynamic and entertaining.

It would be a good idea to add a mini game related to deciphering code or something that lets the user create their own cipher and send it to friends to decipher the messages.

Additionally, there could be links promoting sites that have good cyber-security courses for the users that are more interested in the topic of ciphers.

On top of everything that's already there, videos could be added to the ciphers of someone explaining the history of the cipher, why it was created, when and by who, or why is it still used nowadays.

In the near future, this website could be improved just to allow ourselves to keep learning HTML, CSS and JS. A nice touch to have would be an appreciation button at the end of the website, which would mean that if people went all the way down to the footer, they would have probably liked it, and it would be a morale booster to have a counter and see how many users used the website, or if they want anything else, a contact area.

5 Personal evaluation

Before this module, I was aware of what HTML was and I had a very basic understanding on how it worked, but thanks to this module, I learned what CSS and JavaScript could do, how to implement the three of them together to make a website look way better than how it looks with simple HTML.

I also learned how to learn by myself, since the core learning provided was very basic, and thanks to that I feel that now I can learn whatever I want without needing help from someone.

I never thought books were a good place to start learning code from, however, for this assignment I read a book provided by the university and it was probably the most useful

thing I did, it allowed me to start using CSS on my website and know how to divide my web page in a logical format.

Some of the challenges I had were on how to even start my website, since I did not know what I was capable of doing with HTML, CSS and JS, and even now, I still do not know how big it is, how many fantastic features they have if we just use our imagination and search a little for its capabilities.

It was hard to start designing a good looking website, considering I only knew how to add text boxes and background colours to it. This is why I did the course on StackSkills in which the lecturer creates a website from scratch showing everything he added to it, and from there I could use this code and learn how to implement it within my site.

Now that the assignment is finished, I am proud of myself, because even if the website is not amazing, for me, coding that website from very very basic knowledge of HTML in a couple of weeks is a fantastic job. The more we learn, the better we will be at implementing and designing web sites that can be more focused on the user.

6   References

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