Edinburgh Napier UNIVERSITY

Coursework Report

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Abstract

This is my report for web technologies course work

Keywords – Secret, Communications, Rot13, Cipher, Caesar, Clever key cipher, shift cipher, coursework report

1 Introduction

This report includes the details of processes involved from planning stage to the implementation of website project. This project required to design a website which focus on the implementation of ciphers using web technologies like HTML, CSS and JavaScript. It specifically emphasises on the use of three technologies without using any external libraries. I called my website ***Secret Communications***, because its content and requirements of the project mainly focus on hiding the actual meaning of message by converting it to encrypted text.

Secret Communications website mainly aim to provide users information about ciphers to encourage them to learn more about cryptic or secret communication methods. It gives users chance to explore different ciphers and learn how they work. It also allows users to use ciphers through integrated encoding and decoding tools to give them a view that how some clever techniques can be used to communicate secret message.

My website describes clearly chosen ciphers by using easy to hard encryption algorithms so that users can have a taste of both weak and powerful ciphers. First cipher implemented is called "Rot13"[1] which is a type of "Caesar or Shift cipher"[2]. The idea behind this cipher is to replace every alphabet of user input with alphabet 13 positions ahead of it in English alphabetical table. Second cipher this website describes is known as "3M K" which stands for My Message My Key is designed by the author of website using simple "online guide"[3]. It also uses letter shifting methodology to encrypt plain text but does not follow fixed number for shifting letters and symbols instead uses the sum of all ASCII[4] codes of the plain text entered by the user to generate encrypted text. This cipher is more secure then rot13 because it does not use same encryption key every time. It also provides different ciphered text if same plain text is entered twice. Third cipher explained on the website is a little variation of "Vigenere Cipher"[5]. It involves the use of separate keyword used to encrypt normal text words.

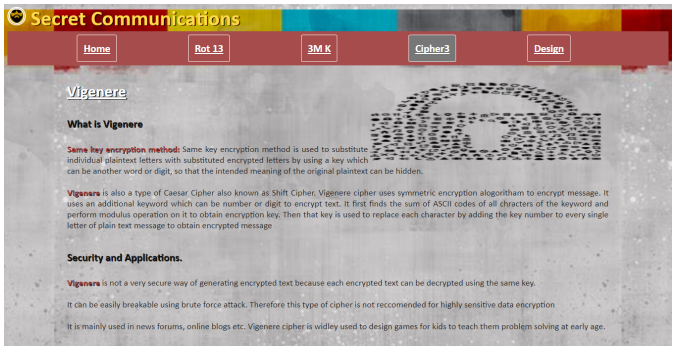

Figure 1: **Overview** of websitet

2 Software Design

Before writing any code, I read the requirements specification document carefully and wrote down all the key points required to design the website. I then divided the requirements into groups of similar specifications like:

2.1 Potential Ciphers.

2.2 Structure and Layout

2.3 HTML elements and Styling

2.4 Semantics and Accessibility

2.5 Applications/Tools required

2.6 PseudoCode

2.1 Potential Ciphers

To decide which ciphers to use I used some YouTube videos[6] to first understand them and then I wrote pseudo code for them before implementing the logic using JavaScript. I first implemented and tested the ciphers functionality using testing web page and this gave me peace of mind because logic implementation was already achieved and extra time to focus more on the designing aspect of the site.

2.2 Structure and Layout

To design the structure [7]and layout of the website I drew some rough sketches of the layout but after analyzing and comparing the design requirements with the sketches I cre-

ated a new drawing which only focused on the common layout and structure of all the pages which included logo, name of site, navigation bar, header and footer etc. Furthermore, I drew the layout of cipher implementation pages and divided them into 3 sections to explain following to accommodate following in each section :

a. Explain implemented cipher on the page and its algorithm's base.
b. Instructions to Encode plain text to cipher.
c. Instructions to decode the ciphered text to plain text.

2.3 HTML elements and Styling

Designing the structure helped me to decide which elements of HTML are required to transform the design requirements to actual website. I choose to use both block level and inline elements which were styled using CSS classes, IDs and main elements styling. Some of the HTML tags I used includes headings tags, anchor tags, paragraph tags, image tag, ordered list tag etc. Cascading Style Sheets styling included choice of correct colour schemes, size of text, alignment of tags, font-weight, borders etc. More details on all the tags and CSS styling used can be found on the design page of website including HTML tags and CSS styles.

2.4 Semantics and Accessibility

As accessibility[8] is very important for websites, I created a list of web safe colours to consider at the stage of implementation of design to address the accessibility aspect. I decided to consider semantic elements[9] of HTML5 and their attributes required to make site user friendly for people from all walks of life.

2.5 Applications/Tools required

Tools required to implement the logic and design were also selected carefully to make the implementation process smooth and flexible. Tool set used to develop website includes Brackets, Google Chrome, Notepad++ and Git Bash terminal.

Brackets[10] text editor which was used to implement the HTML structure by using appropriate HTML elements. It was also used to write Cascading Style Sheets to custom the appearance of used HTML elements. JavaScript file used to make website interactive with the user was also written using Brackets text editor.

ShareLatex[11] which is an online Latex text editor was selected to write and produce documentation for the site because it is open source tool and is free to use for individual projects. I considered Google Chrome browser to test the website presentation and behaviour because it has very good set of developers tools. To track the progress and keep record of all the amendments done to the site during development, i used version control software called Git[12] which helped me to compare and see my work at different stages of the project. I used Git Bash Terminal to save and commit changes to the project's own git repository.

2.6 PseudoCode

ROT13 cipher was implemented by following the below algorithm :

Read User input
Loop through all the letters of input text.
    Find ASCII/Unicode of each letter
    Add 13 to if Unicode is between 65-77
    Convert new Unicode to character
    Add obtained character to output string
Repeat loop until characters are converted
End loop
Display Encrypted text.

Algorithm 1: Rot13 Encryption

3M K cipher was implemented by following the below algorithm :

Read User input
Loop through all the letters of input text.
    Find ASCII/Unicode of each letter
    Find Sum of UniCodes of all characters

End loop
Find Sum % 13 & store it in key variable
Loop through all the letters of input text
    Find ASCII/Unicode of each letter
    Add key value to Unicode obtained in above step
    Convert new Unicode to character
    Add obtained character to output string
Repeat loop until all characters are converted
End loop
Display Encrypted text.

Algorithm 2: 3M K Encryption Method

Cipher 3 cipher was implemented by following the below algorithm :

Read plain text to be encrypted Read encryption key
Loop through all the letters of of key text
    Find ASCII/Unicode of each letter
    Find Sum of UniCodes of all characters

End loop
Find Sum % 6 & store it in key variable
Loop through all the letters of plain text
    Find ASCII/Unicode of each letter
    Add key value to Unicode obtained in above step
    Convert new Unicode to character
    Add obtained character to output string
Repeat loop until all characters are converted
End loop
Display Encrypted text.

Algorithm 3: Cipher3 Encryption Metho

3 Implementation

Secret Communications website consists of five web pages comprising one Homepage, 3 cipher implementation pages and one design page. Homepage is the main index page which is displayed first when a user browses this website. Three cipher pages mainly put light onto the three different ciphers.

Figure 2: **Homepage** Shows its content and layout.

Each page has an introduction to the cipher implemented on the page with instructions on how to use the encoding and decoding tools. These encoding tools allow users to encrypt and decrypt messages. This behaviour was added to site using JavaScript functions and events integrated within the HTML elements of the site. Whereas design page is

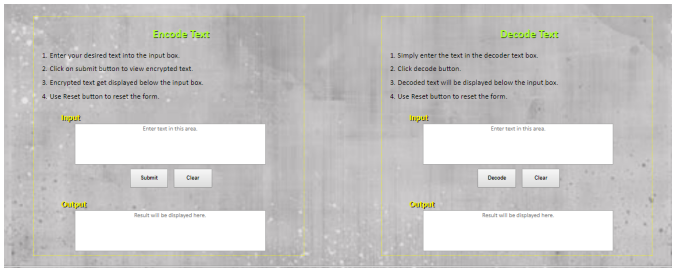

Figure 3: **Cipher Tools** Inbuilt tools on each cipher pages.

not directly linked to the implementation of the ciphers, but it specifically describes all the elements and styles used to structure the website. The main reason to author this page is to give clear understanding of elements specification to web developers so that any future modifications to the site does not affect its consistency and user view.

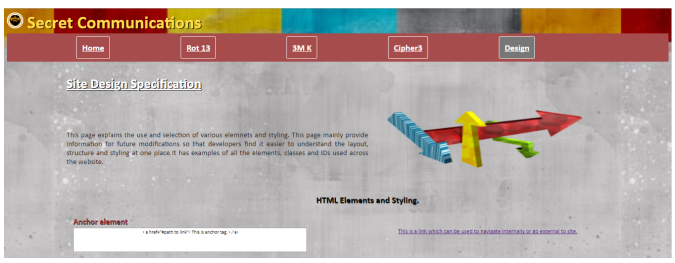

Figure 4: **Design page** Shows HTML and CSS specification.

To make the plan a reality I first created 5 HTML pages with required styling and JavaScript files. After linking CSS and JavaScript with HTML files, I focused onto the deployment of common elements of the site as all the pages of my website have same logo and menu bar which allow users to navigate between web pages.

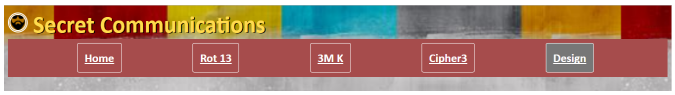

Figure 5: **Header** Scroll menu and logo.

Each page also has a footer section which provide information of developer and owner of the site. I used different styled heading tags to convey the relationship between the different sections of each page. Styling and appearance of different sections of each page was achieved by using classes and IDs of Cascading Style sheets. Specific details of each HTML element and styling used has been provided on to the design page of the site.

Figure 6: **Footer** Contains information of developer.

4 Project Evaluation

This project helped me to gain an insight of all the challenges involved in the development of a website project. One of the main lesson I learned during the implementation and whole project is that not having clear client requirements can make it a lot harder to achieve actual vision of client. Requirements for this project were not very clear because the requirement description document did not clearly specify what features are needed for each band of the score. General terms used in the specification document can be interpreted differently by different individual to make design decisions.

Based upon my personal interpretation and by interacting with my peers, this project required to have at least two ciphers implemented with encoding and decoding tools which users can interact with, I achieved this by introducing site visitors to 3 ciphers. I believe having too much textual information can discourage user to use the website therefore I only provided brief description of each cipher on each page. I trust that simplest ideas are the best idea because by introducing complexity in the core idea can drive us to completely in the wrong direction from our core goal. Therefore, I choose a very simple theme which stayed consistent in all pages to keep my site simple but interactive.

There are plenty of fields where I feel that I could have done better during the project. I sense that I should have included some video introductions on each cipher page for user to learn more about each cipher by using media tags. Other area where I feel that I could improve my site is by

introducing background styling and some different font family to make text look prettier. I also feel that I could have chosen different colour schemes to make website look more modern. As perfection comes with practise, I strongly believe that with more practise and dedicating additional time to web development I can improve my web design skills. I am satisfied with the work I have done because this project encouraged me to explore various techniques and strategies to handle problems which occurs during website development process.

5 Personal Evaluation

This coursework was very good opportunity for me to learn the various stages and aspects of the website development process. I feel that I have gained various technical and personal skills during the coursework time frame.

Before starting the coursework, I was very scared of the level of expertise required to accomplish the project but as I started implementing my ideas it became interesting and very learning process.I developed my research and planning skills which I believe are the core of any problem solving and designing task because more you understand the problem more efficiently you can solve it. Because of no past web hosting experience, I was feeling very nervous and lost to host my website but by investing some time to research about it assisted me to overcome this issue. It also helped me improve my time and stress management skills and played a vital role for me to stay on track to concurrently give attention to other commitments.

Because of the challenging nature of the project it allowed me to engage more with my peers and lecturer to discuss any issues or difficulties I had. Other issue I had was to understand the design page requirements and I used many online resources to find a solution but didn'tâĂŹt get a satisfactory answer. So, to overcome this issue, I approached my lecturer who precisely explained me in more detail about the design web page which saved me a lot of time and energy to be wasted doing something completely wrong. It helped me to develop my personal skills and gave me chance to get early feedback for my work which is an excellent way to increase efficiency. It also gave me chance to have an experience of agile development methods which helped me to gain better understanding of how agile approach work and how it is more flexible but productive then waterfall approach.

I feel that I have created a satisfactory website as compared to my past experiences and I believe that I have performed well in this task. I also feel that I have addressed the accessibility and user experience sides of the website to the best of my knowledge. I feel that project has improved my confidence level to tackle challenging problems. It has also helped me to learn more about myself as a person. It has made me clear that how being pushed out of your comfort zone by putting time constraints make you learn quickly and accurately which is a vital skill to adapt to different situations. I have faith that knowledge and experiences I gained during this project will make a positive difference in my future study methods and plans.

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