

Initial Plan



Creating a cryptography animation for visual learners

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1.0 Project Description

When it comes to learning new information and understanding concepts there are three schools of thought about how learning is categorised. This is: visual learning, auditory learning and Kinaesthetic learning. Visual learning can be defined by “those that need to see pictures and graphs to visualize.” Auditory learning is “those who need to hear the information” and kinaesthetic learning is “those who need to engage in an activity in order to grasp a concept.”ⁱ In the final year of the BSc degree in Computer Science at Cardiff University there is an optional module called “Security” which “provides students with basic understanding of cryptographic tools and techniques that are used in modern systems to achieve security objectives, such as confidentiality, integrity, and authentication.”ⁱⁱ During this module students learn the content through a mix of auditory learning from live lectures and visual learning through a PowerPoint presentation. In my individual project I want to take this content and make a security animation that will benefit visual and kinaesthetic learners as a majority of the module is taught audibly. Visual learning “increases retention by 29-42%”ⁱⁱⁱ meaning that these animations will hopefully benefit the student studying security and allow them an interactive platform where they can understand the concepts, they learn in the security module with a more visual and hands-on approach. My end goal is that the retention rate of this material will increase and thus help them with their exam and application of this material.

An example of the animation that I might implement is the Diffie Helman Key exchange, using the colour mixing example to explain this concept visually^{iv}. In addition to this I could make another animation of the classic Diffie Helman Key exchange so students can take the simpler example and apply that learning to the more mathematical version of Diffie Helman Key exchange.

I will be creating the animation using a JavaScript library and will be making the GUI using HTML, CSS and JavaScript. During my implementation of the animations, I will be running a preliminary study on the target audience (2nd and 3rd year students) to see their content retention of the chosen concept by using auditory learning techniques only. Once my animation is complete, I will be running the study again and seeing the content retention from the visual animation (using visual and kinaesthetic learning techniques). I will then compare the two studies to see if there are any trends the retention rate of both studies.

1.1 Ethics

My individual project will involve the participation of volunteers for my study on retention rate in visual and auditory learning. In addition to this when I am designing and implementing my animation, I will be asking volunteers to give me feedback on the design and interactivity of the animation (this will be done in a questionnaire format). Because of this involvement I will ensure that I complete the Research Integrity Online Training Programme and complete and send off the Ethical Approval Form at least two weeks in advance of data collection/human involvement. Throughout the process of the study and testing I will make sure I am transparent about how I will be using the data and make sure that I display ethical integrity and awareness throughout the process.

2.0 Aims and Objectives

2.1 Aims

Research into the possible topics for the security animation and the different ways I can present the animation. Create a security animation of the chosen topic. Get a better understanding of the psychology behind learning and apply this research to the animation. Produce a study on the content retention rate of visual learning (security animations) vs auditory learning.

2.2 Objectives

- Research and understand the chosen topic for the security animation
- Research background information on human computer interactions (HCI) and how to create an animation that will allow the most content retention.
- Understand the psychology behind visual learning to make the implementation of my animation as effective as possible.
- Look into java script libraries and which would be best for the implementation of the animation
 - Look at PixiJS
 - Processing.js
- Implement the animation using JavaScript (HTML DOM Animation)
 - This will be an agile process with it being tested and reviewed throughout the implementation process.
- Implement a GUI to run the animation
 - A user-friendly GUI
 - Buttons and functions that allow user interaction
 - A “clear” button to restart all animations
 - Small text areas clarifying any points
- Create a study for third year university students to measure the retention rate of auditory learning and quantify the data
- Create a study for third year university students to measure the retention rate of visual learning and quantify the data
- Compare and contrast the data sets to come to a conclusive understanding of trends in the data.

3.0 Work Plan

3.1 Deliverables

I plan to submit the following:

1. Initial project plan
2. Draft report
3. Final Report
4. Prototypes and Designs (specified in the schedule below) – draft/final report
5. Data from both visual and auditable content retention study – draft/final report
6. A URL linking stakeholder to the animation webpage – final report
7. All source code – final report
8. Any other additional supporting files and models. – draft/final report

3.2 Milestones

1. Submit Initial plan
2. Have fully formed initial design of the animation and GUI
3. Create and Test animation prototype
4. First study complete
5. Start final report
6. Second Study complete
7. Submit final report

3.3 Supervisor Meetings

Supervisor meetings will occur every week. A one-to-one session where I can discuss my progress and ideas will take place on Monday's at 12pm every other week. For the weeks which are not one to one I will attend a group supervisor meeting with other students with the same supervisor. These will occur on Thursdays at 1pm. Within the schedule below I have specific milestones where I attend to show my supervisor specific progress.

3.4 Project Schedule

• Week 1 (1/02/2021 - 07/02/2021):

- Research into the different types of security concepts that could be made into an animation.
- Download any necessary software for the design and implementation of the animation.
- Compile a list of questions to ask supervisor while in initial meeting.
- Set up Microsoft tasks (for tracking throughout the individual project)
- Have initial meeting with supervisor [3 Feb 2021 13:00 - 14:00]
- Submit the Initial Plan for the project. [8 Feb 2021]
- **Milestone: Submit Initial plan.**
- **Deliverable: The initial plan.**

- Week 2 (8/02/2021 - 14/02/2021):

- Research and decide on a topic for my security animation
- Research into a java library to use in the implementation
- Learn the basics for all software JavaScript (HTML DOM Animation)
- Experiment with JavaScript making simple animations and understand the scope of that implementation method for animations.
- Have a loose idea of the design and flow of the animation.
- Research background information on human computer interactions (HCI) and how to create an animation that will allow the most content retention.
- **Deliverable: First design draft**

- Week 3 (15/02/2021 - 21/02/2021):

- Read studies on the differences between visual and auditory learning and understand the advantages of visual learning and why its effective.
- Understand the phycology behind visual learning so I can make the implementation of my animation as effective as possible.
- Create initial design for the animation
- Create initial design for the GUI
- Continue learning JavaScript (HTML DOM Animation)
- **Milestone: GUI Design Produced**
- **Deliverable: GUI Design**

- Week 4 – 5 (22/02/2021 - 07/03/2021):

- Create a prototype of the animation (using PowerPoint/simple wireframe)
- Create a questionnaire for the reviews of the prototype
- Test prototype on target audience (third year computer science students). Report the feedback by using a questionnaire to understand the drawbacks and positives of the design.
 - Document the feedback and understand the trends of the data
- Show prototype to supervisor for additional support and feedback
 - Amend prototype accordantly based on feedback for target audience and supervisor
- Continue further reading on visual learning
- **Milestone: Prototype completed and tested**
- **Deliverable: Animation prototype**

- Week 6 -7 (08/03/2021 - 21/03/2021):

- Start the implementation of the security animation
- Complete my study on the retention rate for security concept I will be using for the animation via auditory learning.
 - o Quantify the data from the study
 - o Report findings in final report to compare with later study
- Start writing the Draft report/final report (introduction and background research on visual learning)
- **Milestone: First study complete**
- **Deliverable: Draft report**

Week 8 (22/03/2021 - 28/03/2021):

- Finish first draft of the security animation (includes all the necessary features but not including the GUI or any additional features)
 - o Get supervisor to review the animation and get feedback for improvements or changes [22 March 12:00]
- Start implementing GUI
- **Deliverable: Security animation & GUI First Draft**

Easter Break (29/03/2021 - 18/04/2021)

Week 9 - 10 (19/04/2021 - 02/05/2021):

- Apply GUI to the animations
- Test GUI and animations
 - o Fix any bugs that may be uncovered by testing
- Write up testing and implementation to final report
- Show animation to supervisor and get feedback
- Finalise the animation and GUI
- Start a new study of retention rate for visual learning using the animation.
 - o Quantify the data of study
 - o Compare the visual data study to auditory data study and add this to final report
- Create final report draft
- **Milestone: Second Study complete**
- **Deliverable: Final animations within the GUI.**

Week 11 (03/05/2021 - 09/05/2021):

- Edit first draft
- Submit final report draft to my supervisor for feedback

- **Deliverable: Final report draft**

Week 12 (10/05/2021 - 16/05/2021):

- Edit and improve my final report
- Submit final report [23:00, 14/5/2021]
- **Milestone: Submit final report**
- **Deliverable: Final report**

3.5 Gantt Chart

Tasks/time period		February				March				April				May			
Week Beginning	Status	01/02/2021	08/02/2021	15/02/2021	22/02/2021	01/03/2021	08/03/2021	15/03/2021	22/03/2021	29/03/2021	05/04/2021	12/04/2021	19/04/2021	26/04/2021	03/05/2021	10/05/2021	17/05/2021
Research /Preparation										Easter Break							
Research into the different types of security	Started																
Download any necessary software for the design and implementation of the animation.	Started																
Research and decide on a topic for my security animation																	
Research into a java library to use in the implementation																	
Learn the basics for all software JavaScript (HTML DOM Animation)																	
Research background information on human computer interactions (HCI) and how to create an animation that will allow the most content retention.																	
Read studies on the differences between visual and auditory learning																	
Understand the psychology behind visual learning																	
Design/Prototype																	
Design and flow of the animation.																	
Create design and prototype for the animation																	
Create design for the GUI																	
Show prototype to supervisor																	
Implementation																	
Security animation Implementation																	
GUI Implementation																	
Experiment with JavaScript making simple animations and understand the scope of that implementation method for animations.																	
Study																	
Study (1) on the retention rate for security concept (auditory)																	
Study (2) on the retention rate for security concept (Visual)																	
Testing																	
Test prototype on target audience																	
Test GUI																	
Test Animation																	
Final Report																	
Submission																	
Submit the Initial Plan	Complete		18 Feb 2021														
Submit Final report																	

[The excel view of this Gantt chart will be submitted separately]

4.0 Planning for Multiple Reports

A Draft report will not be produced for this project however I will be giving my supervisor a rough draft of my final report for feedback and guidance. I have scheduled this into my plan and have specified which deliverables will be included. Overall, the final report will encompass all the deliverables above (minus the initial report / draft report).

5.0 Appendix

ⁱ St. Louis, M., 2017. *How to Spot Visual, Auditory, and Kinesthetic-Learning Executives*. [online] Inc.com. Available at: <<https://www.inc.com/molly-reynolds/how-to-spot-visual-auditory-and-kinesthetic-learn.html>> [Accessed 3 February 2021].

ⁱⁱ Dr. George Theodorakopoulos. Security Module description .Available at: <https://data.cardiff.ac.uk/legacy/grails/module/CM3110/20A.html> [Accessed 5 February 2021].

ⁱⁱⁱ Daniels, D., 2019. *Why is Visual Learning So Important?*. [online] Insight Resources. Available at: <<https://www.insightresources.org/2019/04/26/why-visual-learning-and-teaching/>> [Accessed 3 February 2021].

^{iv} Educative: Interactive Courses for Software Developers. 2021. *What is the Diffie–Hellman key exchange?*. [online] Available at: <<https://www.educative.io/edpresso/what-is-the-diffiehellman-key-exchange>> [Accessed 5 February 2021].