MSc project computer science structure:

**Introduction:** Make sure have included the importance of this project within my introduction

* How this is relevant to force rehabilitation exercises
* Does not need to be done in presence of a clinician
* Can take analyse multiple forms of data, e.g hand tracking, force tracking, client progress (better than current forms of progress tracking)

**Literature review:**

* Explanation of what research has already been performed in a specific area
* Analysis and critical evaluation of that literature
* Highlight gaps and how will my research contribute to this

Each paper make notes on: e.g do this as a table

* Research question
* Methodology
* Results
* Conclusion
* Strengths, weaknesses or gaps in research

When critiquing papers

* Date research was conducted
* Impact and reach of the research
* Breadth and depth of research
* Overgeneralisations and assumptions
* Methodological limitations & strength
* Recommendations and calls for further research

Structure:

* Wheel approach
  + This structure might be useful if there are various approaches to understanding your topic
  + Your subject is the ‘centre’ of the wheel
  + You might discuss different theories, approaches or methodologies that apply to this topic, but are themselves dissimilar and separate

Paragraph structure: look at the example lecture slides for example paragraph

* Introduce your point
* Elaborate your point with sources
* Comment on the evidence
* Conclude your point

Find literature on

* Haptic devices and their relevance on rehabilitation
* VR and its relevance on rehabilitation
  + Game design for rehabilitation
* Look at the plan below and find references for each bullet point

**Designing the software to create communication between the force dimension delta and Unity**

How to create comport

How to compile sdk in C

How to run a script in unity to call the software I create

1. Learn how to program using the force dimension SDK
2. Modify the examples so forces can be sent from unity
3. How to get a com port and get it into unity and
4. Transmission protocol
5. Com port in unity and in the haptic device (SDK example)
6. Writing the program for software to make the client server talk to each other
7. Need communication between them

Next:

* Are the forces applied through unity or the haptic device, applied gradually, through unity will give me stability, SDK can manage it
* Simple unity scene where I just need to press button to give a force response
* Evaluation does the program work, is the simulation good enough, did I reach the target, document my targets and did I reach them, could also use users and get feedback

Unity TCP connection scripts and try build from one of these to establish communication

C+ and c# program to establish a TCP connection

Write a client script for the TCP server script and implement this in unity

**Book notes:**

Stroke base rehabilitaton: haptic technologies p.g 26

**Methodology notes:**

Interface design: (chapter 11)

* Interface provides data to the actuation unit and catches and transmits all the data from the sensors (517)
* Speed of transmission is most relevant bottleneck when designing haptic devices (517)
* Most haptic controllers integrated into simulator as and external hardware component (521)
  + Reduces computer load for main simulator and reduces data rate significantly
* Table 11.1 – required unidirectional data rates for typical haptic devices
* At a frequency of 1 to 10 Hz: this specifies the rate at which the force output (e.g gravitational force) should be updated by the simulator (e.g VR) i.e the simulator should provide force outputs that are updated between 1 and 10 times per second (11.2.3 - 520)

Code:

* Use the fixed update method to update the forces within unity project

The camera or user visual placement is determined by the haptic device and unity integration

* In some camera placements the perspective meant that the x, y, and z axis’s were mixed up, which also impacted the forces, especially the repelling force

**Making my game**

Making the ball move in curve fashion

* Getting the sin of many points

Creating attractive force exercise: 31/08/2023

* Use coordinates of the target object and end effector to apply forces to the haptic device in the direction of the target object
* Turn forces off when the object enters a specified area close to the ball
* Apply resistive forces when the user has successfully been inside the ball for longer than 5 seconds
  + Need to check the times on this and make sure they are a measurable outcome
  + Could also remove these forces if needed
* Applying the resistive force:
  + Apply a resistive force if the user has been inside the object for longer than 5 seconds
  + OR apply a resistive force every 15 seconds, apply the force for 5 seconds
  + Always apply the resistive force for longer than
* Create a repelling force rather than adding a force to a different random point
  + As you get closer to the ball, the repelling force is harder
  + As you get further away from the ball, the repelling force gets smaller

Creating a repelling force exercise: 7/08/2023

* Create a force between the sin points that repel the haptic device away from the target object
  + This could be done by spawning circles between the 2 randomly generated points along the sin line that repel the haptic device
  + How can I vary the realism of the ball movement:
    - Vary the frequency
    - Vary the amplitude
    - Vary the phase: make the sine wave move

Make the ball change colour when its inside the target

Making the scene, just create a room

* Priority is to make sure the user won’t feel disorientated

**Experimental design:**

* Think about the instructions I will need to provide the user with
* Create a demo scene with no forces initially for the user to interact with first
* What messages will be shown
* UI where the user can put their ID to login

Process:

* Come up with a message script that explains the process of my study
  + Demo will be shown, focus on the target (blue bubble), focus on the endEffector which is what they will be controlling (white ball)
  + Include instructions on how the game will work, i.e 15 seconds intervals x 20x 3 different forces
  + Try move as close to the target as possible
  + Either attractive, repelling or no forces will be applied to the haptic device
  + Use of the haptic button to move through the messages, demo and then one last message after the demo that will say the game is starting on the next button press
* Experimental design
  + Game will last 15 seconds before resetting to the original position
  + This will happen 20 times, so the there will be 20 trials lasting 15 seconds
  + There will be 20 trials at attractive, repelling and no forces, so 60 trials total
  + There will be a break in between different force transitions
* Data will be collected on a csv file and analysed comparing the accuracy of the user when different forces are applied