Bachelor Informatica

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# A web-based patient-therapist platform for PCIT-VR

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CHAPTER 1

# Context

The environment on which this thesis is built is in fact multi-layered, something which is prevalent in the name "PCIT-VR". Broadly speaking there are two parts in play; parent-child interaction therapy (PCIT), and virtual reality (VR). It is apparent that PCIT plays in fields such as psychology and didactics, whereas VR has a clear foundation within computer science.

For this thesis, a general knowledge of how PCIT works is enough, as there has been extensive research regarding PCIT, and several theses have produced work related to using VR with PCIT, more of which will be elaborated on in the literature section. As such, the focus will be on improving the existing framework that allows for interaction with a VR based platform for therapists and patients.

PCIT is a therapy that aims to help treat children between the ages of 2 and 7 that have disruptive behaviour problems. It does so in two separate stages; the Child-Directed Interaction phase, and the Parent-Directed Interaction phase. While the CDI phase is more about praising good behaviour of the child and enforcing a better parent-child relationship, the PDI is more about changing structural behaviour; how a parent responds to the child, for example. This second part is what the aim for this thesis will be: the parent will be using the software in order to train themselves with the ideas they learned during PCIT.

The virtual reality aspect is based on using 360° video, which allows the user to freely look around, while remaining stationary to the camera's position. This is in contrast to other popular forms of VR based in 3D environments, where the user is free to move around the world *as well* as look around. However, as creating such 3D environments can become very complicated and time consuming, the option of 360° video allows for a more immersive experience than regular video, while remaining relatively cost-efficient to introduce.

This will be shaped by means of a web-app, which on the one hand will allow the therapist to create and edit 360° video, with the ability of using a nonlinear storyline, creating key choices to interact with, and other functionality which is important to PCIT (as will hopefully become evident soon following the technical PCIT-VR document), and on the other hand will provide the parent with an easy to use app which they can use to watch and interact with these 360° videos.

CHAPTER 2

# Literature

Previous work has shown how VR can be used for PCIT, and has elaborated on a web-based video editor which allows the user (therapist) to upload and edit 360° video footage. The current state allows for the uploading of clips, placing them on a timeline, trimming, adding interactive elements, previewing the video (without the ability to pan the image), and export the video to be used in separate VR software.

The works of importance to this thesis are those of Paul Schrijver, "The Application of Virtual Reality Technology for PCIT" (July 2018), and Alistair Geesing, "A web-based video editor for PCIT-VR" (July 2019). Schrijver's thesis shows the fact that VR can, in fact, be used to improve parent child interaction therapy. He created what can be thought of as a prototype 360° video, along with a prototype VR viewer, and evaluated the usability of the application by letting field specialists test out his prototype. This turned out to be a success, upon which Geesing's thesis builds. Having shown the usability of the VR software in terms of therapy, Geesing now proceeds in creating a web-based VR video editor. A great deal of work has been done by Geesing to allow the therapist proper control over the first part of Schrijver's research; creating the prototype 360° video. Some parts exist that have not yet been exposed to the user, such as dynamic range compression for automatic volume balancing of audio, scaling the video timeline, and showing a timecode when hovering over parts of the timeline. Other parts are proposed but have not yet been implemented, for example the panning of 360° video within the web browser, and showing thumbnails of clips.

CHAPTER 3

# Research question

*"How can the current state of the 360 video framework be improved and expanded upon, such that the usability and functionality are increased for therapist and patient?"*

1. This will provide a framework that allows the therapist to create more interactive videos, with a nonlinear timeline, while at the same time remaining intuitive and simple to use. Moreover, by allowing the therapist to pan the video in-browser, intuitiveness should increase.

2. Next to this, the same framework should provide for a basis on which the parent's video viewer can be built. By enabling use of the same platform as the therapists', it should also be made possible to easily share videos from therapist to parent, while at the same it must be noted that it is incredibly important to remain confidentiality of all records, something that is even more important when using a web-based framework as proposed.

By exposing already existing functionality to the user by building user interface elements to interact with, as well as implementing a connection to the back-end that will be developed by Mick Vermeulen, the usability and functionality can be improved upon, respectively.

CHAPTER 4

# Methods

In order to build upon the pre-existing framework, it is imperative that a proper understanding of the current state-of-the-art exists.

- To achieve this, an extensive literature research will be concluded regarding the VR framework, as well as a more general overview of how PCIT works, and how VR could be used to complement this.
- In addition, the source code from Alistair Geesing will be acquired from the UvA's Linux servers, analysed, and executed, in order to gain a better understanding of the user's perspective, and the currently existing software.

To then work upon the existing software, a simplified form of Scrum will be used for the development cycle. In order to keep track of progress, as well as maintaining a dynamic development of the software, the combination of daily standups and scrum boards will be used.

- As Scrum is typically used in multi-person settings, it is important to understand how it will be used. In normal daily standups, colleagues share progress with one another, sharing how the last day's progress went, and what went wrong, and how this will reflect in today's work. By doing this alone, the idea of sharing progress with colleagues is gone, but it will still incite the reflection upon what has been done, and what still needs to be. These daily standups will be documented, and will consequently form log entries.

  In order to keep the time required for daily standups to a minimum, attempts will be made to record these small (several minute) sessions every day, and automatically transcribe them in order to make a simple log entry (that could always be fleshed out later).
- The scrum boards will form a dynamic timetable, allowing the tracking of current tasks and their progress. This can initially be based upon the planning proposed later in this document.

While working on the software, there will clearly remain literature research on a per-needed basis.

As the main focus for this thesis is on improving functionality and ease-of-use, there also needs to be extensive research in user experience, allowing for an educated approach to developing more of the user interface.

The development is coupled together with Mick Vermeulen, who will be working on the back-end related to this project. Main parts of (back-end) functionality will be built by him, such as an API for editing video, which will then be implemented into the frontend by myself to be fully functional for the user. While nothing is set in stone, me and Mick will be interchanging information frequently, attempting to plan our work ahead so that any dependencies can be resolved. For example, this means that while the editing API is not yet done, it will be hard to create a user interface for it. As such, our planning now coincides so that the (back-end) API for video editing will be done by week 4, after which the actual implementation can occur.

CHAPTER 5

# Planning

A critical dependency that could prove a problem is the fact that Mick Vermeulen is working on the back-end of the project. Given that the front-end has no real functionality without a proper back-end, this evidently is a critical point that cannot be simply disregarded. However, as there already exists some form of back-end, it could be possible to fall back on the older prototype if need be. It is highly likely that some form of functionality is added which requires some change on the back-end, which could eventually lead to missing functionality altogether. In this case, depending on the situation, it could be viable to proceed with what progress Mick has made, making some side-tracked progress, or to see whether this functionality could be emulated in order to provide a proof-of-concept that can be further expanded upon.

Following is a Gantt chart that shows the entire planning for this thesis.