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# CLOSED LOOP VIRTUAL REALITY FOR THE TREATMENT OF PHOBIAS

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## Bachelor Thesis

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# Abstract

- a brief mentioning of the study and its attempt to treat acrophobia with a virtual environment
- theme of this thesis: the design of a VR fit to treat patients
- goal: evaluate the worth of a VR therapy by measuring changes in the subjects stress level(before/after)

# Zusammenfassung

translation of abstract

# Declaration

I hereby declare that I have authored this work independently, that I have not used other than the declared sources and resources, and that I have explicitly marked all material which has been quoted either literally or by content from the used sources. This work has neither been submitted to any audit institution nor been published in its current form.

Saarbrücken, January 24, 2018

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Dominik Limbach

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# 1 Introduction

## 1.1 Motivation

- restrictions through phobias in daily life
- subject of the study, reduction of acrophobia
- the use a virtual environment can have in treating acrophobia
- benefits of VRET over in vivo therapy (safety,one-fits all)

## 1.2 Acknowledgments

give thanks to

- Prof. Dr.Dr. D.J.Strauss
- Dr. L. Haab
- everyone else contributed

## 1.3 Theoretical Background

### 1.3.1 Acrophobia

definition of fear and specific phobias,prevalence, evolutionary purpose(fight or flight),connection fear to stress

### 1.3.2 Stress

definition of stress, ways of stress perception (eustress and distress)



### 1.3.3 Galvanic Skin Response

short explanation, influences (autonomic nervous system), role as method to register physiological correlates of mental states like stress

- illustration of a typical gsr signal and explanation of its components (graph, peaks etc.)
- how and where is gsr usually measured? why there?

### 1.3.4 Exposure Therapy

what is exposure therapy?

when is it used?

how is it done?

what is needed for it to be successful?

how effective is it?

## **2 Problem Analysis and Goals**

### **2.1 State of the Art**

how gsr is currently used in scientific experiments

## 2.2 Recent Advances in Research

recent progress and attempts in decomposition algorithms of gsr signals

## **3 Materials and Methods**

### **3.1 Materials**

mention the SNNU and the lab where the study takes place

#### **3.1.1 Setup**

- description of the therapy setup
- graphic 1, shows a patient inside the defined treatment area, wearing VR-Headset, the lighthouse system, eeg and gsr sensors, connection to the pc controlled by the physician

#### **3.1.2 Procedure(Paradigm)**

- how many subjects did participate?
- which tasks did the patients fulfill? (cross the bridge etc.)
- duration of the experiment
  
- description of the virtual environment, the procedure (baseline measurement, VRET in detail)
- pictures that show the VE in it's starting state as well as it's therapy state (descended floor)
- description of how the VR is controlled by the user(which parameters can be influenced)

### **3.2 Methods**

- main objective is the measurement of gsr during the therapy and the evaluation of the gsr data concerning the stress of the patient during the therapy
- how is the gsr information processed and evaluated?

how is it presented to the user?

- description of how the VR is controlled by the user(which parameters can be influenced)
- graphic of control chain

## 4 Results

## 5 Discussion

## 6 Conclusions and Future Work



## A Tables and Measurement Results

Table A.1: Surgical needle sizes in Gauge<sup>1</sup>

Size [G]	Diameter [mm]	Colour code
10	3.4	brown-olive
11	3.0	yellow-green
12	2.7	lightgray
13	2.4	purple
14	2.1	lightgreen
15	1.8	blue-gray
16	1.6	white
17	1.4	violet
18	1.2	pink
19	1.1	ivory
20	0.9	yellow

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<sup>1</sup>see [1]

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# Bibliography

- [1] Sigma-Aldrich Co. LLC. Syringe Needle Gauge Chart, June 1, 2015.  
URL [http://www.sigmaaldrich.com/chemistry/stockroom-reagents/  
learning-center/technical-library/needle-gauge-chart.html](http://www.sigmaaldrich.com/chemistry/stockroom-reagents/learning-center/technical-library/needle-gauge-chart.html).