

**Development of a  
virtual audience concept for  
public speaking training in  
immersive virtual environments**

Ana-Despina Tudor



Universitätsverlag Ilmenau  
2016

# Impressum

## **Bibliografische Information der Deutschen Nationalbibliothek**

Die Deutsche Nationalbibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Angaben sind im Internet über <http://dnb.d-nb.de> abrufbar.

Diese Arbeit hat der Fakultät für Wirtschaftswissenschaften und Medien der Technischen Universität Ilmenau als Dissertation vorgelegen.

Tag der Einreichung: 3. Juni 2015  
1. Gutachterin: Prof. Dr. Nicola Döring  
(Technische Universität Ilmenau)  
2. Gutachter: Prof. Dr. Wolfgang Broll  
(Technische Universität Ilmenau)  
3. Gutachterin: Prof. Dr. Line Tremblay  
(Laurentian University of Sudbury, Canada)  
Tag der Verteidigung: 09. November 2015

Technische Universität Ilmenau/Universitätsbibliothek

### **Universitätsverlag Ilmenau**

Postfach 10 05 65  
98684 Ilmenau  
[www.tu-ilmenau.de/universitaetsverlag](http://www.tu-ilmenau.de/universitaetsverlag)

### **Herstellung und Auslieferung**

Verlagshaus Monsenstein und Vannerdat OHG  
Am Hawerkamp 31  
48155 Münster  
[www.mv-verlag.de](http://www.mv-verlag.de)

**ISSN** 1865-3804 (Druckausgabe)  
**ISBN** 978-3-86360-146-1 (Druckausgabe)  
**URN** urn:nbn:de:gbv:ilm1-2015000709

# Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	Relevance of research	5
1.2	Chapter overview	6
<b>2</b>	<b>Audience research model for communication training in virtual reality</b>	<b>8</b>
<b>2.1</b>	<b>Communication skills</b>	<b>9</b>
2.1.1	Introduction . . . . .	9
2.1.2	Oral communication styles . . . . .	10
2.1.3	Communication skills definition . . . . .	11
2.1.4	Communication skills training . . . . .	13
2.1.5	Communication within and across disciplines . . . . .	14
2.1.6	Communication skills for state and trait apprehension . . . . .	16
2.1.7	Summary . . . . .	17
<b>2.2</b>	<b>Virtual environments and applications in communication training and treatment</b>	<b>18</b>
2.2.1	Introduction . . . . .	18
2.2.2	Immersive virtual environments . . . . .	19
2.2.3	Concepts and definitions . . . . .	22
2.2.4	The role of immersion and presence in virtual reality applications . . . . .	28
2.2.5	Speech anxiety treatment in virtual reality . . . . .	33
2.2.6	Virtual humans in speech anxiety treatment applications . . . . .	36
2.2.7	Summary . . . . .	41

<b>2.3</b>	<b>Communication training in virtual reality: Audience research model proposal</b>	<b>43</b>
2.3.1	Audience centrality . . . . .	44
2.3.2	Research model for a virtual audience . . . . .	46
2.3.3	Summary . . . . .	50
<b>3</b>	<b>Audience characteristics research study</b>	<b>51</b>
<b>3.1</b>	<b>Introduction to audience characteristics</b>	<b>52</b>
<b>3.2</b>	<b>Theoretical background on real and virtual audiences</b>	<b>54</b>
3.2.1	Audience customization . . . . .	55
3.2.2	Interaction . . . . .	59
3.2.3	Group dynamic . . . . .	63
3.2.4	Summary . . . . .	67
<b>3.3</b>	<b>Methodology</b>	<b>69</b>
3.3.1	Research questions . . . . .	70
3.3.2	Expert interview guideline . . . . .	72
3.3.3	Sample . . . . .	73
3.3.4	Data collection and content analysis . . . . .	75
3.3.5	Ethical considerations . . . . .	77
<b>3.4</b>	<b>Results</b>	<b>78</b>
3.4.1	Audience customization - Familiarity . . . . .	80
3.4.2	Interaction . . . . .	85
3.4.3	Group dynamic . . . . .	98
3.4.4	Real life training . . . . .	100
3.4.5	Virtual audience characteristics . . . . .	110
3.4.6	Virtual audience setup . . . . .	120
3.4.7	Limitations and risks in virtual audience design . . . . .	122
<b>3.5</b>	<b>Conclusion</b>	<b>124</b>
3.5.1	Summary of findings . . . . .	127
3.5.2	Discussion . . . . .	132
3.5.3	Limitations and outlook . . . . .	135

<b>4</b>	<b>Audience behaviors research study</b>	<b>137</b>
<b>4.1</b>	<b>Introduction to audience behaviors</b>	<b>138</b>
<b>4.2</b>	<b>Theoretical background on nonverbal audience behaviors</b>	<b>141</b>
4.2.1	Audience definition . . . . .	141
4.2.2	Audience behaviors . . . . .	142
4.2.3	Attentive audiences . . . . .	144
4.2.4	Inattentive audiences . . . . .	147
4.2.5	Neutral nonverbal behaviors . . . . .	150
4.2.6	Group dynamic . . . . .	151
4.2.7	Body movements analysis . . . . .	152
4.2.8	Nonverbal behavior multimodality . . . . .	154
4.2.9	Summary . . . . .	155
<b>4.3</b>	<b>Methodology</b>	<b>156</b>
4.3.1	Research questions . . . . .	156
4.3.2	Codebook and code sheet development . . . . .	157
4.3.3	Sample . . . . .	161
4.3.4	Data collection . . . . .	161
4.3.5	Coding interface . . . . .	162
4.3.6	Coding rules . . . . .	163
4.3.7	Inter-rater agreement . . . . .	164
4.3.8	Ethical considerations . . . . .	165
<b>4.4</b>	<b>Results</b>	<b>166</b>
4.4.1	Attentiveness and inattentiveness . . . . .	167
4.4.2	Activation . . . . .	174
4.4.3	Group dynamic . . . . .	175
4.4.4	Further characteristics of attentive and inattentive behaviors . . . . .	176
<b>4.5</b>	<b>Conclusion</b>	<b>189</b>
4.5.1	Summary of findings . . . . .	190
4.5.2	Discussion . . . . .	193
4.5.3	Limitations and outlook . . . . .	195

<b>5</b>	<b>Virtual audience design concept</b>	<b>198</b>
<b>5.1</b>	<b>Introduction to the design concept</b>	<b>199</b>
<b>5.2</b>	<b>Theoretical background on virtual environments design</b>	<b>201</b>
5.2.1	Technical affordances . . . . .	202
5.2.2	Skills transfer . . . . .	204
<b>5.3</b>	<b>Methodology</b>	<b>207</b>
5.3.1	Design models . . . . .	207
5.3.2	Content creation . . . . .	209
<b>5.4</b>	<b>Results</b>	<b>211</b>
5.4.1	Audience concept . . . . .	211
5.4.2	Audience scenario . . . . .	228
5.4.3	Summary . . . . .	244
<b>5.5</b>	<b>Conclusion</b>	<b>245</b>
<b>6</b>	<b>General discussion</b>	<b>247</b>
<b>6.1</b>	<b>The research model for a virtual audience</b>	<b>250</b>
6.1.1	Audience . . . . .	251
6.1.2	Virtual environments . . . . .	253
6.1.3	Interaction . . . . .	254
6.1.4	Communication training context . . . . .	256
6.1.5	Audience design concept and scenario . . . . .	257
<b>6.2</b>	<b>Limitations</b>	<b>259</b>
<b>6.3</b>	<b>Outlook</b>	<b>261</b>
	<b>References</b>	<b>264</b>