

Virtual Tales: Narrative Virtual Reality for Patient Education

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Motivation

Problems of patient education (using information sheets):

- many incomprehensible technical terms
- irrelevant information due to general applicability
- doctors have little time to answer questions

Narrative Visualization:

- uses storytelling methods to convey complicated scientific facts to non-experts^[1]
- promising approach to convey important information in a patient-friendly way

Virtual Reality:

- enables various interactions
- promotes a sense of presence
- may help patients feel closer to a story

Template Structure

We identified two main challenges for the creation of Narrative Virtual Reality Stories:

- **narrative paradox:** challenge of author influence vs. free exploration enabled by interaction^[1]
- **loss of frame:** a scene cannot be framed like in theatre or movies but needs attention cues instead^[2]

We introduce a template structure consisting of two scene types:

CINEMATIC SCENES

- convey all **necessary information**
- no user interaction
- unskippable
- full **control** granted to the **author**
- use of narrative elements to **pique interest**

INTERACTIVE SCENES

- convey **additional information**
- full use of **user interaction**
- parts skippable
- simple design
- **reuse of designs** (e.g. interactive stations)

How is the narrative paradox solved?

- either free exploration or full author control for each scene
- scene type determined by importance of information
- easy & intuitive way to solve the narrative paradox

How is the loss of frame solved?

- focus lies on story or interaction (is never split)
- simple design amplifies given attention cues
→ no need for a frame, as focus can be directed anyways

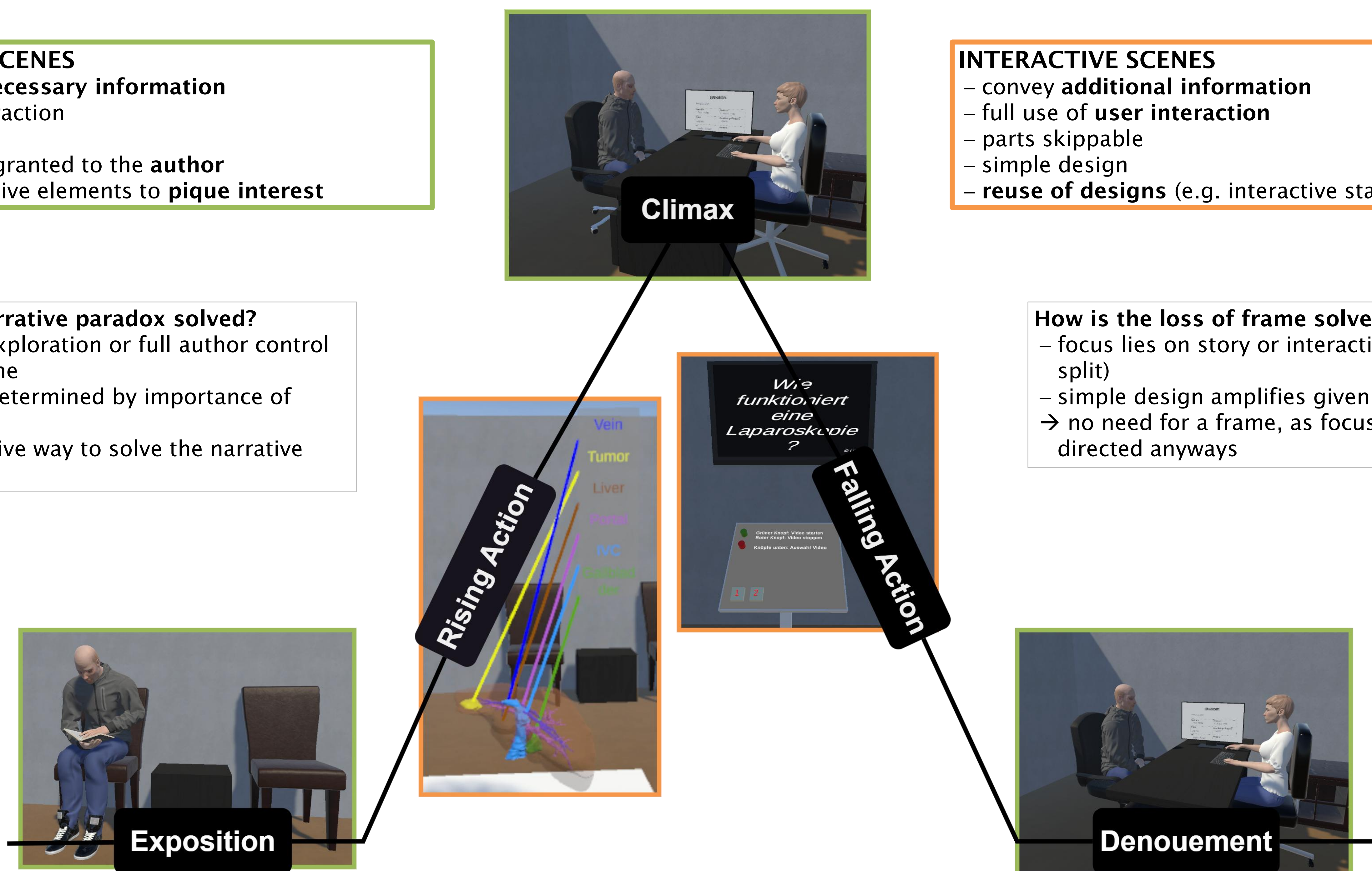


Figure 1: Structure of the Liver Resection Prototype using the introduced template structure with cinematic (green) and interactive (yellow) scenes.

Prototype

As proof of concept we created a prototype for patient education regarding liver tumors, using Unity.

Story arc of the prototype:

- follows Freytag's Pyramid
- **Exposition:**
 - introduction of patient
 - cinematic scene
- **Rising Action:**
 - introduction to the liver & it's functions
 - interactive scene
- **Climax:**
 - doctor's consultation
 - conclusion: liver resection necessary
 - cinematic scene
- **Falling Action:**
 - further information to liver resections
 - interactive scene
- **Denouement:**
 - resolution in form of a positive check-up
 - cinematic scene

Results

Feasibility study (n = 9):

- Focus on: **general usability** (SUS)^[3], **learning effect** (questions regarding the information given inside the prototype application), our **template design** and **qualitative feedback**
- Qualitative feedback:
 - Positive: desired features of the application (e.g. understandable language, interactive, plausible)
 - Negative: realted to yet incomplete parts of the prototype (e.g. depiction of characters)

The results show the **potential of our approach**.

Characteristics	Value
Age	
– 20 – 30 years	7
– 50 – 60 years	2
VR experience	
– None	2
– < 15 times	3
– > 15 times	4
Medical background (Likert scale)	
– 1	3
– 2	2
– 3	1
– 4	2
– 5	2
Experience with 3D visualization (Likert scale)	
– 1	2
– 2	2
– 3	0
– 4	4
– 5	1

Table 1: Demographic data of study participants.

SUS:	Learning Effect
– average score: 79.7	– possible score: 23 points
– standard deviation: 8.0	– average score before using the application: 12.67 (11*)
	– average score after using the application: 21 (20.4*)
	* barring the participants with a medical background

Table 2: Study results regarding SUS & learning effect.

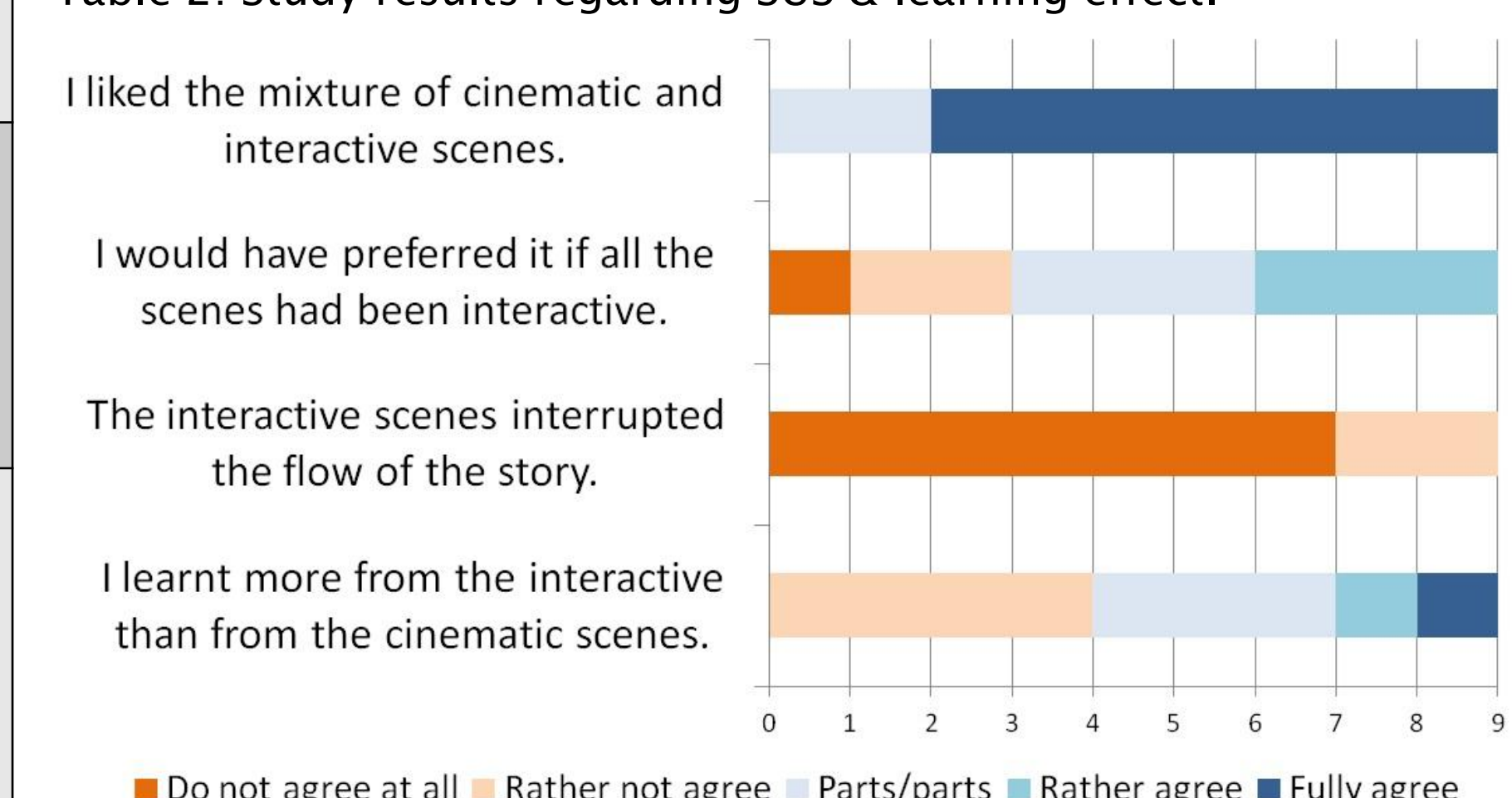


Figure 2: Study results regarding the template/scene design.

References:

- [1] SEGEL E., HEER J.: Narrative visualization: Telling stories with data. IEEE Trans Vis Comput Graph 16, 6 (2010), 1139–1148
- [2] TRICART C.: Virtual reality filmmaking: Techniques & best practices for VR filmmakers. Taylor & Francis, 2017
- [3] BROOKE J.: Sus-a quick and dirty usability scale. Usability Evaluation in Industry 189, 194 (1996), 4–7