

Approaches for Assessing the Simulator Sickness



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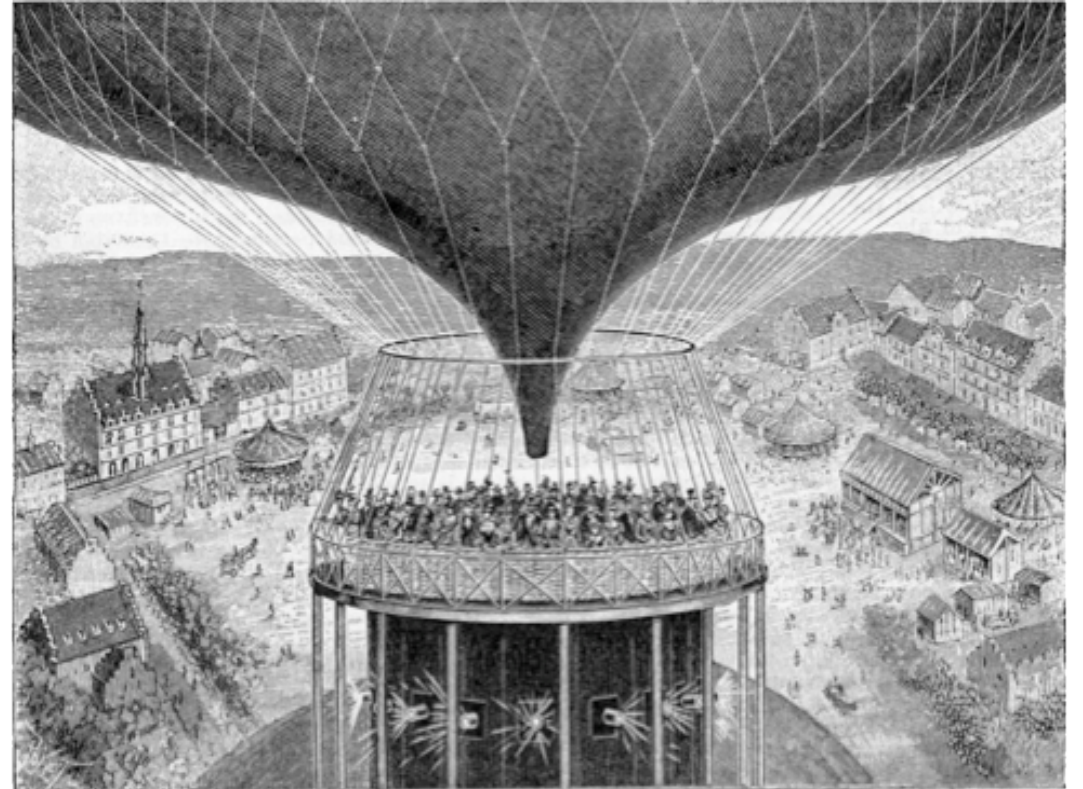
Introduction/Motivation

- What is Simulator Sickness?
 - Sensory and Perceptual mismatch between visual and vestibular system
- Why do we need to assess Simulator Sickness?
- Some users are more Sensitive
 - Symptoms occur both, during and after participation
- Implications on:
 - Health and Safety
 - User Experience
 - System Effectiveness
 - Technology Acceptance



In 1897 - Cineorama Projection

- Premiered at the Paris Exposition
- Used 10 synchronized projectors to arrange in a full 360° circle
- A viewing platform dressed like a hot air balloon, large enough to hold 200 people, was in the center
- Closed after only three days due to the extreme heat from the projectors



Motion Sickness vs Simulator Sickness or Cybersickness

- Motion, simulator and cyber sickness are similar in many ways but are very different in the way which they are caused

- Motion Sickness is caused by real motion on land, at sea, and in air.

- Simulator Sickness/Cybersickness:
Sub-type of motion sickness
- Triggered only by visual stimuli

Motion Sickness Susceptibility Questionnaire (MSSQ)

Over last 10 years, how often you felt sick or nauseated (tick boxes):

- MSSQ scoring index, provided more objective measure of motion sickness susceptibility
- Index reflected motion sickness history susceptibility of individuals based on their travelling experience
- Higher the score, more susceptible is the individual to motion sickness

	Not Applicable	Never Felt Sick	Rarely Felt Sick	Sometimes Felt Sick	Frequently Felt Sick
Cars					
Buses					
Trains					
Aircraft					
Small boats					
Ships					
Swings in playgrounds					
Roundabouts in playgrounds					
Big Dippers, funfair rides					

Assessment of Simulator Sickness in Virtual Environment

Long Simulator Sickness Questionnaire

1. General Discomfort

None	Slight	Moderate	Severe

2. Fatigue

None	Slight	Moderate	Severe

3. Headache

None	Slight	Moderate	Severe

4. Eye Strain

None	Slight	Moderate	Severe

5. Difficulty Focusing

None	Slight	Moderate	Severe

6. Salivation Increasing

None	Slight	Moderate	Severe

7. Sweating

None	Slight	Moderate	Severe

8. Nausea

None	Slight	Moderate	Severe

9. Difficulty Concentrating

None	Slight	Moderate	Severe

10. Fullness of the Head

None	Slight	Moderate	Severe

11. Blurred Vision

None	Slight	Moderate	Severe

12. Dizziness with Eyes Open

None	Slight	Moderate	Severe

13. Dizziness with Eyes Closed

None	Slight	Moderate	Severe

14. Vertigo

None	Slight	Moderate	Severe

15. Stomach Awareness

None	Slight	Moderate	Severe

16. Burping

None	Slight	Moderate	Severe

Categorization of Simulator Sickness Symptoms

Nausea	Oculomotor	Disorientation
General Discomfort	General Discomfort	Difficulty Focusing
Increased Salivation	Fatigue	Nausea
Sweating	Headache	Fullness of Head
Nausea	Eyestrain	Blurred Vision
Difficulty concentrating	Difficulty Focusing	Dizzy (Eyes open)
Stomach Awareness	Difficulty concentrating	Dizzy (Eyes closed)
Burping	Blurred Vision	Vertigo
[1]	[2]	[3]

Measurement of Simulator Sickness

- $N = [1] * 9.54$
- $O = [2] * 7.58$
- $D = [3] * 13.92$
- $TotalScore = ([1] + [2] + [3]) * 3.74$

Short Simulator Sickness Question

- This below question shall be asked from subjects and MOS would be calculated.

How is the level of dizziness or nausea during VR viewing experiment on the scale from 1 to 5?

Absolutely not dizzy	Not Dizzy	Slightly dizzy	Dizzy	Very Dizzy
1	2	3	4	5

- Use case: To analyse simulator sickness based on content type

Conclusion

- No clear scenarios defined under which long or short SSQ should be used
- Based on our analysis:
 - Long SSQ
 - Should be used for duration of videos > 30 s
 - Can be applied post test session comprising of multiple videos
 - Short SSQ
 - Could be asked from subjects after every PVS with duration ≤ 30 s
 - Not appropriate for in detailed analysis

Thanks 😊
Questions?

