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Fidelity in Virtual Reality

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Capt.
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Why are we here and talking about fidelity

- Like many others, Royal Danish Defence College has had a focus on VR for the past 4-5 years.
- I/ITSEC 2023 – Thomas B Talbot
- Examples from the Danish defense and home guard:
  - Master's Thesis Holger Nordgaard Roland and Jonathan Navntoft Lundstrøm
  - On-site traffic control (Trafikregulering)

Fidelity

From the Latin term fidelis for “faithful”. Realism is a specific form of fidelity. **Therefore, a VR application can have low realism yet high fidelity to a reference frame other than the real world.**

https://arxiv.org/html/2402.16665v1

The game Beat Saber has a very low degree of realism, but the feeling for the user is High Fidelity. For example,

- The swords in have high fidelity to lightsabers from *Star Wars.*
- The haptic feedbacks when you break a box
- The realistic movements when you “fight” with the sword

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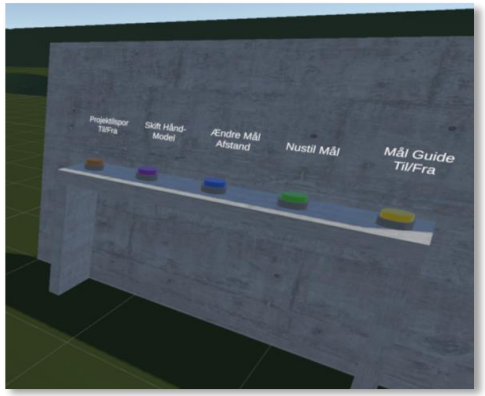
What can create the feeling of fidelity?

- Graphics
- Interactivity
- Realistic Physics
- Haptic feedback and sensory input
- Audio and sounds
- The storyline
- Multiplayer and collaboration



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VirtuVoce: Empowering voices with virtual reality

Ïo Valls-Ratés,
University of
Southern Denmark
(SDU), PhD.

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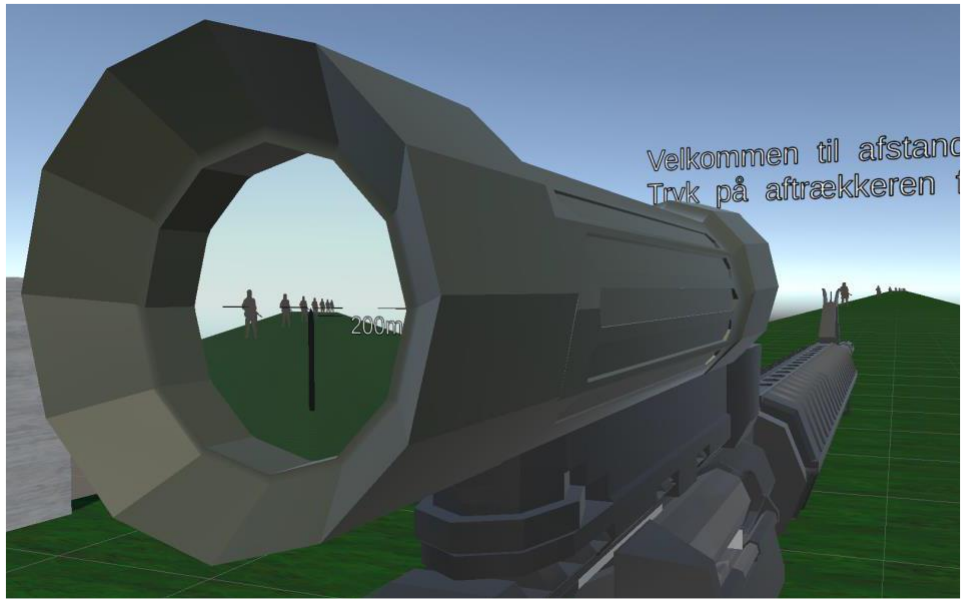
Your learning objectives is you guiding star!



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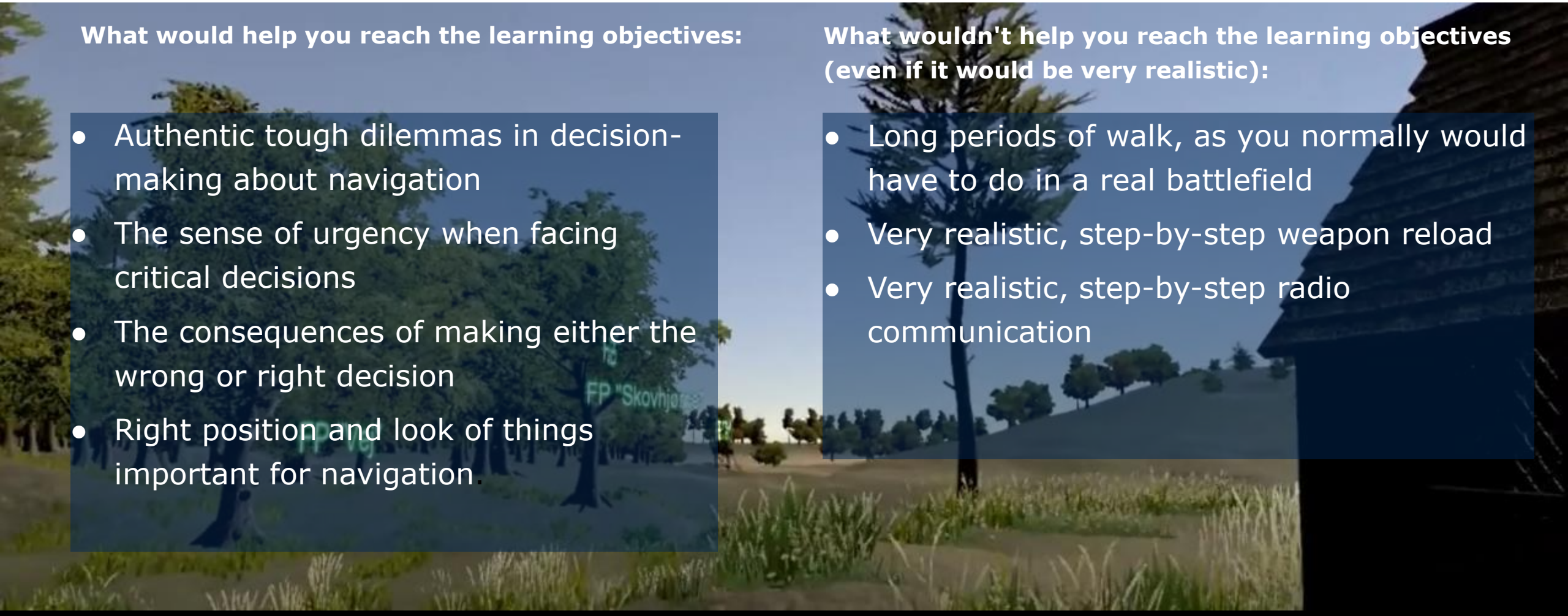
Fictive Example: Navigation training with VR

Learning objective: Decision making about navigation in the battlefield



What would help you reach the learning objectives:

- Authentic tough dilemmas in decision-making about navigation
- The sense of urgency when facing critical decisions
- The consequences of making either the wrong or right decision
- Right position and look of things important for navigation.

What wouldn't help you reach the learning objectives (even if it would be very realistic):

- Long periods of walk, as you normally would have to do in a real battlefield
- Very realistic, step-by-step weapon reload
- Very realistic, step-by-step radio communication

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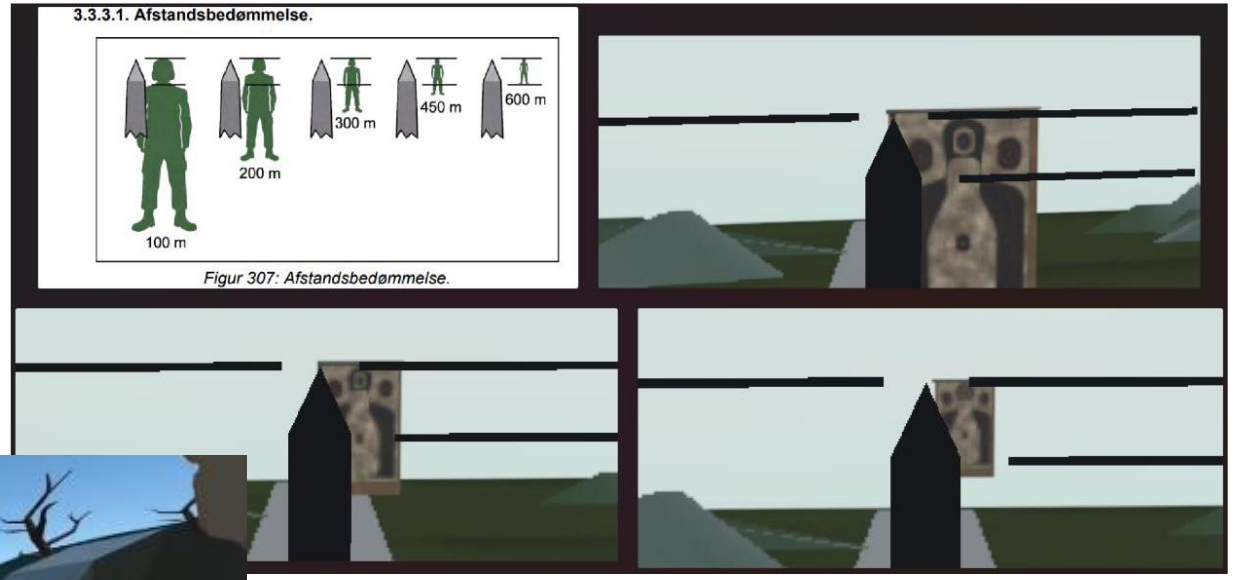
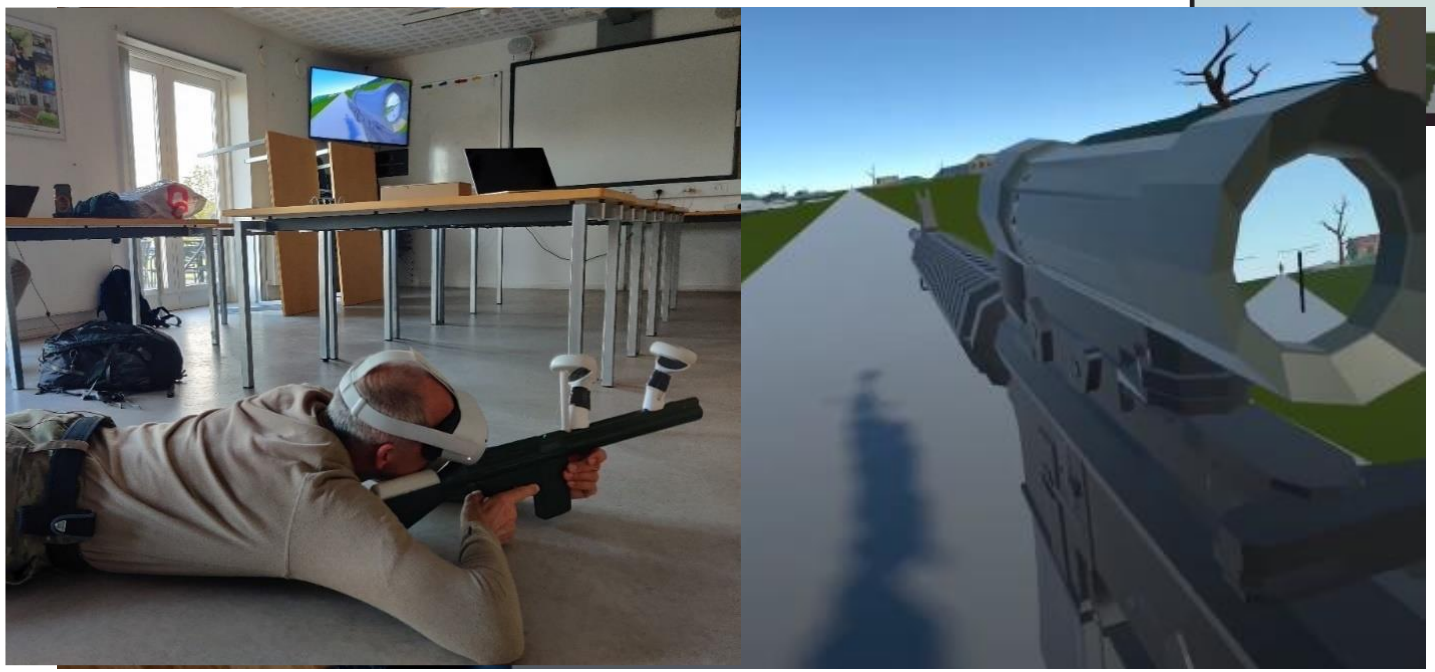
VR application: Distance estimation





Holger Nordgaard Roland
Jonathan Navntoft Lundstrøm

Master's Thesis, University of Southern Denmark
Spring 2023

Learning objectives: supporting soldiers in the Danish defence on how to estimate distances at the shooting range


Velkommen til afstandsbedømmelse.
Tryk på aftrækkeren for at begynde

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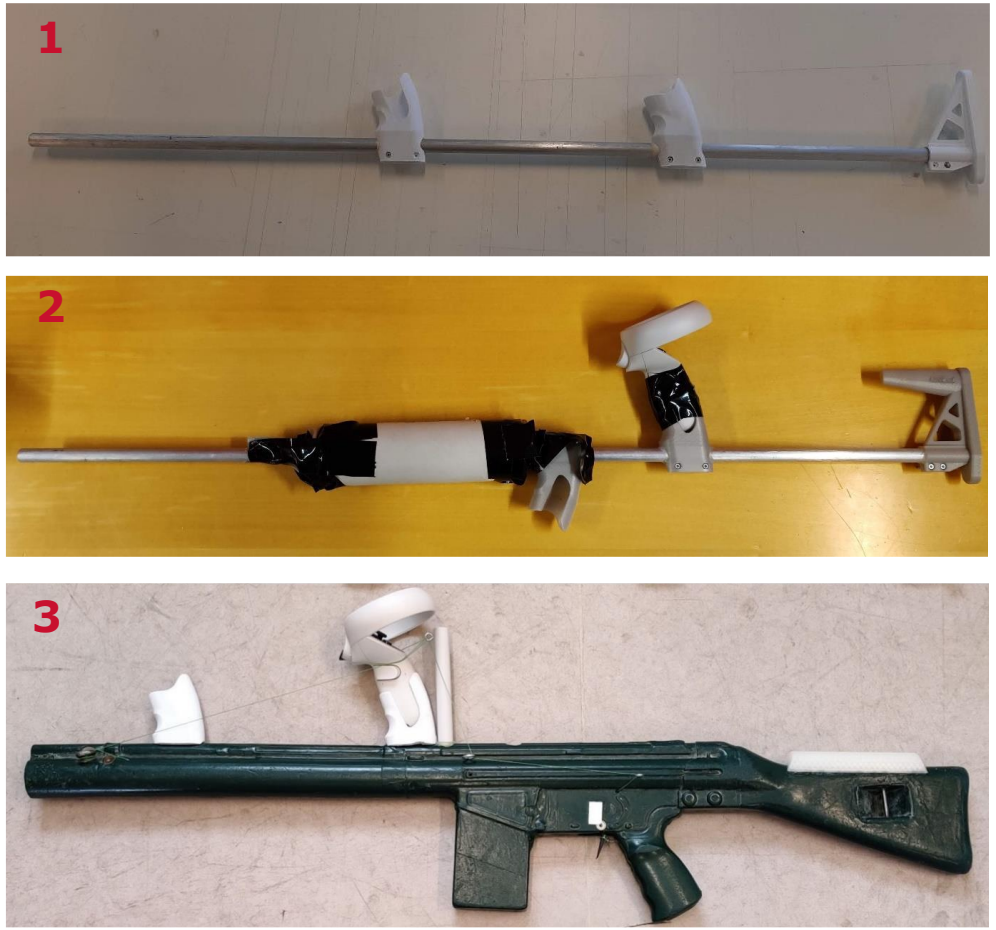
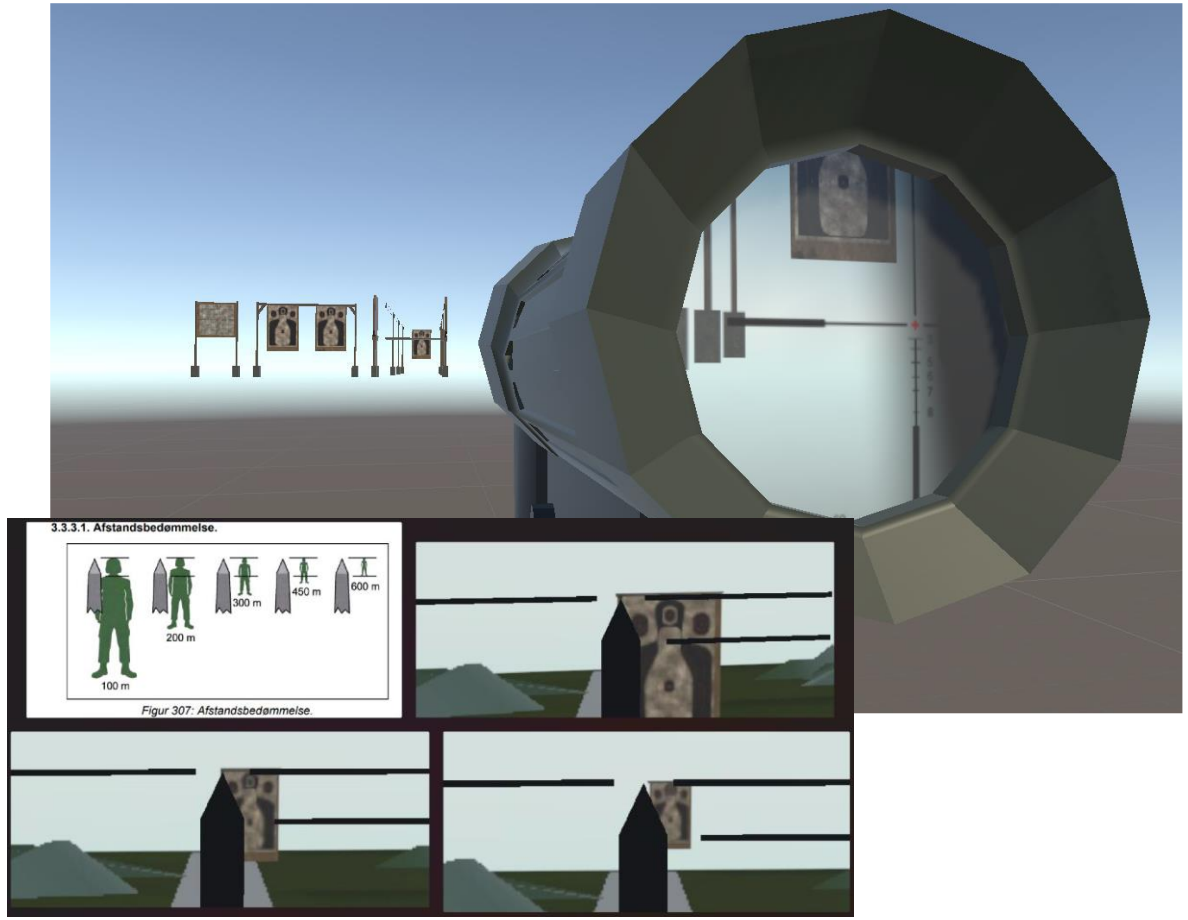
High fidelity

(1): Gunstuck!



(2): The Scope and it's behavior



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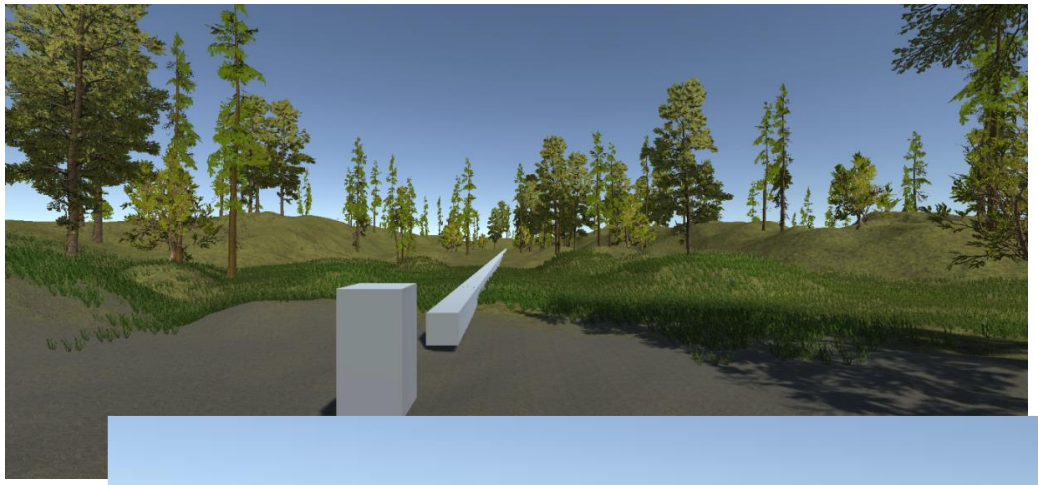
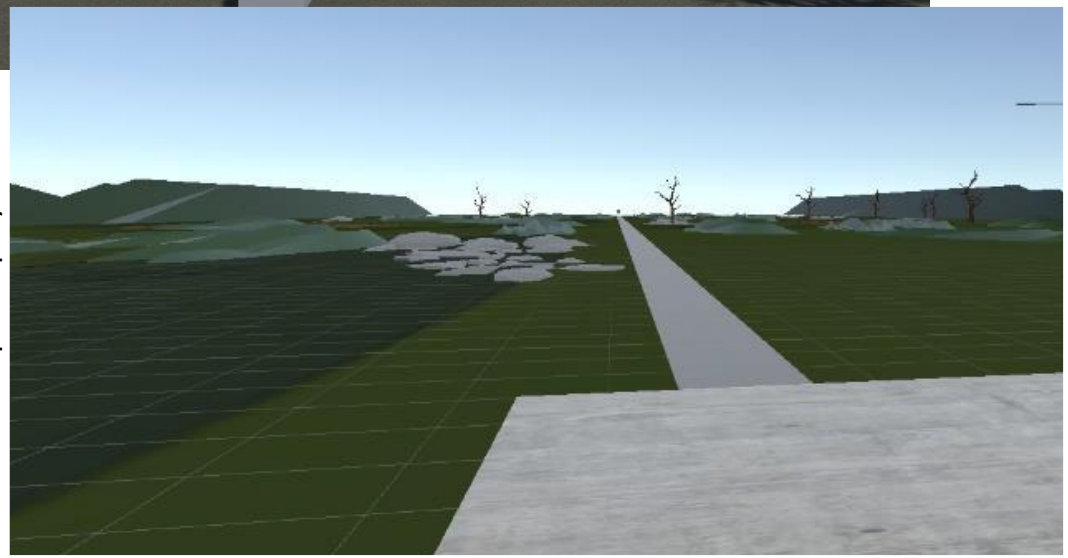
Low fidelity

(1): Graphics

First moch-up



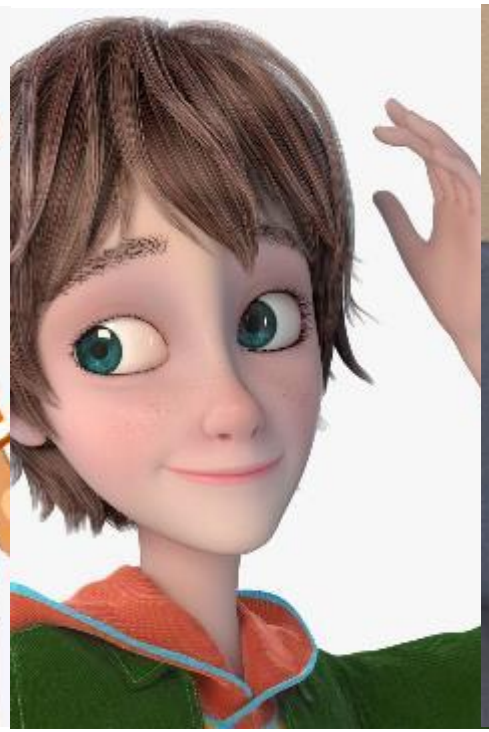
The test-setup low poly



(2): Assemble/disassemble the weapon

Avatars and characters

Credit: Thomas B Talbot



2D **3D** **PhoRe 3D**

Avatars and characters

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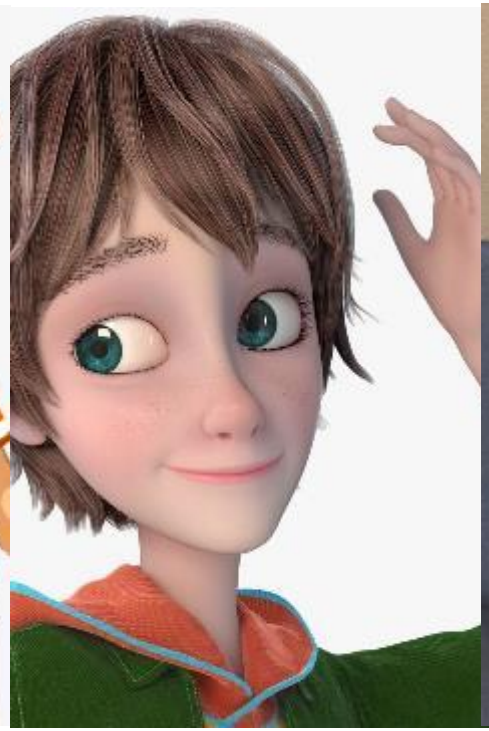
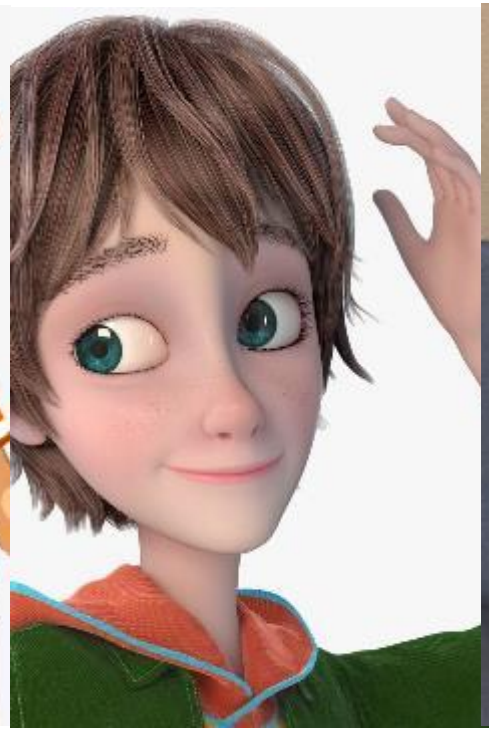


TIME & COST

Avatars and characters

Credit: Thomas B Talbot



EASE OF ANIMATION

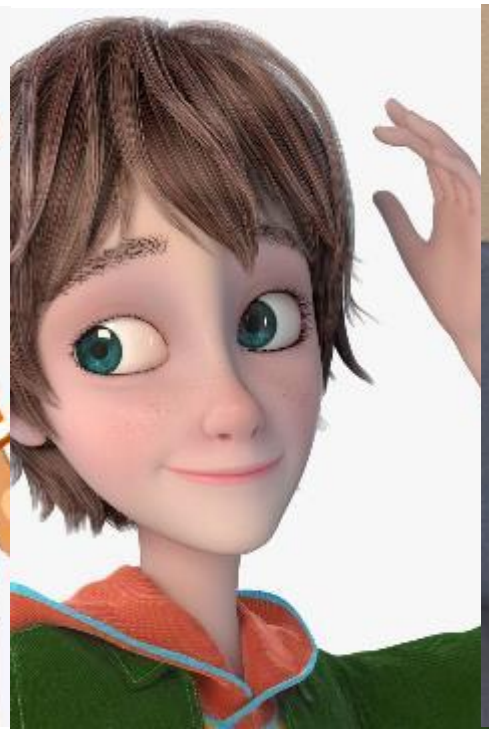
Avatars and characters

Credit: Thomas B Talbot

EXPRESSIVITY

Avatars and characters

Credit: Thomas B Talbot



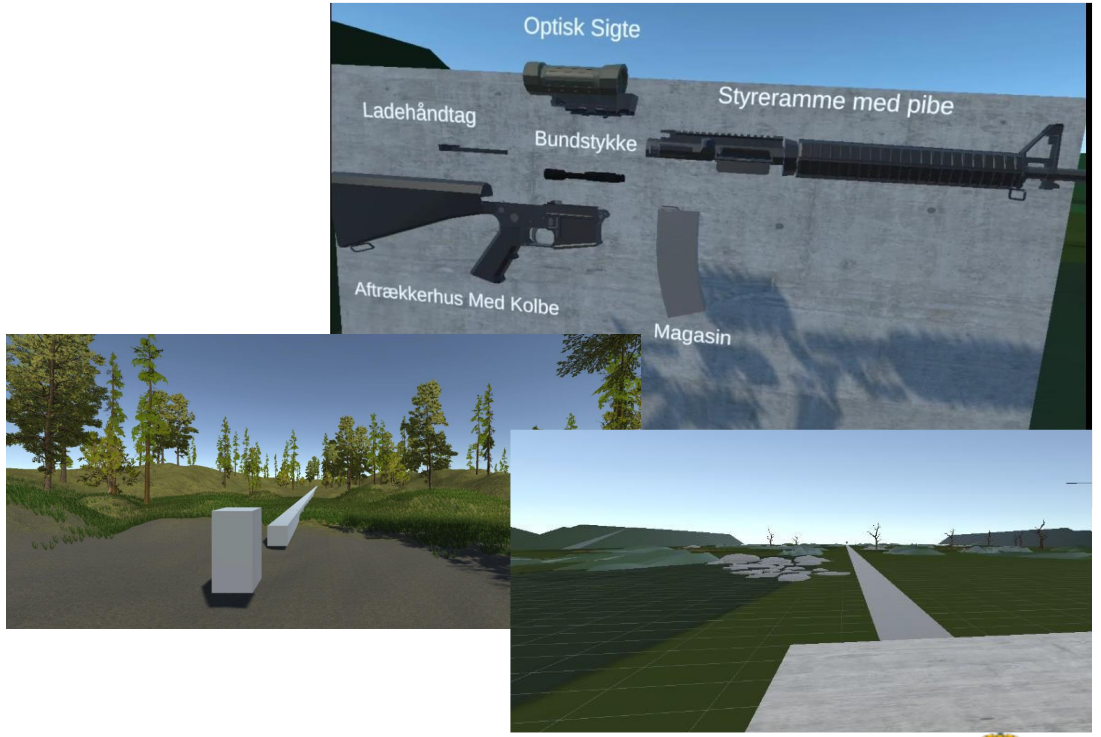
BANDWIDTH

CPU POWER

High fidelity can be crucial to achieve the learning objectives…

…but put your energy where it counts!

1. High fidelity the wrong places may increase costs without benefits
2. High fidelity the wrong places may go unnoticed or unused



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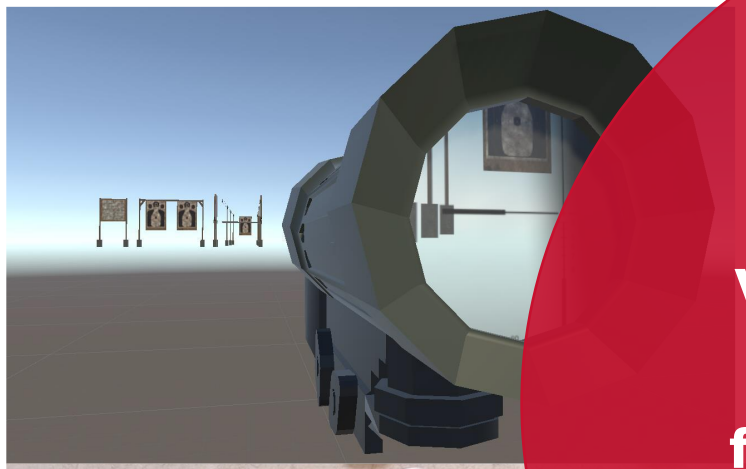
High fidelity can be crucial to achieve the learning objectives…

…but put your energy where it counts!

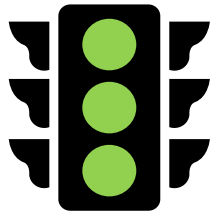
1. High fidelity the wrong places may increase costs without benefits
2. High fidelity the wrong places may go unnoticed or unused

Before embarking on any VR project, it's always wise to analyze where high fidelity is most essential for achieving the learning objectives.



Traffic control

Why traffic control??



- Traffic control was chosen as a case for the pilot project
  → What can VR do?

- The project should be evaluable on several parameters.

Muscle memory

Cost effective

Motivational learning

Fear free

End-user purpose

Price

- Oculus Quest 2 (20 pairs) 13.500 €
- Trafik Traffic control 24.000 €
- Develop time

Test

https://www.oculus.com/casting/

Where is high fidelity in this application?

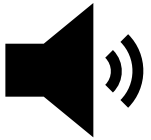
- Placement

- Arm movements

- The cars' speed

- The distance between the cars

What is Low fidelity in this application?



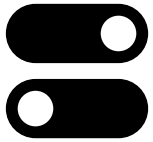
- Sound

- Graphics

- Environment not the normal cityscape, onlooker ○

- Constant cars, quantity of cars and Types of cars

- Types of people

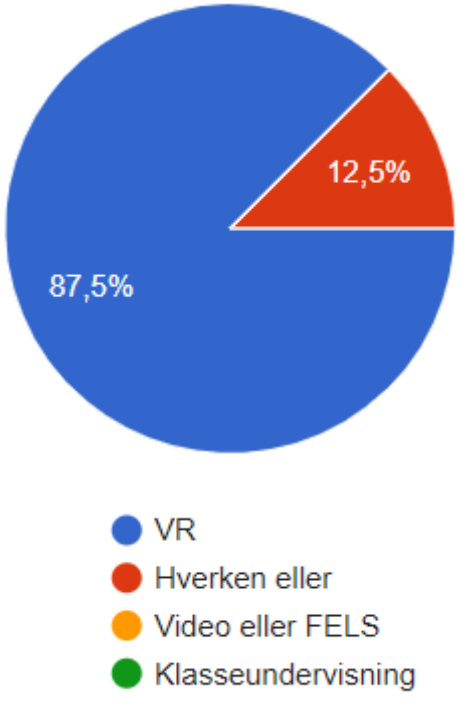


- Few functions

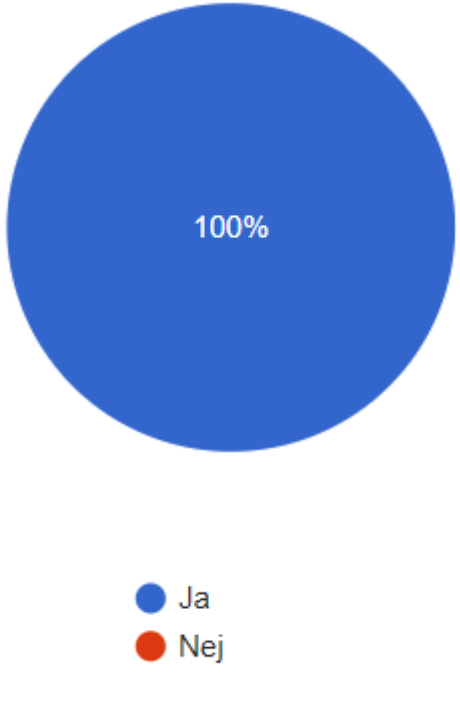
Is high fidelity equal to high learning??

**How would you rate the realism in the VR environment?
(1 is 'not at all realistic' and 5 is 'very realistic')
87,5 % Positive**

What would you prefer as a learning platform for traffic control?



Did you feel safe during the VR course?



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Would you like to try?

Come to this room at 17.40

Thank you! Questions?