XRDC

Building Virtual Reality for Public Safety

Sarah Hughes & Jack Lewis
NIST Public Safety Communications Research Division

Tuesday, October 15, 2019
3:00-3:40pm | Innovation Stage

Overview

- NIST PSCR's Context & Mission
- Why a UI/UX research portfolio?
- Prototyping Tech in VR
- Prize Competitions & Collaborations with Innovators
- Lessons Learned Developing VR for Public Safety
- Future Opportunities

PSCR Overview

Primary federal laboratory conducting research, development, testing, and evaluation for public safety communications technologies

PSCR Mission

PSCR is driven towards **advancing public safety communications technologies** by accelerating the adoption and implementation of the most critical communications capabilities **to ensure the public safety community can more effectively carry out their mission** to protect lives and property during day-to-day operations, large scale events, and emergencies.

PSCR Innovation Accelerator Program

Middle Class Tax Relief and Job Creation Act of 2012 passed. FirstNet is created.

Section 6303 provides $300M to NIST to perform critical R&D to ensure success of FirstNet.

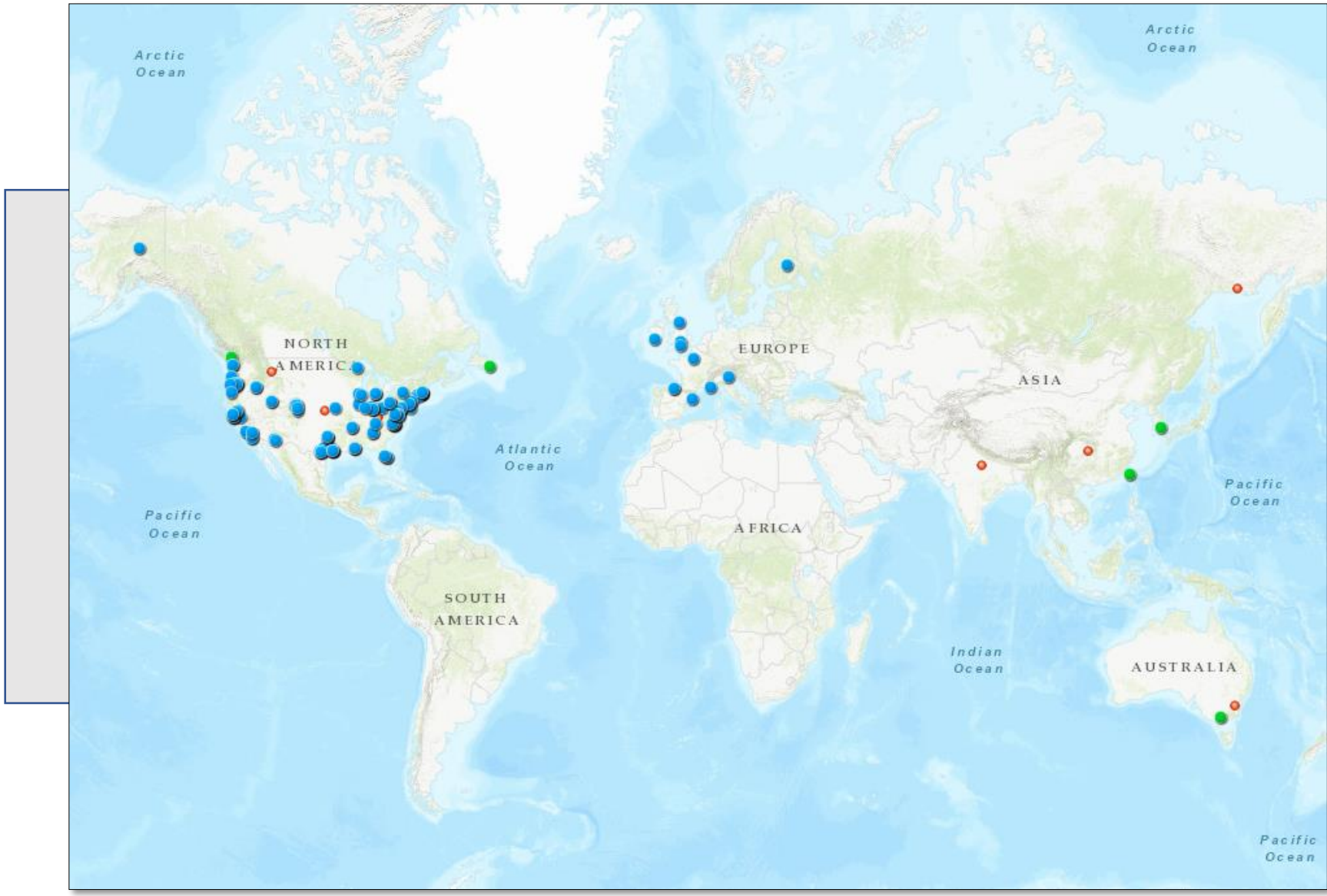
Focus on MCV & LMR to LTE.

Addressing R&D necessary to push beyond current broadband technology.

Working closely with Public Safety and FirstNet every step of the way.

Open Innovation program utilizing grants and awards to address high priority public safety R&D needs.

Pulling the future forward will require a worldwide effort.



We will get there through partnerships with researchers across sectors.

5 Key Research Areas

Cross Cutting Research Areas

UI/UX was identified as a priority research area for PSCR. Stakeholders from across the United States identified augmented reality (AR) and virtual reality (VR) as the R&D areas.

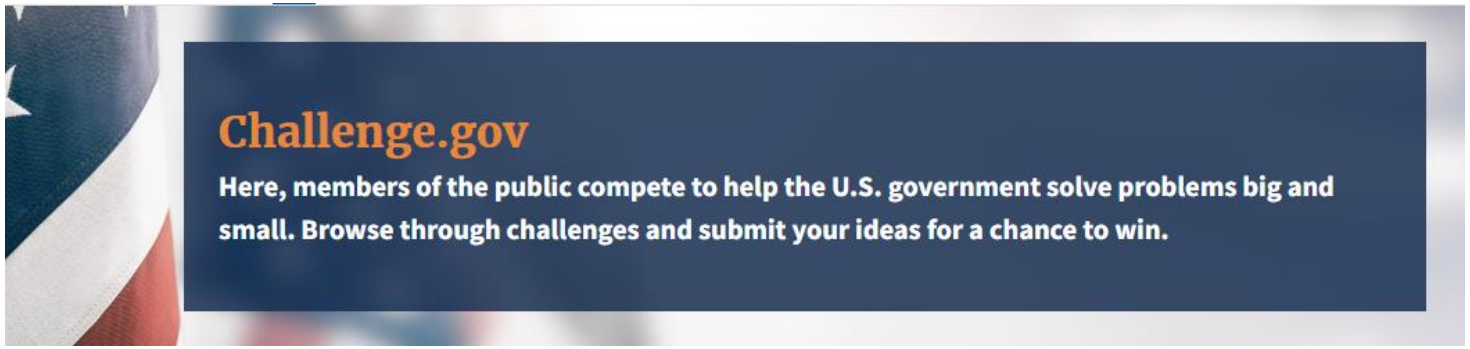
Internal Research

- User Experience Research and Testing Methodologies
  - Qualitative and Quantitative Surveys
  - Technology Needs and Wants for First Responders
- Virtual Reality and Augmented Reality Scenarios
  - Situational awareness, navigation, and patient monitoring

External Research

- **Improved Test, Development and Training for Public Safety**
- Immersive Environments; passive haptics & first responder props
- Physical Stress and Cognitive Load Research
- Improved Measurements
- Smart/AI User Interfaces

Internal Research. External Research. Prizes & Challenges.



NIST PSCR

2017 The Future of Public Safety Technology Challenge

Challenge: Submit a video concept that will inspire Americans to help develop the public safety technology of tomorrow.
Prize Purse: $100,000

2018 Virtual Reality Heads-Up Display Navigation Challenge

Challenge: Create a heads-up display (HUD) for first responders' navigation with unimpeded visual aids.
Finalists: 6
Prize Purse: up to $125,000

PSCR's Current UI/UX Related Challenges:

	Phase 1 Concept Paper	Phase 2 Teaming	Phase 3 Prototyping	Phase 4 VR Evaluation	Phase 5 Fire Nav. Course
Start:	March 18	May 13	May 24	July 9	September 10
End:	May 10	May 23	July 9 -11	September 10	November 15

www.publicsafetyhaptics.com

$425,000 in prizes;

Six finalists will compete on Nov. 5-6 at a fire training center in Colorado.

TECH TO PROTECT

www.techtoprotect.org

$2.2M in prizes; Participate in-person in 6 cities Nov. 1-2 or online until November 15th

- **PSCR's Anticipated Future UI/UX Related Challenges:** Augmented Reality; Audio Cues; etc

yet2 Search and Market Feedback for NIST PSCR

Objective and Metrics

yet2 conducted market feedback on typical R&D cycles for the development of products with significant user interface components (HUDs, wearables, haptics, audio, etc.)

Key Respondent Feedback

Benefits of prototyping in VR

Save costs

Overall estimates of savings ranged from 1 – 4 weeks of time and 20% - 30% of costs.

Increase the efficiency of design and development time

- Ability to quickly iterate on ideas
- Blueforce Development estimated that VR testing could reduce the development process by one month

Decrease the complexity of testing

- Reduce the number of prototypes carried forward into hazardous testing
- Limiting the hazard to study participants
- Responder Corp shared that they get better feedback when testing with a range of participants rather than at a single fire station

XRDC

VR Lessons Learned

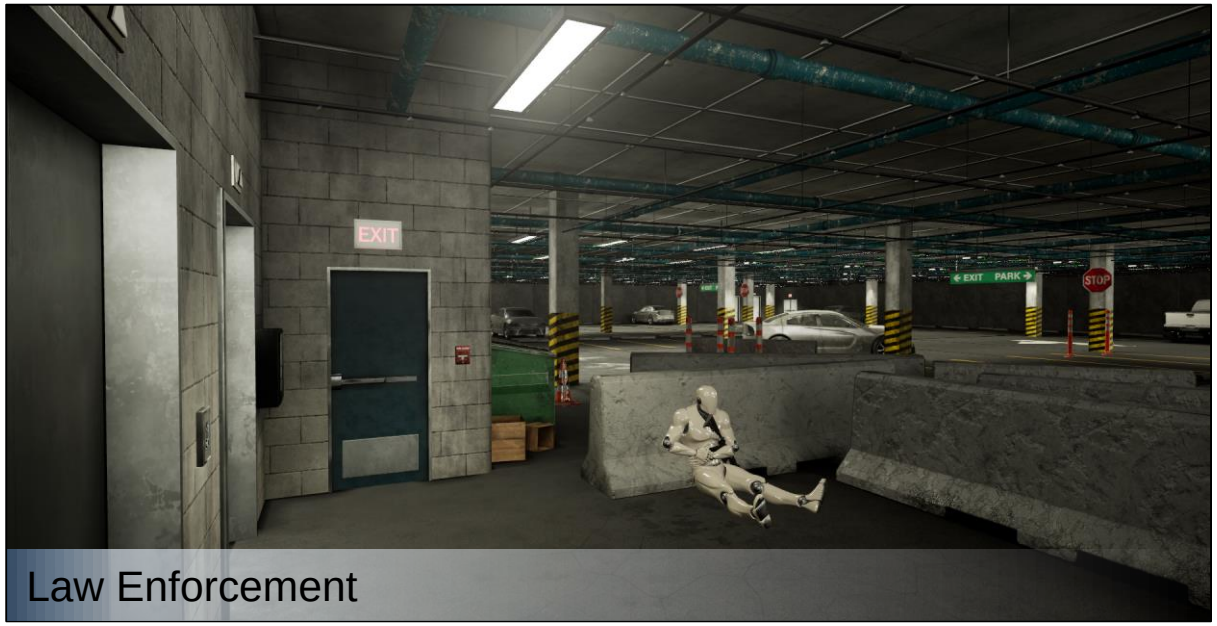
Jack Lewis
Lead VR Developer – PSCR NIST

Haptic Challenge Project

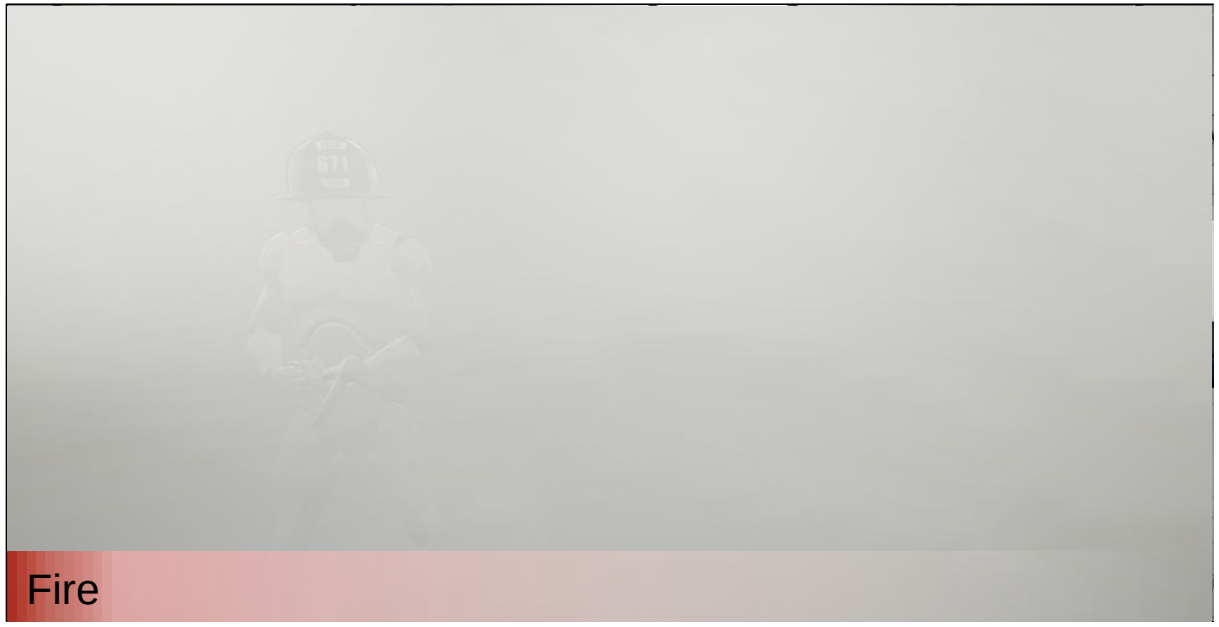
- 3 Month Turnaround
- 4 Developers
- Realistic Graphics
- Three environments and 3 scenarios (Fire, Law, EMS)
- Support SteamVR, Oculus and Windows Mixed Reality
- Built in metric gathering
- No marketplace content

Examples of VR Scenarios from the Haptic Interfaces for Public Safety Challenge:

Emergency Medical Services



Law Enforcement



Fire

First Lesson Learned

Good Game Design

≠

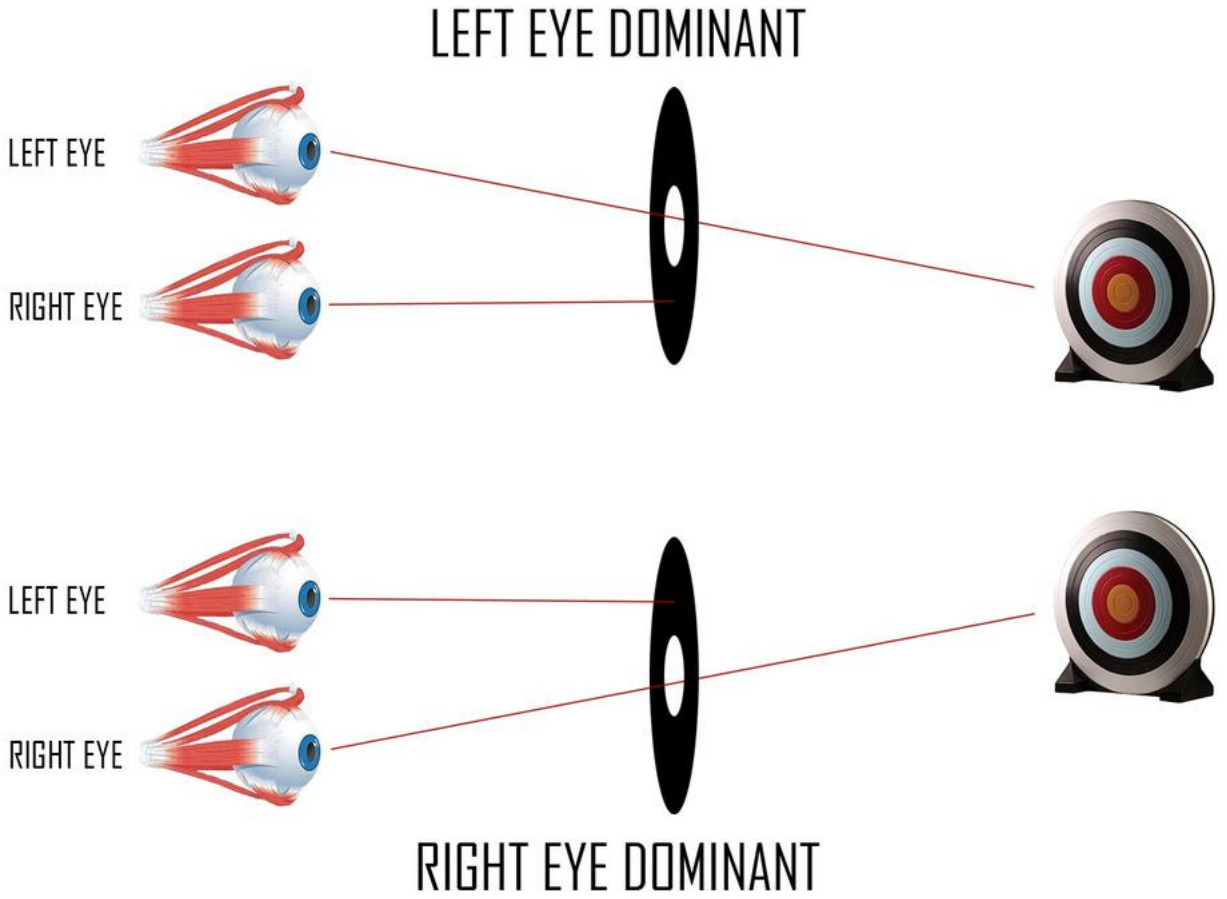
Good VR Design

Red Dot Sights in VR

Rainbow Six Siege

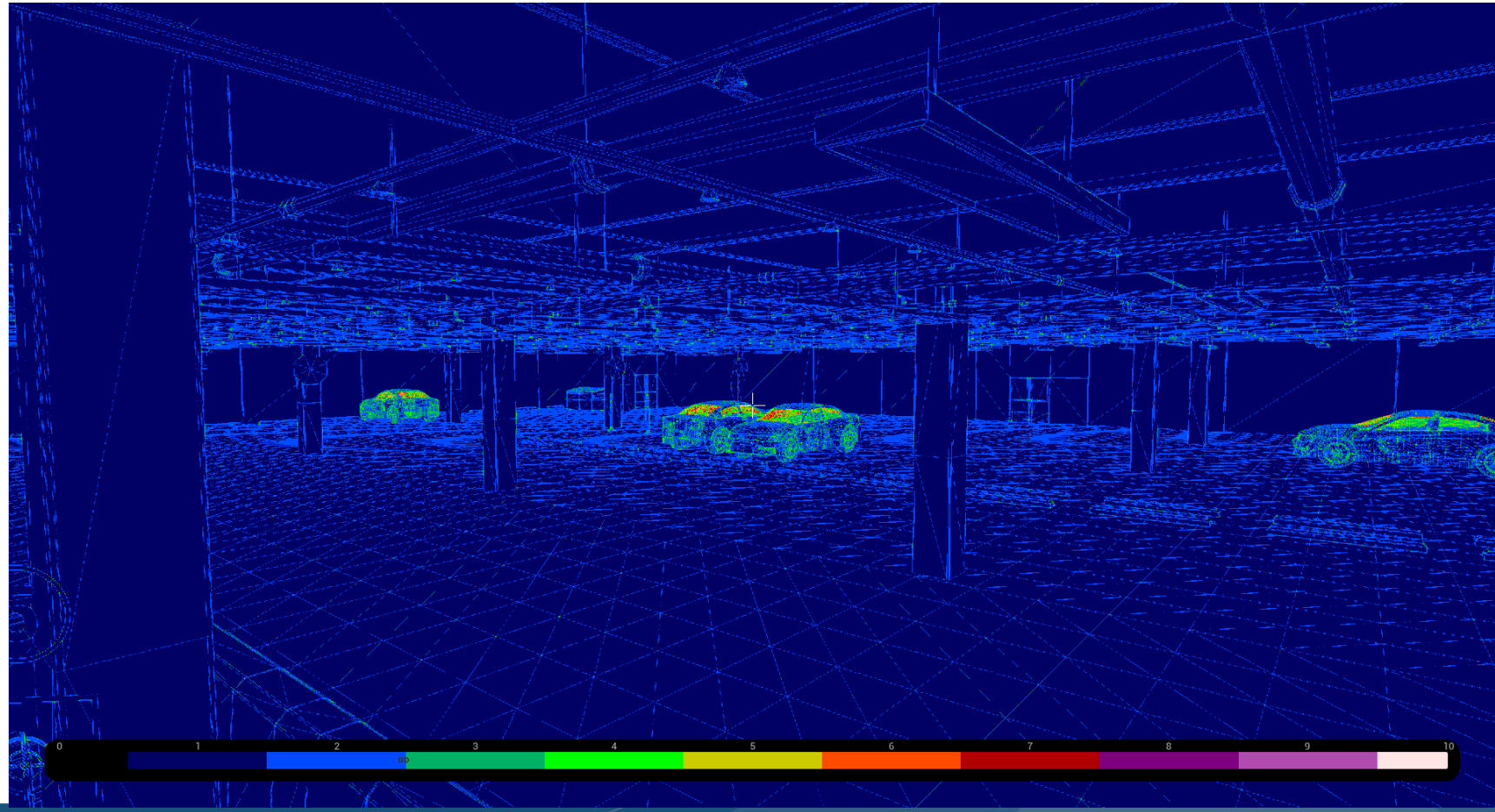
Eye Dominance

Your eye dominance does not always match your handedness.



Second Lesson Learned

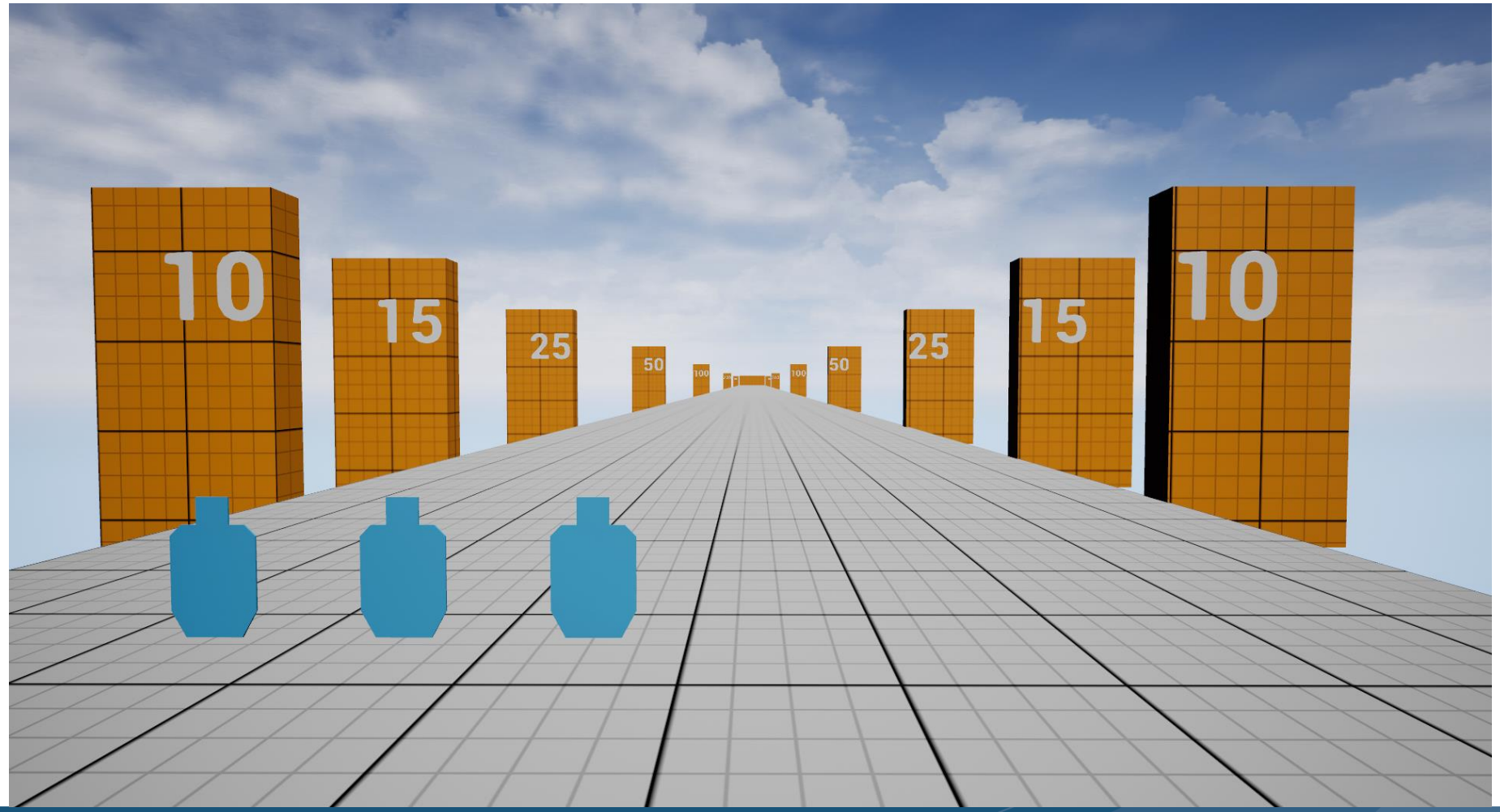
High frequency detail and the problems it can cause



The “sizzle” effect

Avoid thin triangles!

It gets worse at a distance…



Third Lesson Learned

Creating and optimizing low visibility environments

Creating realistic smoke

- Volumetric fog particles as smoke

Screen Percentage 100

- 45 FPS

Using Screen Percentage 70

- 90 FPS

PSCR

contact:

Jack.Lewis@nist.gov
Sarah.Hughes@nist.gov
psprizes@nist.gov

https://github.com/usnistgov/HapticChallengeUE4
(not for redistribution)

Join PSCR at CES in Las Vegas.

January 7-10, 2020

PSCR