Disclaimer

Certain commercial entities, equipment, or materials may be identified in this document in order to describe an experimental procedure or concept adequately.

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*Please note, all information and data presented is preliminary/in-progress and subject to change.
Acronym Glossary

- AR/VR = Augmented Reality/ Virtual Reality
- EKG = Electrocardiogram
- EMS = Emergency Medical Services
- HUD = Heads-Up Display
- PS = Public Safety
- PSIAP = Public Safety Innovation Accelerator Program
- UI/UX = User Interface/ User Experience
Agenda

• Portfolio Overview
• Project Highlights
• PSIAP-UI Grant
• Prize Challenge
• VR Usability – Kevin Mangold
• Video Quality Survey – Margaret Pinson
Mission:
Work with the public safety community, stakeholders, and vendors to create an environment that encourages industry to develop reliable, intuitive, and mission-focused technology for the public safety community.

• Projects
  • User Experience Research and Testing Methodologies for New PSCR Technologies
  • Video and Image Quality
  • Leveraging AR/VR for Improved UI - Tests, Development, and Measurement
Usability Research and Testing Methodologies

Principal Investigator – Mary Theofanos

Goal: Capture and define first responder user requirements for next gen technology

Approach:
- Conducted 200+ interviews across the United States
- Large scale surveys to capture user problems, needs, and future requirements and opportunities.

Outcome:
- User-Identified Needs and Requirements
- Context-based Usability Guides
- Test Method and Environment for Assessing Technology Effectiveness
Principal Investigator – Margaret Pinson

Goal: Intelligent cameras and networks

Approach:
• Datasets that demonstrate PS needs and problems.
• Conduct multiple surveys to capture human assessment of video and image quality.

Outcome: Work with industry, academia, and public safety to create solutions.
Identified state of current technology for First Responder Cameras

Issues preventing practitioner from key information

Solution: Develop algorithms and applications to improve public safety camera applications
AR/VR Environment for Improved UI

Principal Investigator – Scott Ledgerwood

Goal: Leverage virtual reality and augment reality as a tool to develop and test user interfaces for public safety.

Approach:
• Create unique content for variety PS scenarios.
• Incorporate instrumentation to assess the effectiveness and efficiency

Outcome:
• An environment that can be reproduced with simple equipment
• Rapid prototyping for industry and academia
• Lower resources and risks are testing new technology
• Potential to leverage testing environments for training on interfaces
Example PSCR VR Environment
• Investigating Emergency Response Performance with VR-based Intelligent User Interfaces

• ARTEMIS: Augmented Reality Testing of Equipment in Multiple Immersive Simulations
PSIAP-UI Award Recipients

- FirstSimVR - a versatile multimodal platform for simulating and evaluating first responder interfaces
- Design, Prototyping and Evaluation of Next Generation Public Safety User Interfaces
- Glove-Based Home-to-Ambulance Simulation Environment
PSIAP-UI Award Recipients

- Virtual and Augmented Laboratory for Objective Realities (VALOR)

- Cognition-driven Display for Navigation Activities (Cog-DNA): Personalized Spatial Information System Based on Information Personality of Firefighters
Contestants created innovative user interfaces in a virtual heads-up display to assist participants in navigating to an objective while avoiding hazards.

- Compete for fastest time – built-in instrumentation for time/distance
- Functionality and quality of HUD
- Drive public safety content in VR.
- Go beyond HUD and develop innovative technology that may be used when interacting for first responder.

Live Challenge is taking place tomorrow!

Demos Thursday and Friday
VR Navigation Heads-up Display Environment
AR/VR Environment for Improved UI – Finalist

Featuring:

Screen Door Labs

Guardian Airwaves

NextGen Interactions

Factual VR

Look On Media

Virtual Reality Universe

PSCR
Measuring Usability of Virtual Reality
Measuring Usability of Virtual Reality

• New doesn’t always mean better
  • How do we define better?
  • Is it actually better?
  • How much better?
  • How much of a learning curve is needed to become proficient?
  • How do we know?

• Virtual/augmented reality has the potential to be a significant game changer…
  • … but there is more to it than just the technology.
• From ISO 9241-11:2018:
  • Usability
    • is the extent to which a system, product or service can be used by specified users to
      achieve specified goals with **effectiveness**, **efficiency** and **satisfaction** in a
      specified context of use
  • Effectiveness
    • **accuracy** and **completeness** with which users achieve specified goals
  • Efficiency
    • **resources used** in relation to the results achieved
  • Satisfaction
    • extent to which the user's physical, cognitive and emotional responses that result
      from the use of a system, product or service **meet the user’s needs and
      expectations**
Measuring Usability of Virtual Reality (cont.)

• What interactions will be measured?
  • Currently
    • Button presses and how it relates to in-environment actions
      • E.g., a trigger pull/release maps to teleportation or movement
    • Timing
      • Total duration
      • Timestamps for all inputs/interactions
  • Under investigation
    • Eye gaze
    • Head movement
    • Controller movement
    • Physiological characteristics (e.g., EKG)
• What are some visual user interface components that will be looked at?
  • User location(s)
  • Time
  • First Responder Equipment
    • Internal temperature, remaining oxygen, heart rate
  • Environmental concerns
    • Temperature, carbon monoxide

• Which characteristics of each component are important?
  • Necessity
    • Avoid information overload
  • Size
  • Location
  • Visual representation
    • For example, would the remaining air in the tank be best represented as a 0-100, a thermometer-like gauge, or a typical pressure gauge?
Measuring Usability of Virtual Reality (cont.)

• How will we generate user feedback and data?
  • Follow methods and guidance from *NIST Handbook 161, Usability Handbook for Public Safety Communications: Ensuring Successful Systems for First Responders*

• Parallel Design
  • This is already in progress through the submissions of the challenge participants

• Record performance data within the virtual environment
  • E.g.,
    
    [2018.05.07-17.36.28] [CONTROLLER] [14428 - TriggerPressed]
    [2018.05.07-17.36.30] [CONTROLLER] [14428 - TriggerReleased]

• Cognitive walkthroughs / expert reviews
  • Focus Groups

• Usability testing
  • Followed by user interviews

• Surveys and questionnaires
Measuring Usability of Virtual Reality (cont.)

- How will this all be measured and evaluated?
  - Iterative process
  - Start with baseline virtual reality environment (initial prototype)
  - Generate feedback / data
  - Data analysis and normalization
    - Compare with baseline
    - Compare with the other participants
  - Formulate conclusion
    - Final findings will be published and publicly available
  - Adjust prototype and repeat
Video Quality Survey

Margaret Pinson
National Telecommunications and Information Administration
Institute for Telecommunication Sciences
Camera Innovation

Camera Capture

Network Optimization
Video Quality for Public Safety Experiment

I need your help

• 6 choices
• 20 min
• Thank you gifts
  • $10 Amazon gift certificate
  • Stylus pen
Video Quality for Public Safety Experiment

Crime Scene

Crime Walkthroughs!

Fireground

Search & Rescue

Prison Riot

Weather & Vehicles
Video Quality for Public Safety Experiment

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Weather & Vehicles
Would you feel confident relying on these videos?
UI/UX Activities - Thursday

8:30am- 11:30am
UI/UX Track Sessions
UI/UX Activities – Tues-Fri

- Video Quality Survey
- PSCR VR Demo
- VR HUD Prize Challenge Demo
- PSIAP-UI Awardee Posters
UI/UX Activities - Friday

10:30am - 11:30am
VR Prize Challenge Contestants and Announcement of Winners

1:30PM/2:00PM/2:30PM – Law/EMS/Fire
First Responders and UI/UX VR Team
THANK YOU