Thoughts on Authoring AR and VR for Workforce Training

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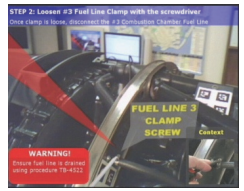
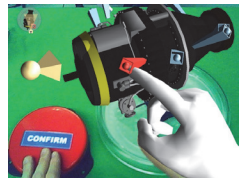
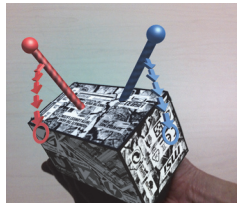
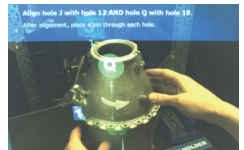
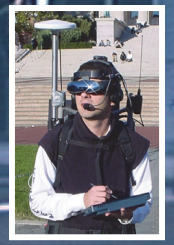




UIs for AR and VR



Navigation

Columbia *Touring Machine*, 1996–

Games

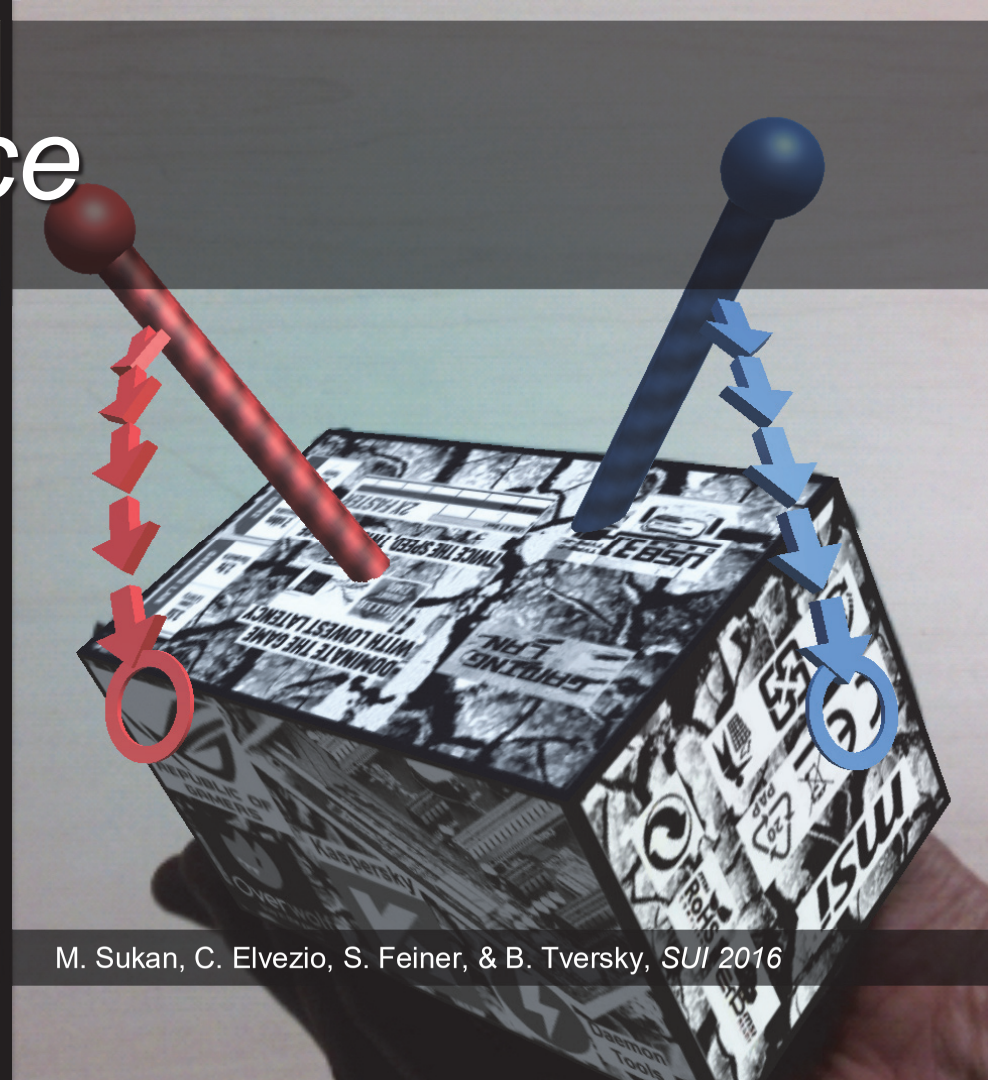
O. Oda et al., *ISMAR 2009*

Task Assistance

S. Henderson & S. Feiner, *ISMAR 2011*

Task Assistance

O. Oda, C. Elvezio, M. Sukan, S. Feiner, & B. Tversky, *UIST 2015*



M. Sukan, C. Elvezio, S. Feiner, & B. Tversky, *SUI 2016*

Remote Task Assistance

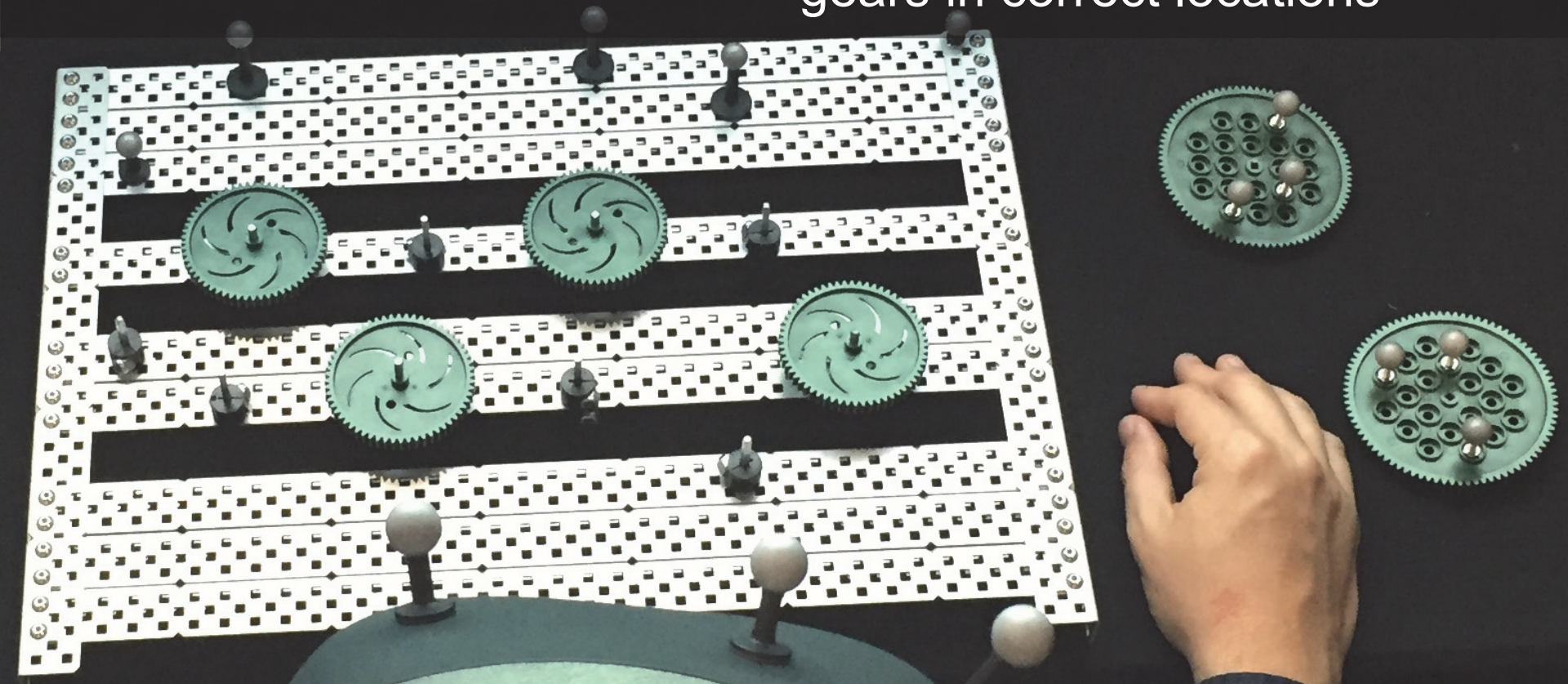
C. Elvezio, M. Sukan, O. Oda, B. Tversky, S. Feiner, SIGGRAPH 2017

Local Tech in AR

Remote SME in VR

Task Domain

Remote SME must show Local Technician how to install gears in correct locations

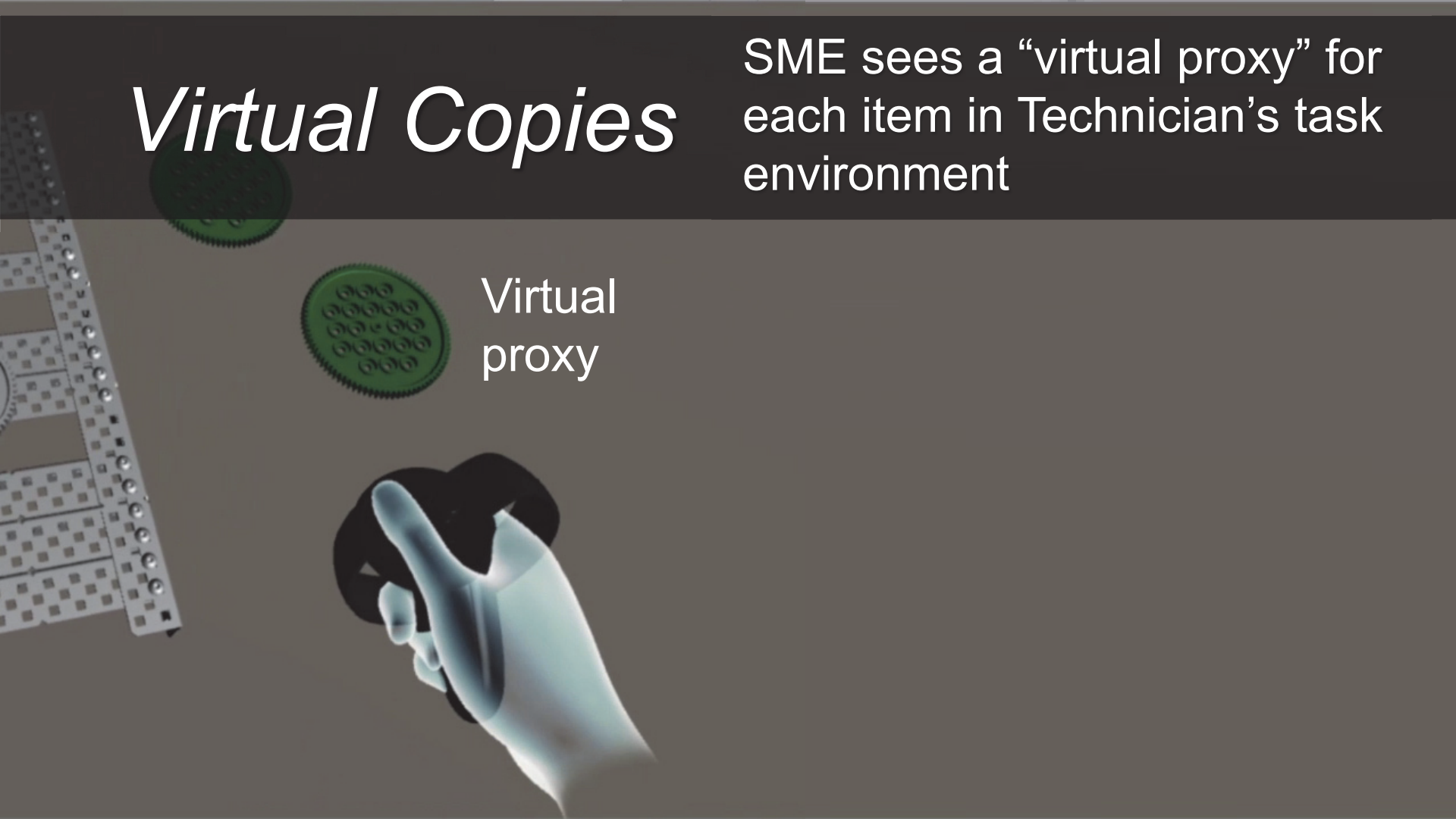


All important items in Technician's task environment are tracked in 3D
Technician performs task in AR (Meta 2 stereoscopic optical-see-through HWD)

SME interacts with a live virtual copy of the Technician's task environment (*digital twin*)
NVIDIA
SME demonstrates task to Tech in VR (Oculus Rift stereoscopic VR HWD)

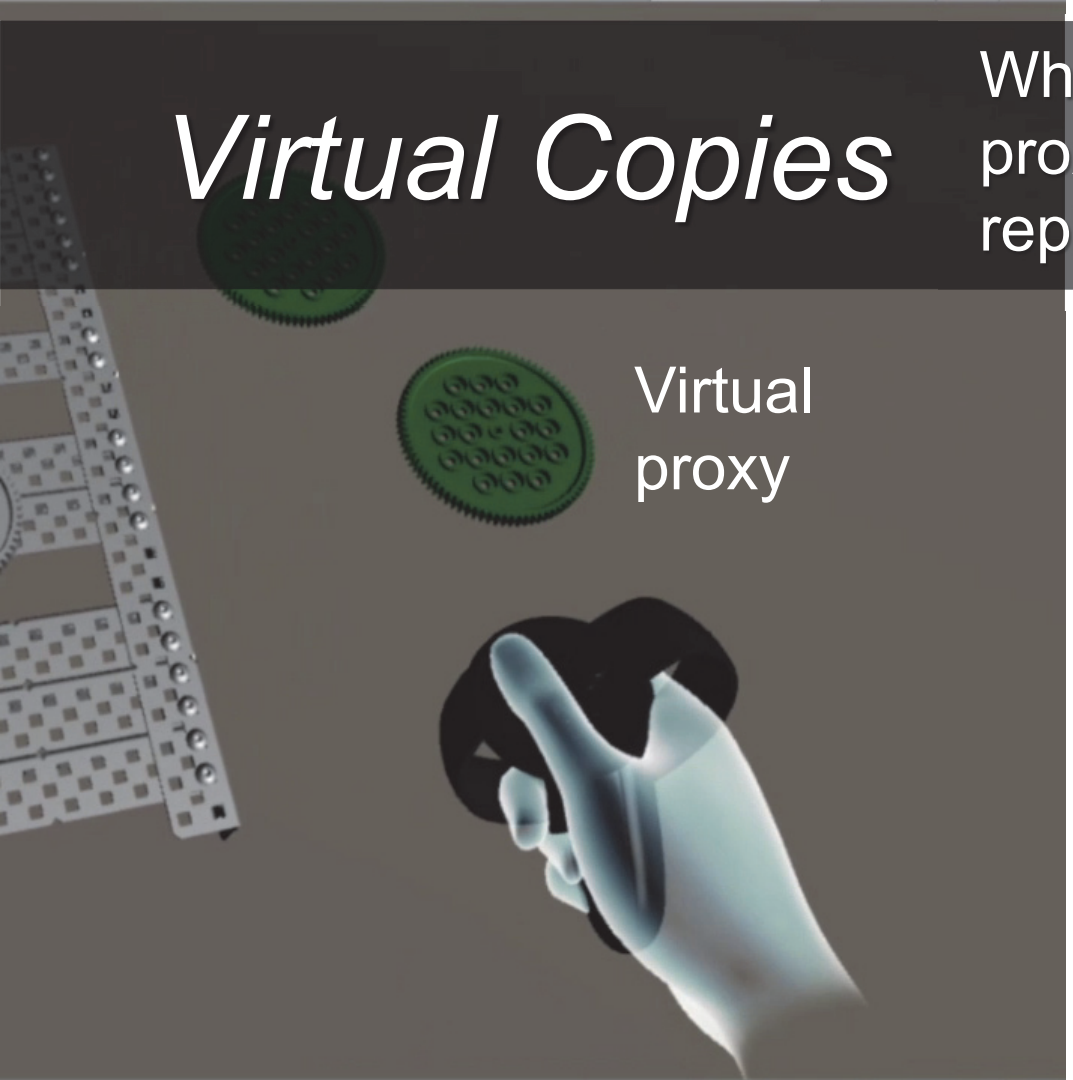
Virtual Copies

SME sees a “virtual proxy” for each item in Technician’s task environment

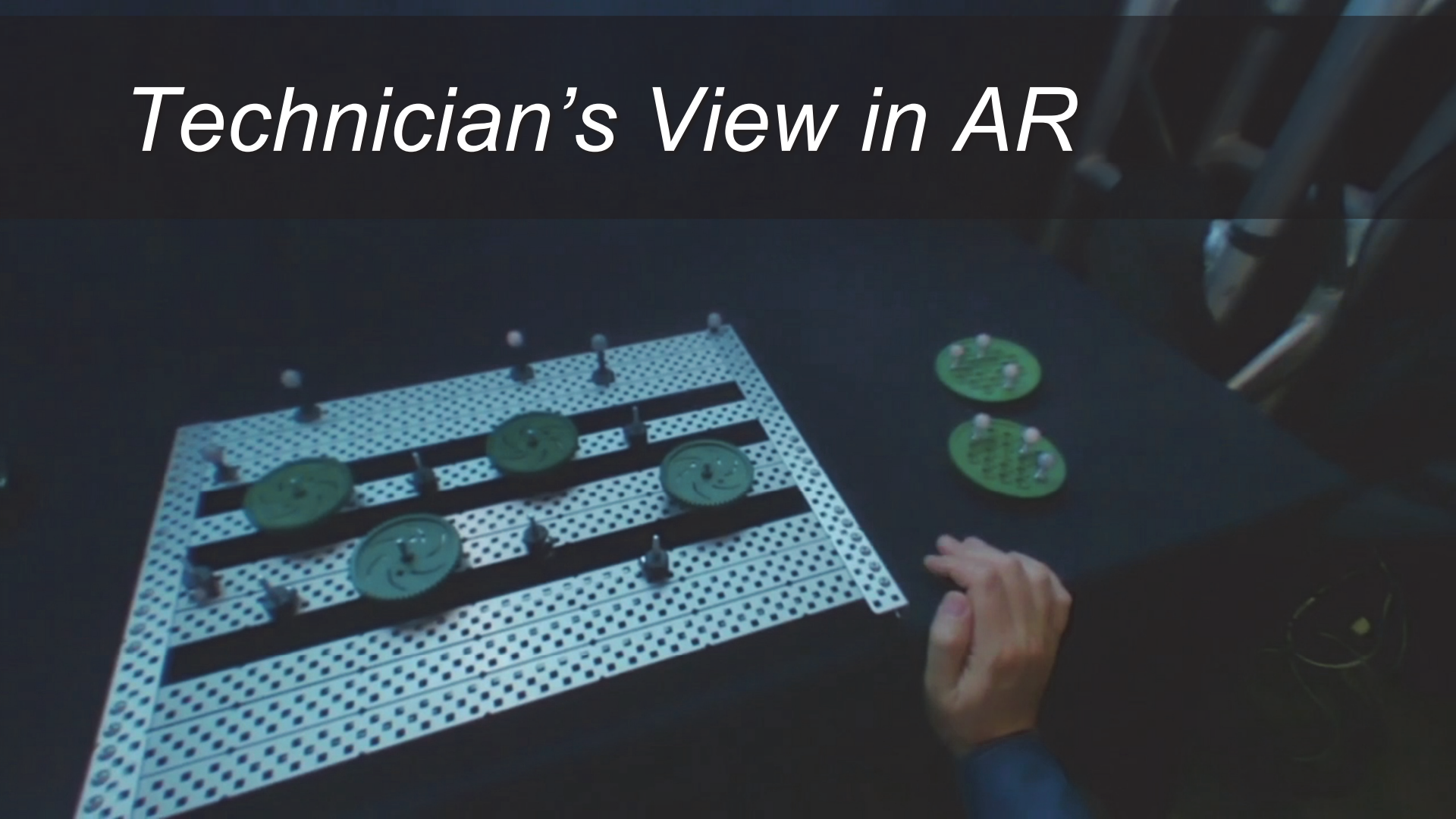


Virtual Copies

When SME grabs a “virtual proxy,” they create a “virtual replica” they can control

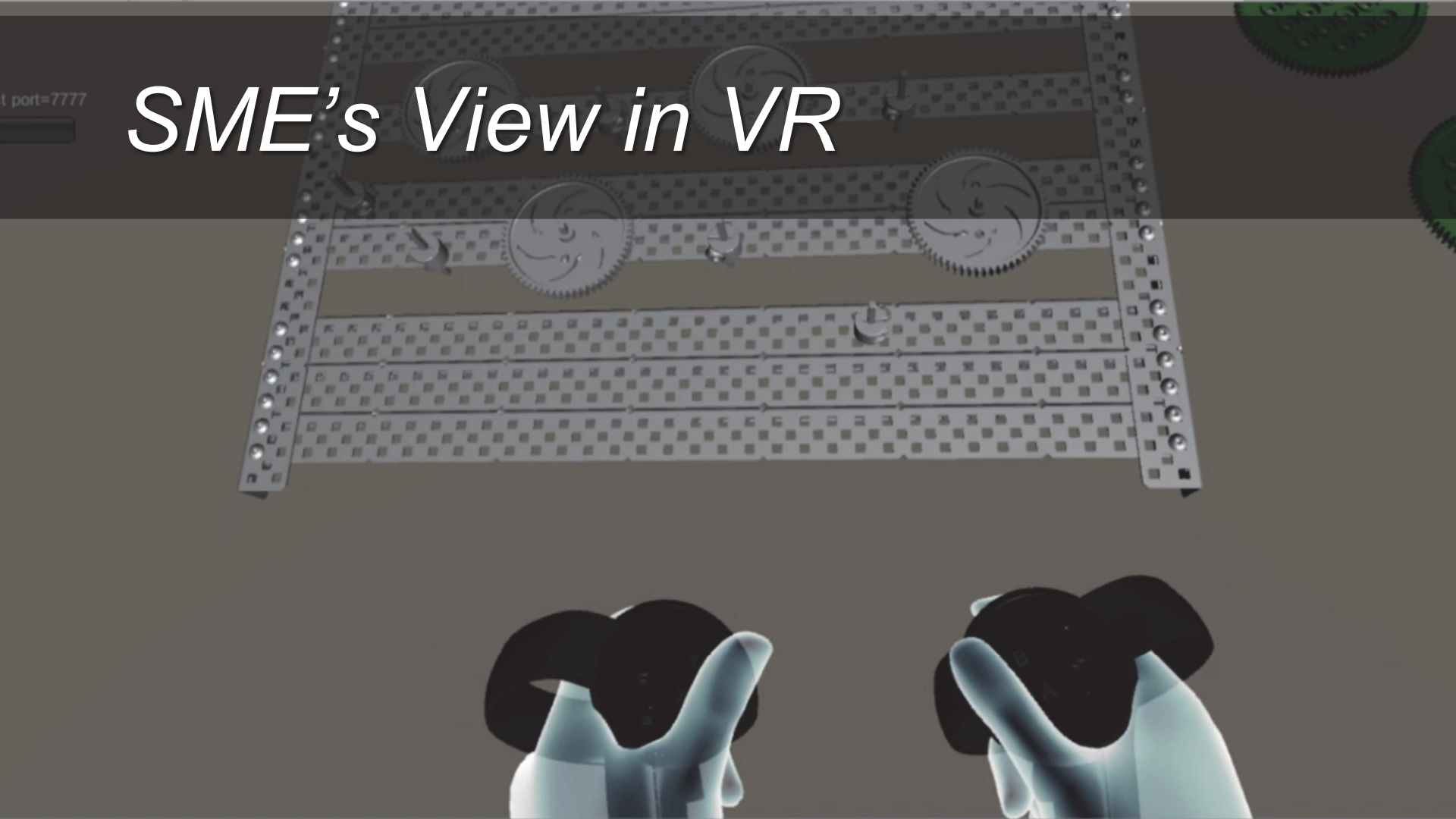


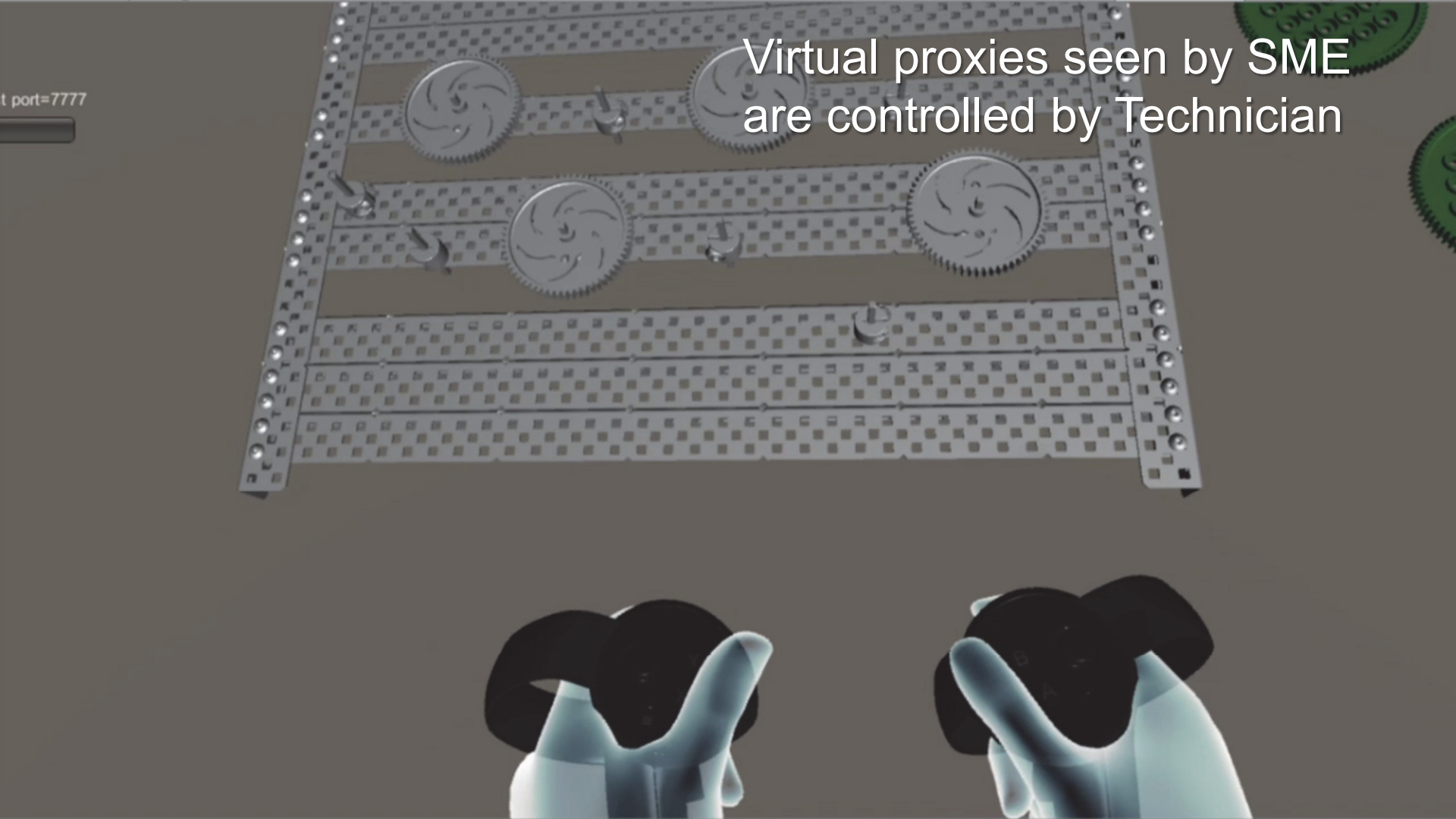
Technician's View in AR



Virtual replicas seen by
Technician are controlled by
SME

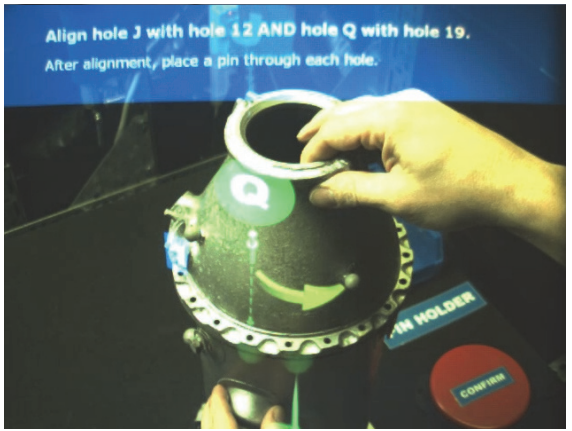
SME's View in VR




t port=7777
Virtual proxies seen by SME
are controlled by Technician

AR Authoring Challenges

- Must respond to
  - changes in physical world
  - changes in visibility
  - changes in skill
- Avoid deskilling



Henderson & Feiner, *ISMAR 2011*

AR Authoring Challenges/Approach

- Modeling dynamic 3D task domains (including people)
  - CAD and sensors
- Cataloging validated interaction/visualization techniques
- Capturing and analyzing SME assistance
- Generating integrated documentation
- Evaluating performance

Acknowledgments

https://github.com/ColumbiaCGUI/MercuryMessaging

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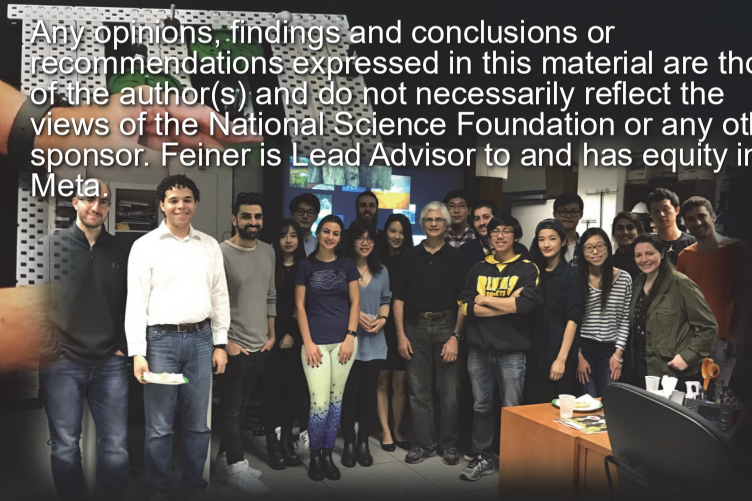
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