

Living in the Holo(s)cene

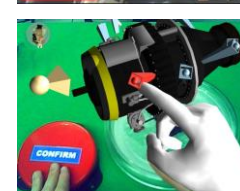
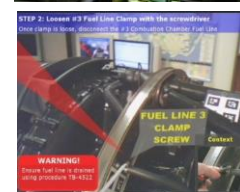
Steven Feiner



Computer Graphics & User Interfaces Lab
Department of Computer Science
Columbia University
New York, NY 10027

Supported in part by NSF, and gifts/loans from
Canon, Google, Microsoft, VTT, Vuzix

Microsoft Research Faculty Summit Redmond, WA 8–9 July 2015



Navigation

...er's Restaurant
of this place
Morningside Library is
featured on the TV series
"Sanford". The Green
Salad is tops and the Broadway show
rules.
2850 Broadway Ave.
(717) 864-6127

Web Page

Menu

Reservations



Columbia Touring Machine, 1996–

Games



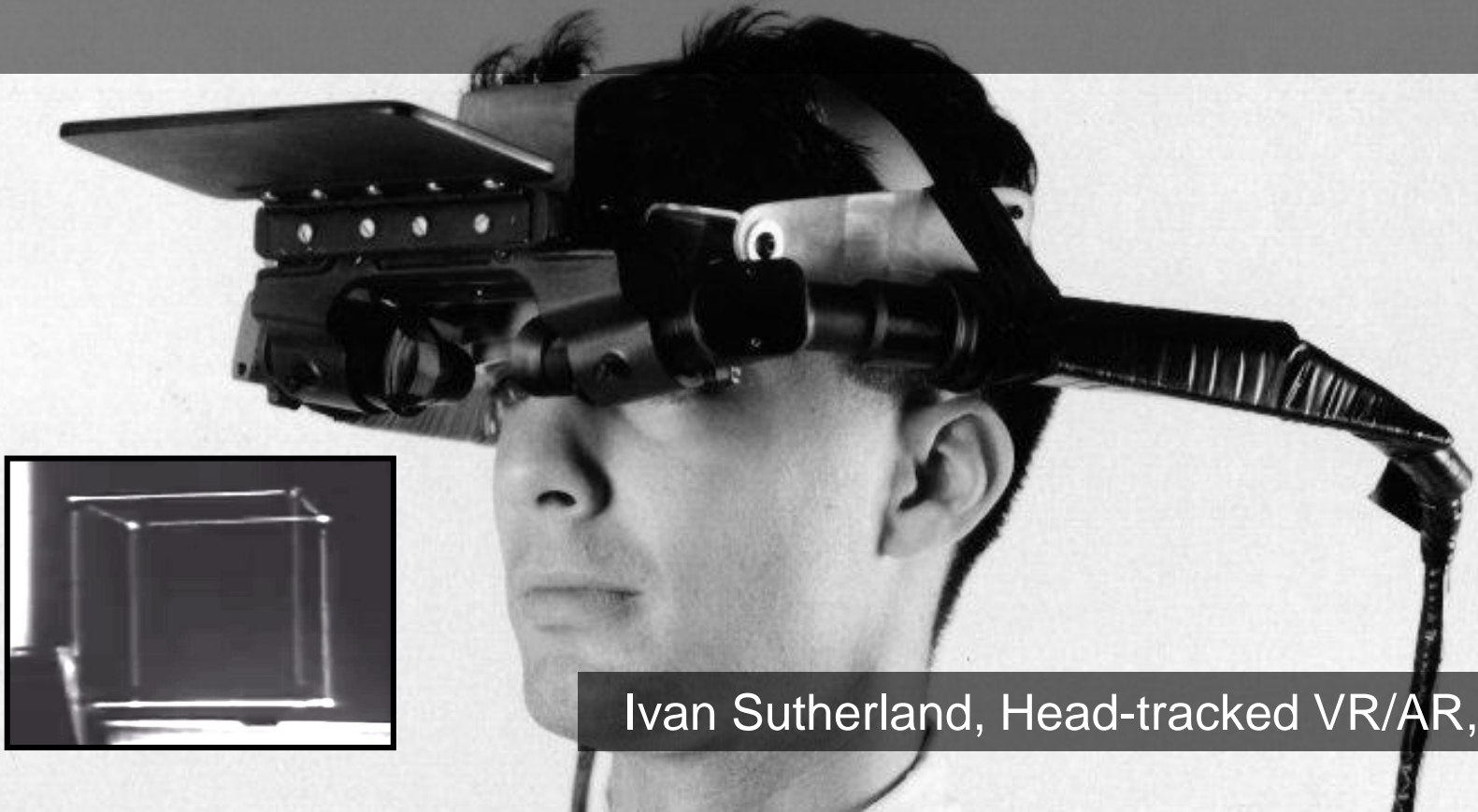
O. Oda et al., 2009

Task Assistance



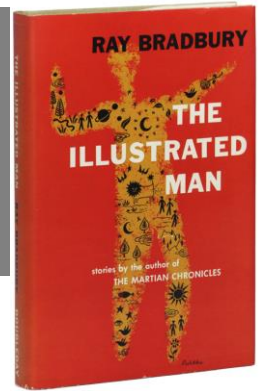
S. Henderson & S. Feiner, ISMAR 2011

> 45 Years of VR/AR Research



Ivan Sutherland, Head-tracked VR/AR, 1968

The Ultimate Display



1951

“The ultimate display would, of course, be a room within which the computer can control the existence of matter. A chair displayed in such a room would be good enough to sit in. Handcuffs displayed in such a room would be confining, and a bullet displayed in such a room would be fatal. With appropriate programming such a display could literally be the Wonderland into which Alice walked.”

— I. Sutherland, *The Ultimate Display*, *Proc. IFIP 65*, 506–508, 1965

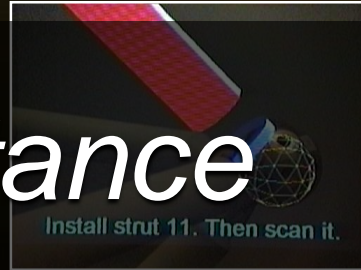
The Ultimate Display

- Multimodal
- But, ...
 - One user
 - One room
 - Indoors

AR Task Assistance



1991-1993



Install strut 11. Then scan it.



1996-1997



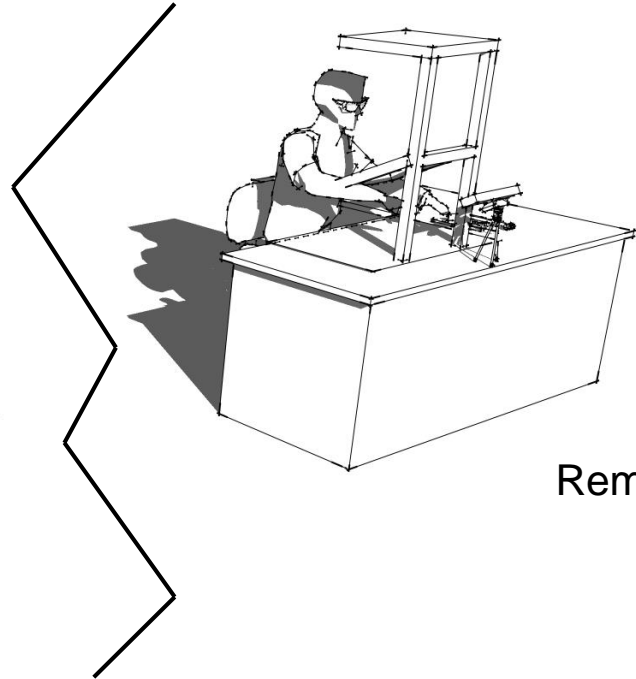
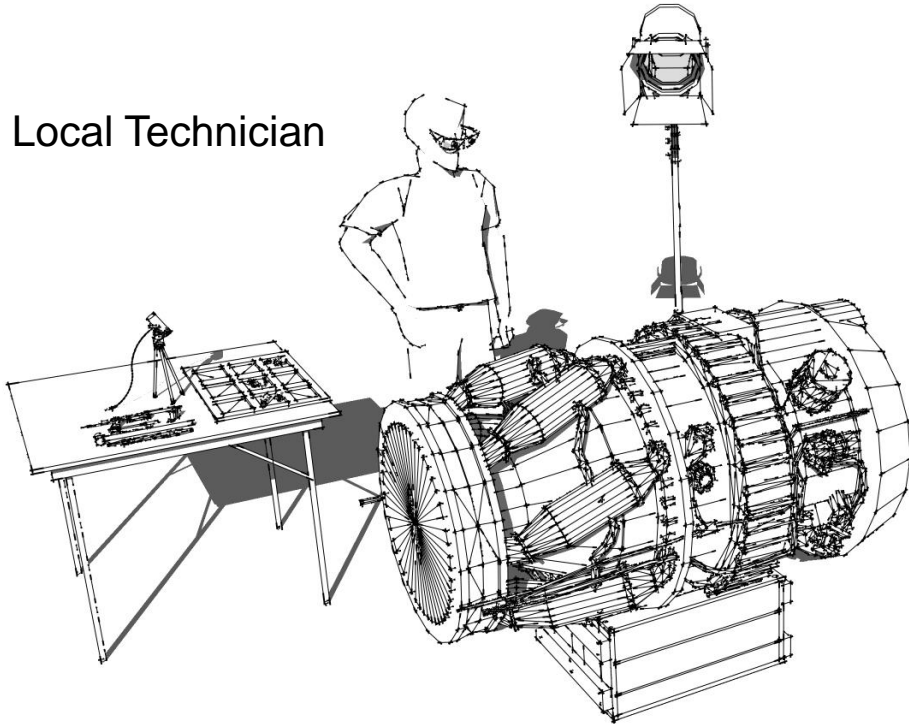
2007-2008



2011-

AR Remote Task Assistance

Local Technician



Remote SME

AR Remote Task Assistance

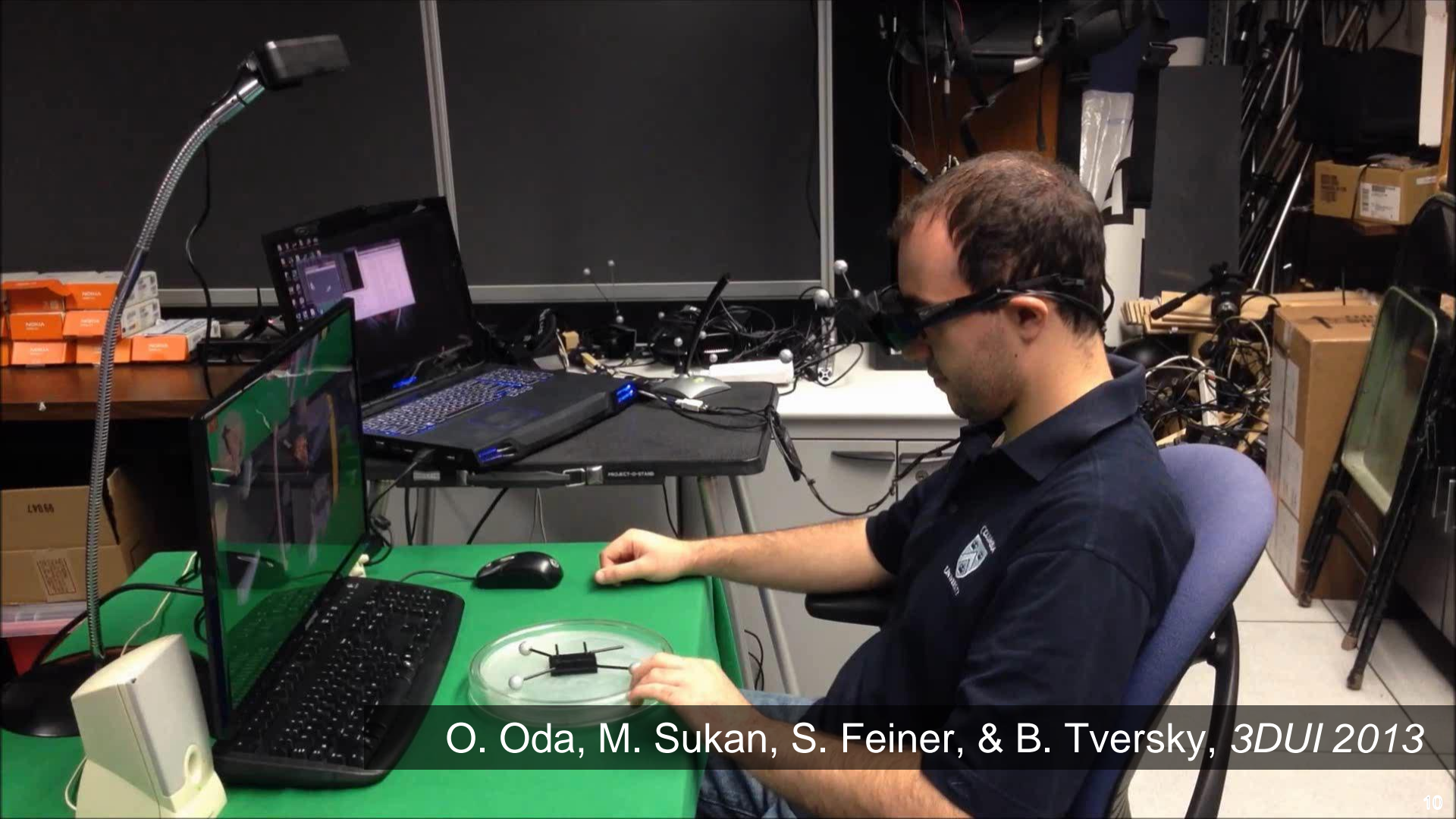
- Tasks
 - Get Tech to move to correct location
 - Get Tech to perform correct task

Getting the Tech in Place



Local Technician View

O. Oda, M. Sukan, S. Feiner, & B. Tversky, *3DUI 2013*



O. Oda, M. Sukan, S. Feiner, & B. Tversky, *3DUI 2013*

A man wearing a VR headset and headphones is shown in profile, looking towards a large, yellow, teardrop-shaped object. The object is positioned in the center of the frame, and several thin, light-colored lines radiate from its base, suggesting a virtual or augmented reality environment. The background is a workshop or laboratory setting with various mechanical components and equipment.

Getting the Tech in Place ParaFrustum

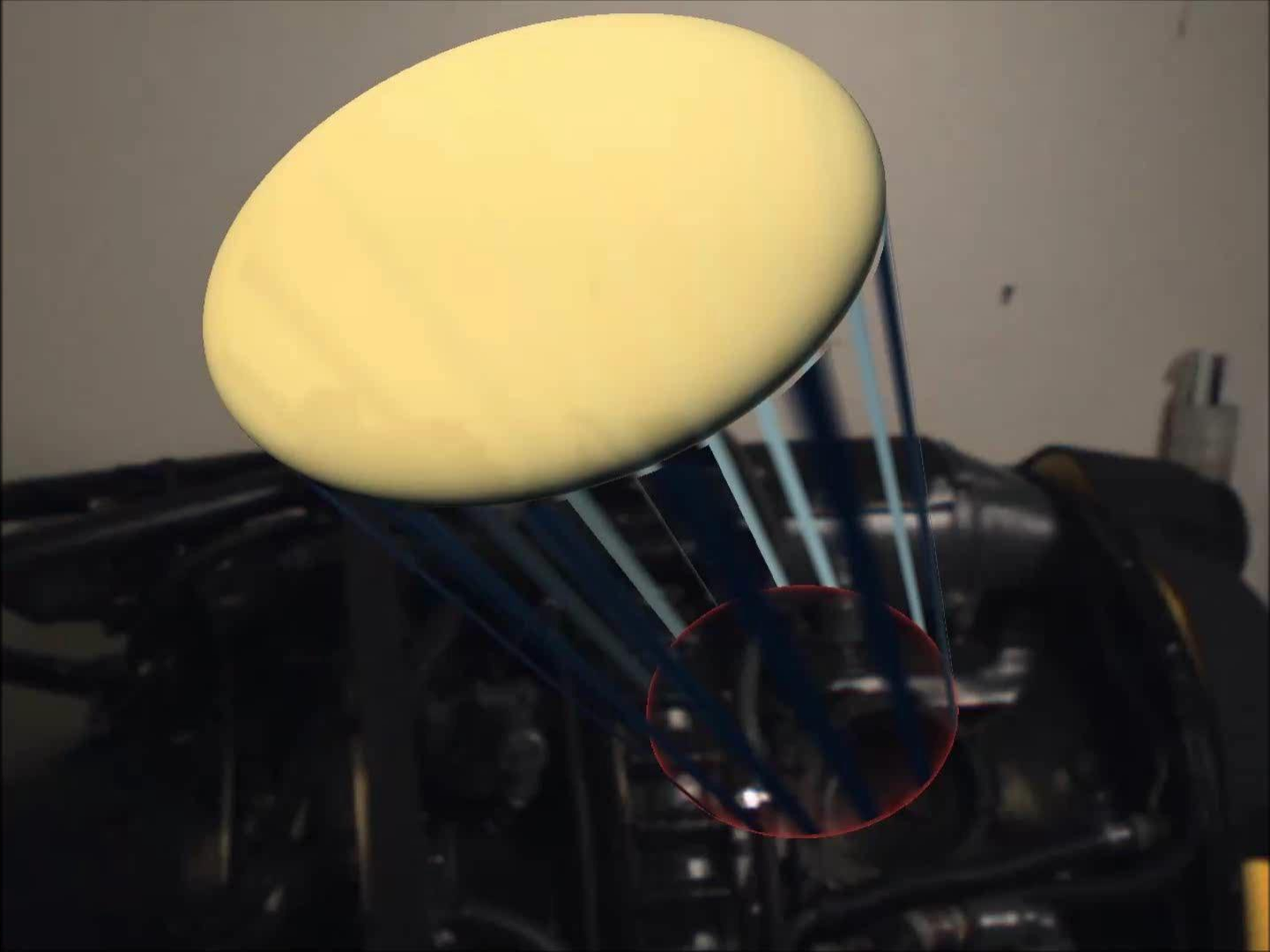
M. Sukan, C. Elvezio, O. Oda, S. Feiner, & B. Tversky, *UIST 2014*

Getting the Tech in Place *ParaFrustum*

Head volume



Tail volume



Performing the Task

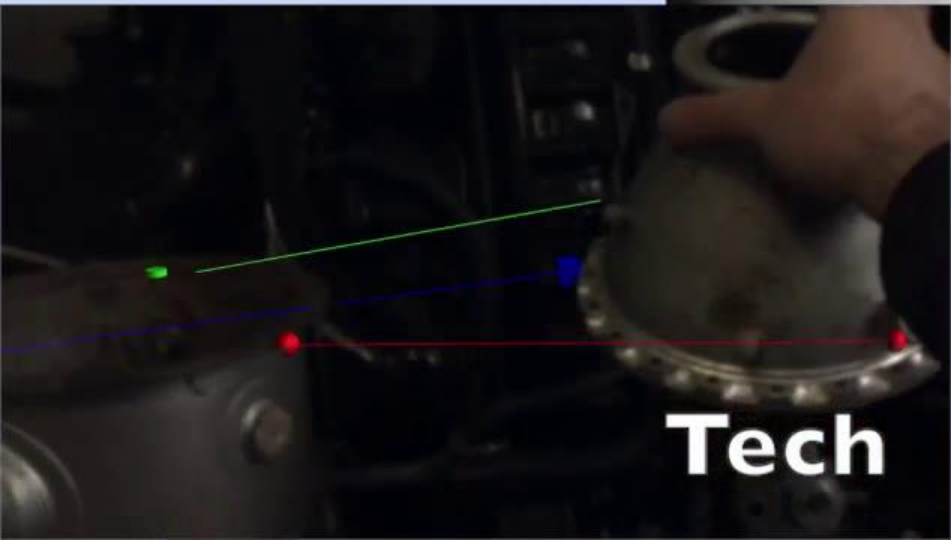
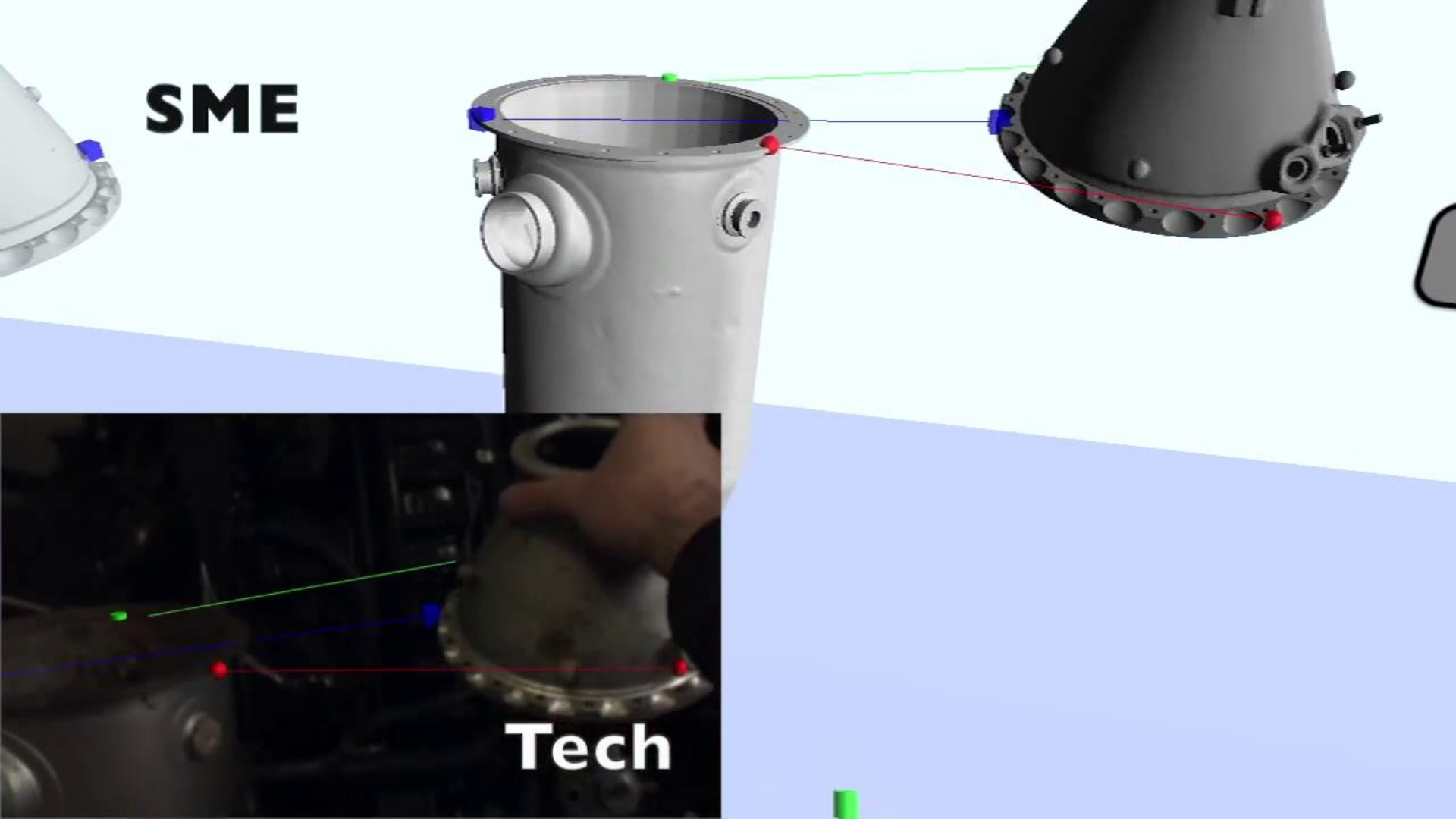


O. Oda, C. Elvezio, M. Sukan, S. Feiner, & B. Tversky, 2015



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

SME



Tech

UI Design for AR



Multiple People

Multiple Viewpoints



Multiple Displays



Acknowledgments

- Carmine Elvezio
- Steve Henderson
- Ohan Oda
- Minhaz Palasara
- Mengu Sukan
- Barbara Tversky

- Supported in part by NSF, ONR, Raytheon, USMC and gifts/loans from Canon, Google, Microsoft, Nokia, VTT, Vuzix

- Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation or any other sponsor