SFU

SCHOOL OF INTERACTIVE ARTS + TECHNOLOGY

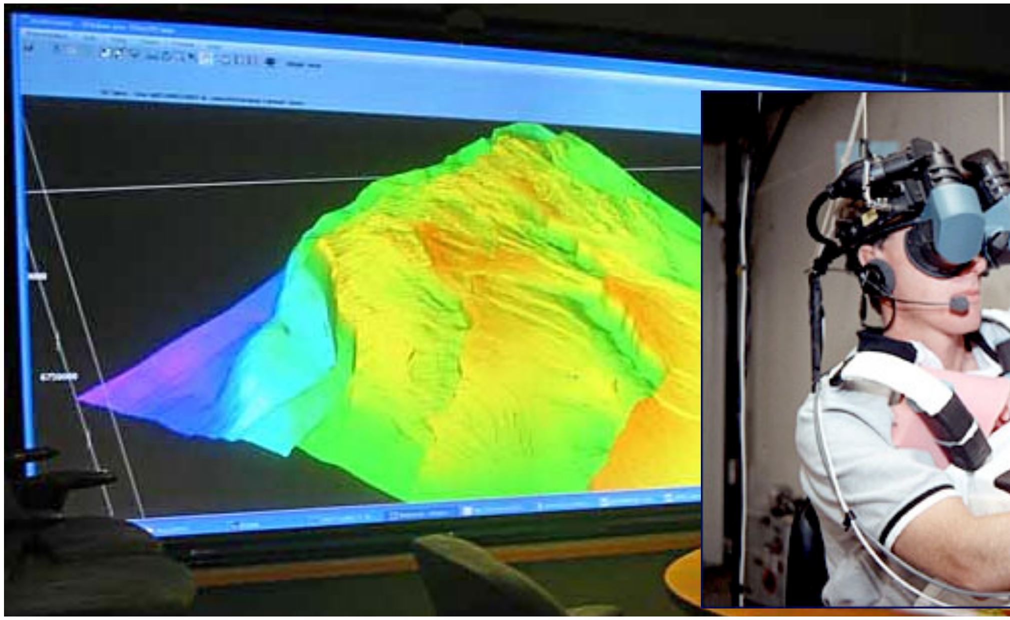
Towards Better User Interfaces for 3D & Large Displays

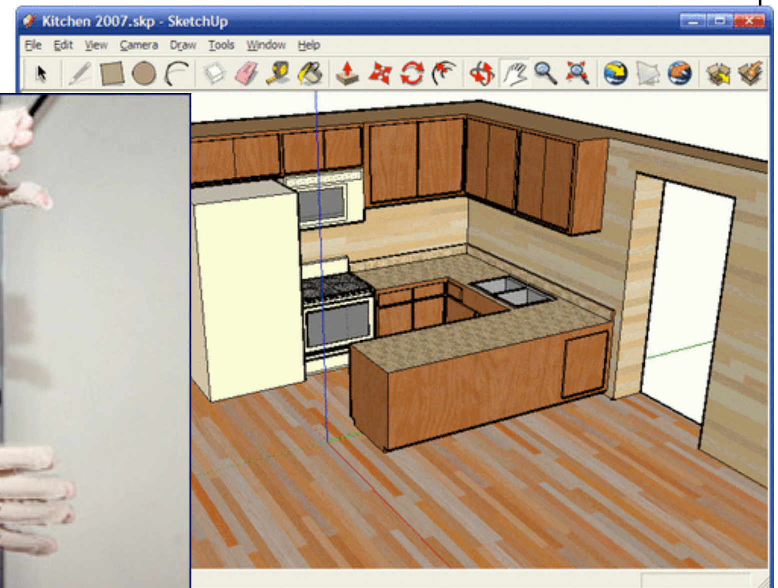
Wolfgang Stuerzlinger
Simon Fraser University, Vancouver
vvise.iat.sfu.ca

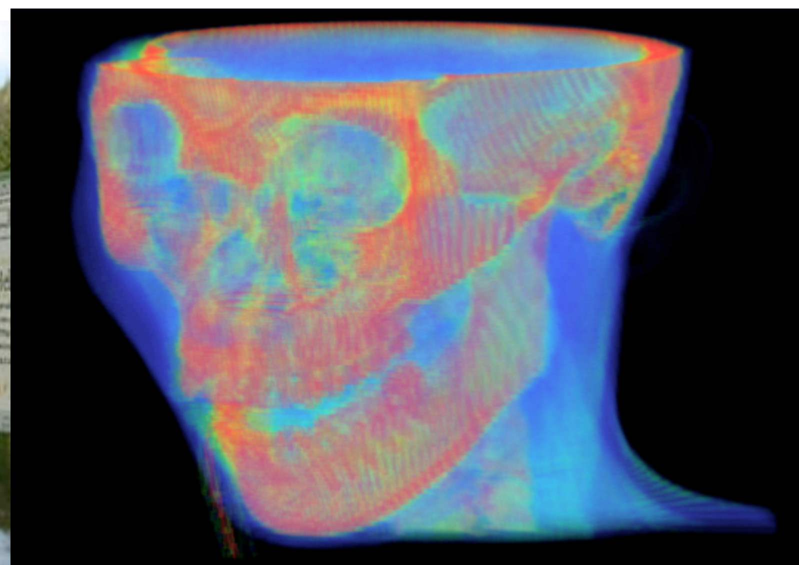
VVISE

3D UI in 'Iron Man 2'

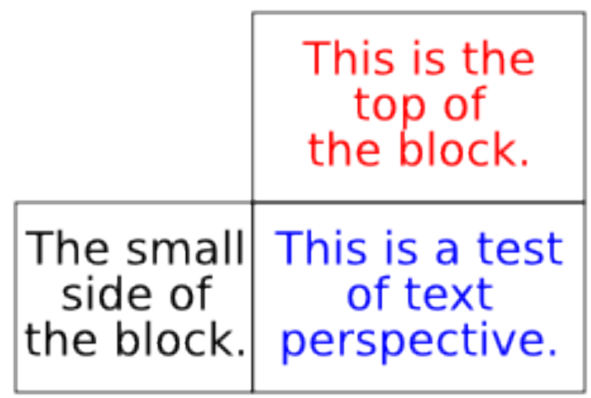
Real Examples for 3D UI’s

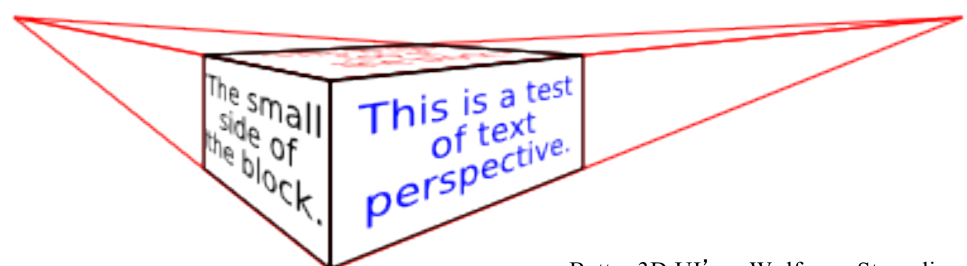




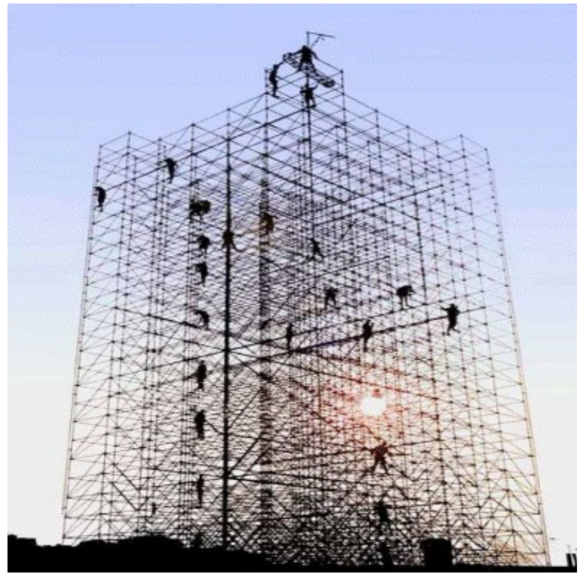


Output


This is the top of the block.
The small side of the block.
This is a test of text perspective.


The small side of the block.
This is a test of text perspective.

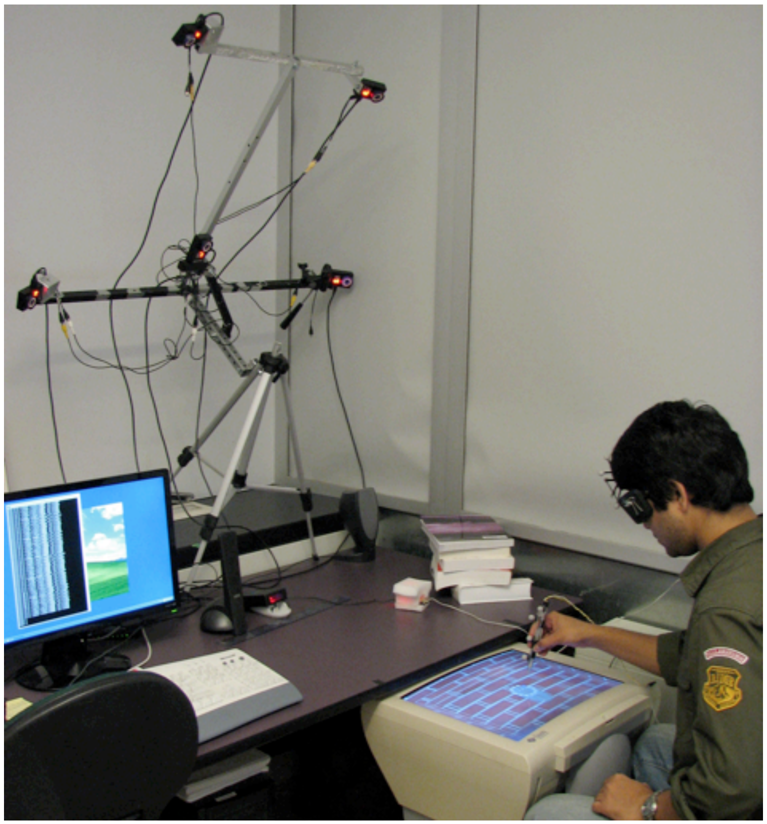
Spatial Navigation/Manipulation

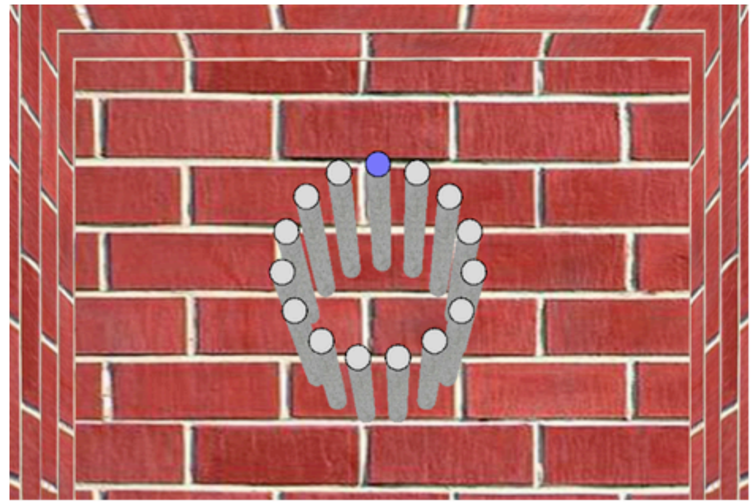


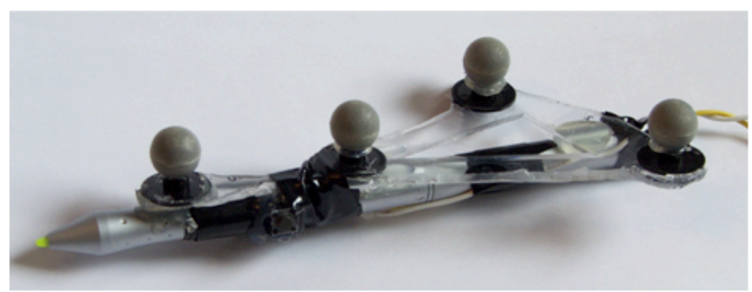
2D & 3D Input for 3D Pointing

Compare in Fishtank VR system

- Effective throughput, ISO 9241-411

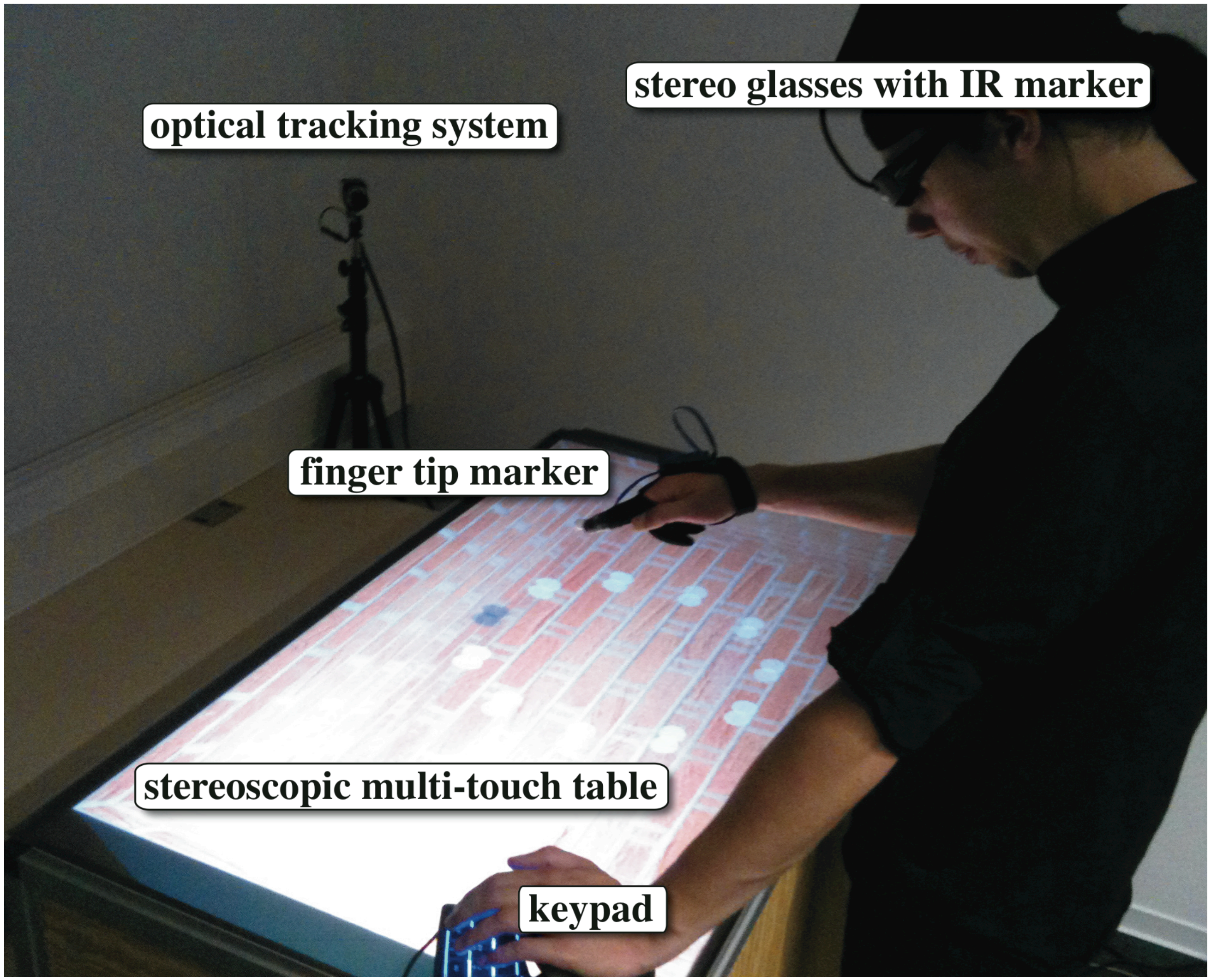






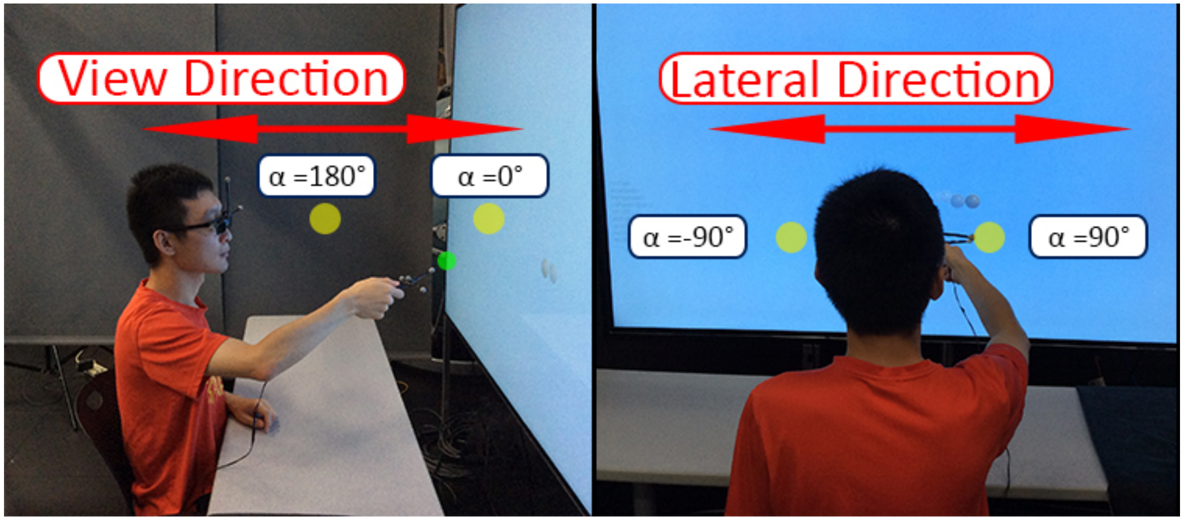
[Teather PhD, CHI 13]

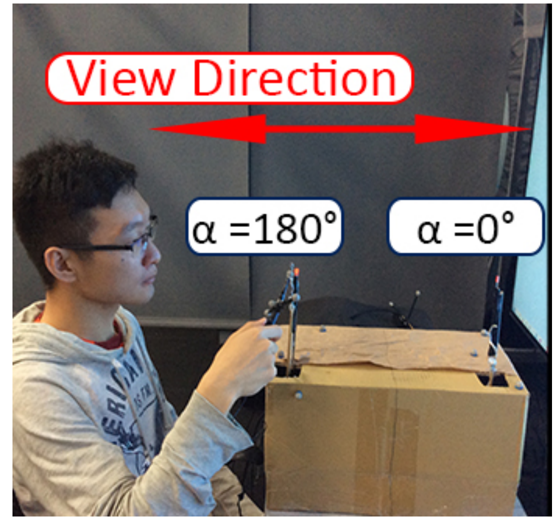
2D & 3D Touch



[G. Bruder, F. Steinicke SUI 13]

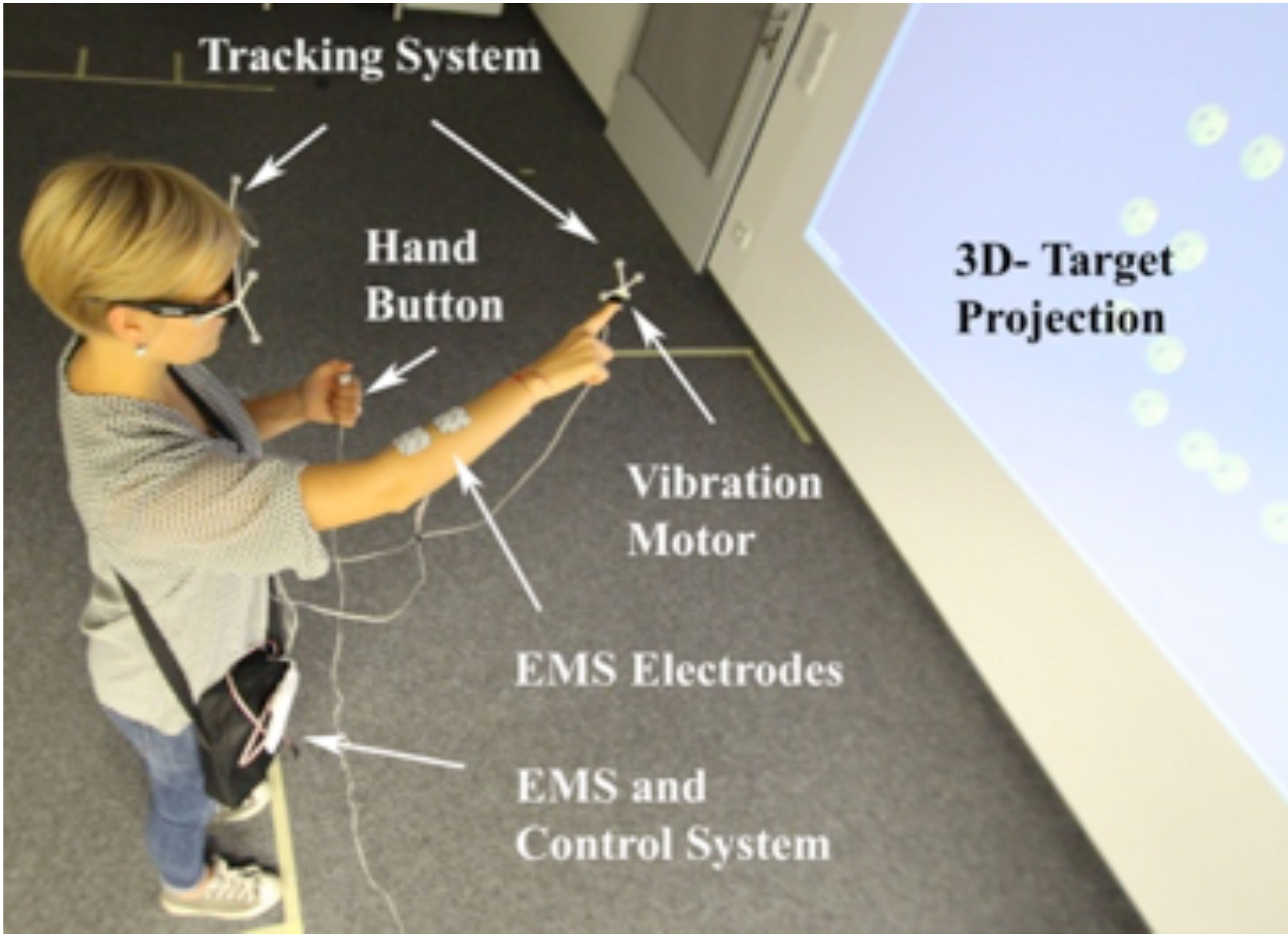
3D Fitts' Law





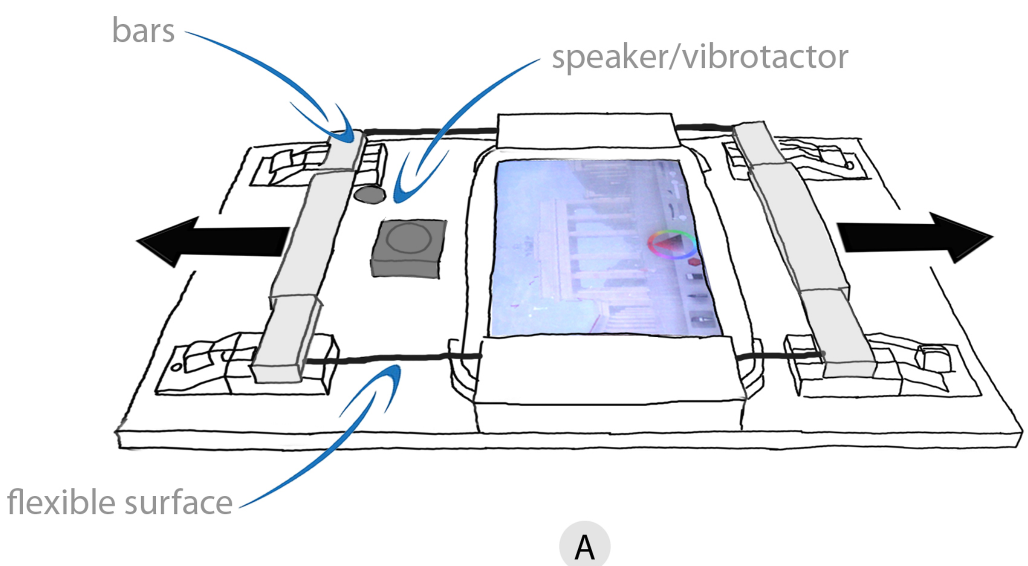
[M. Barrera Machuca CHI 19, A. Batmaz VR 19]

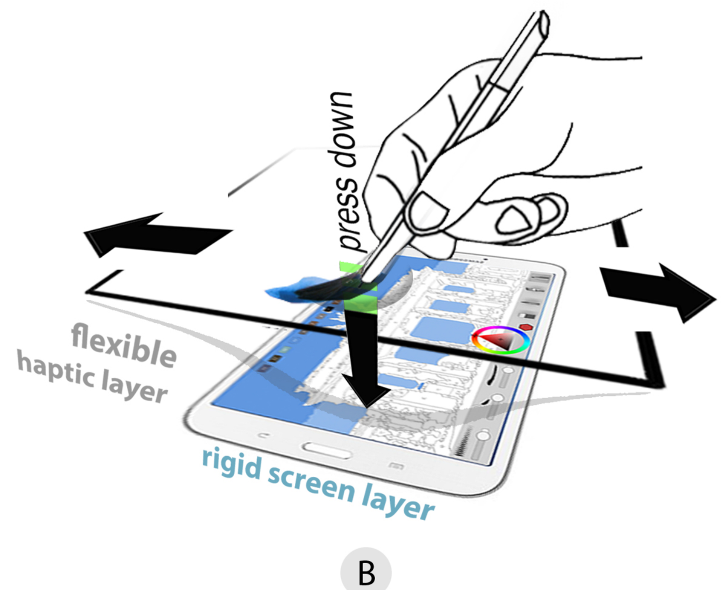
Haptic Feedback



[M. Pfeiffer 3DUI 15]

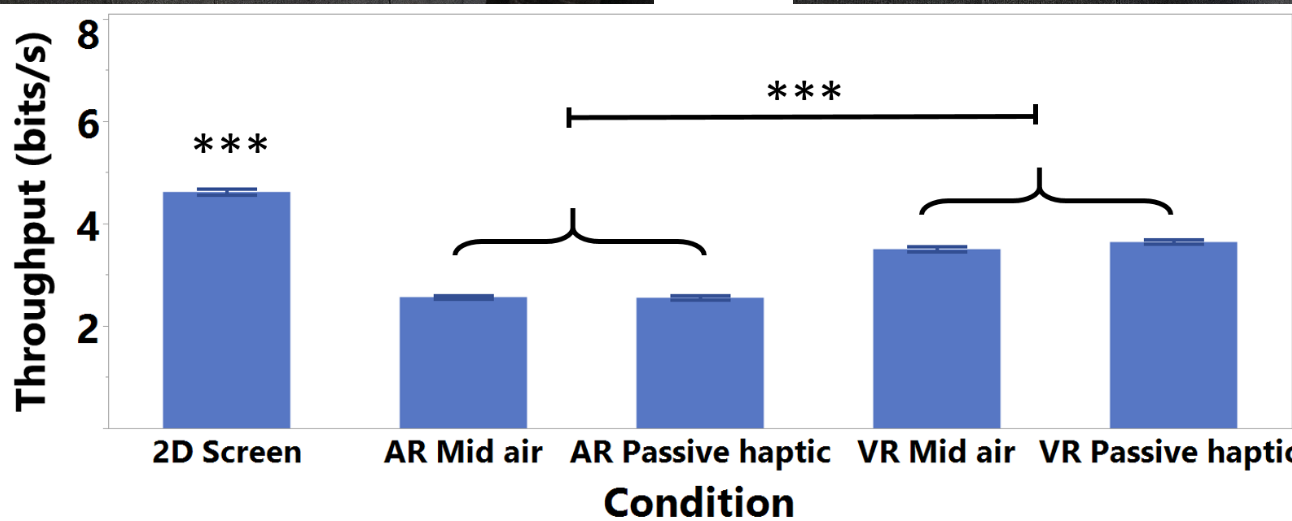
Above-Screen Haptics





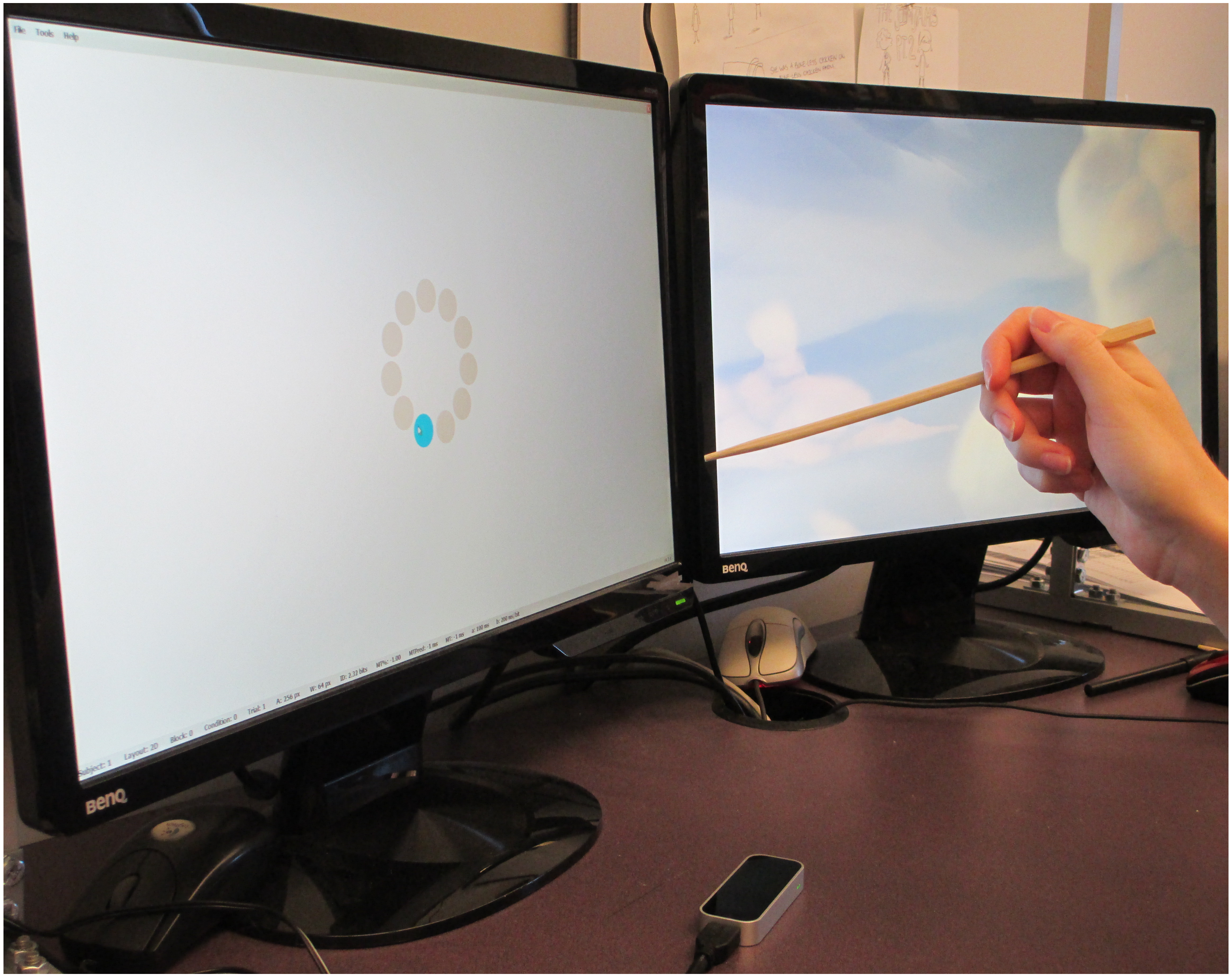
[E. Kruijff, et al. CHI 19]

Passive Haptics



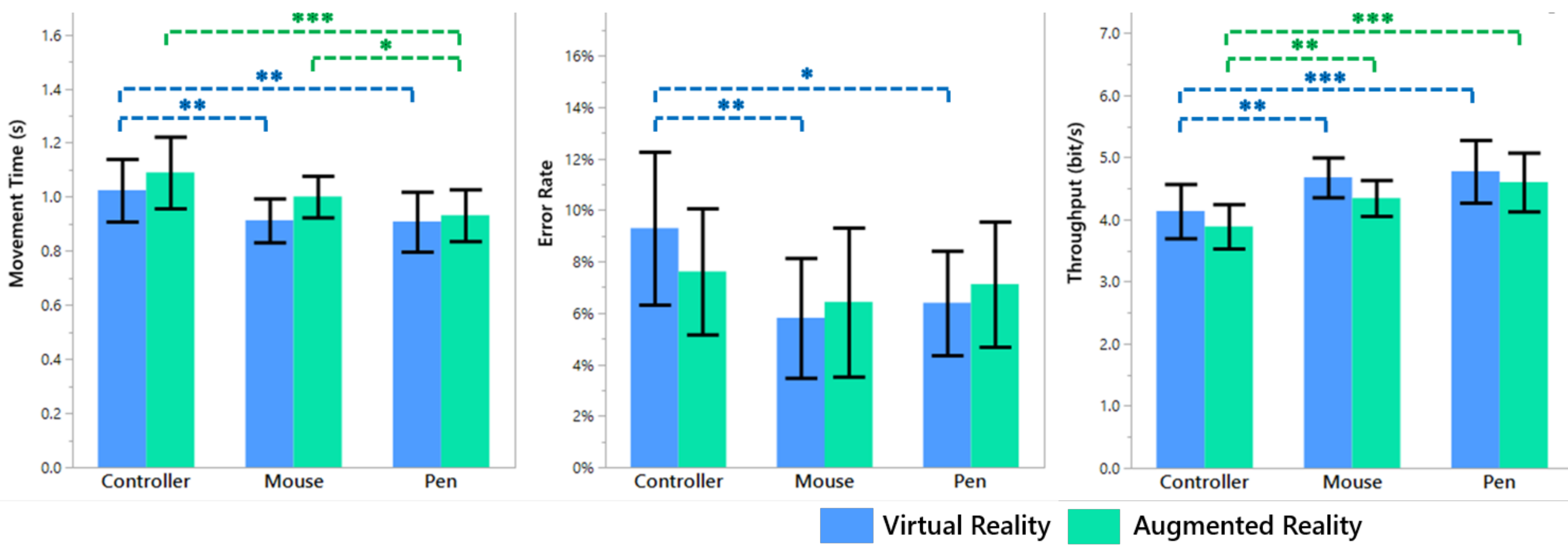
[A. U. Batmaz VR20]

Chopstick Input



[M. Brown GI 14, HCII 16]

Pen Input



[D. Pham, VRST19]

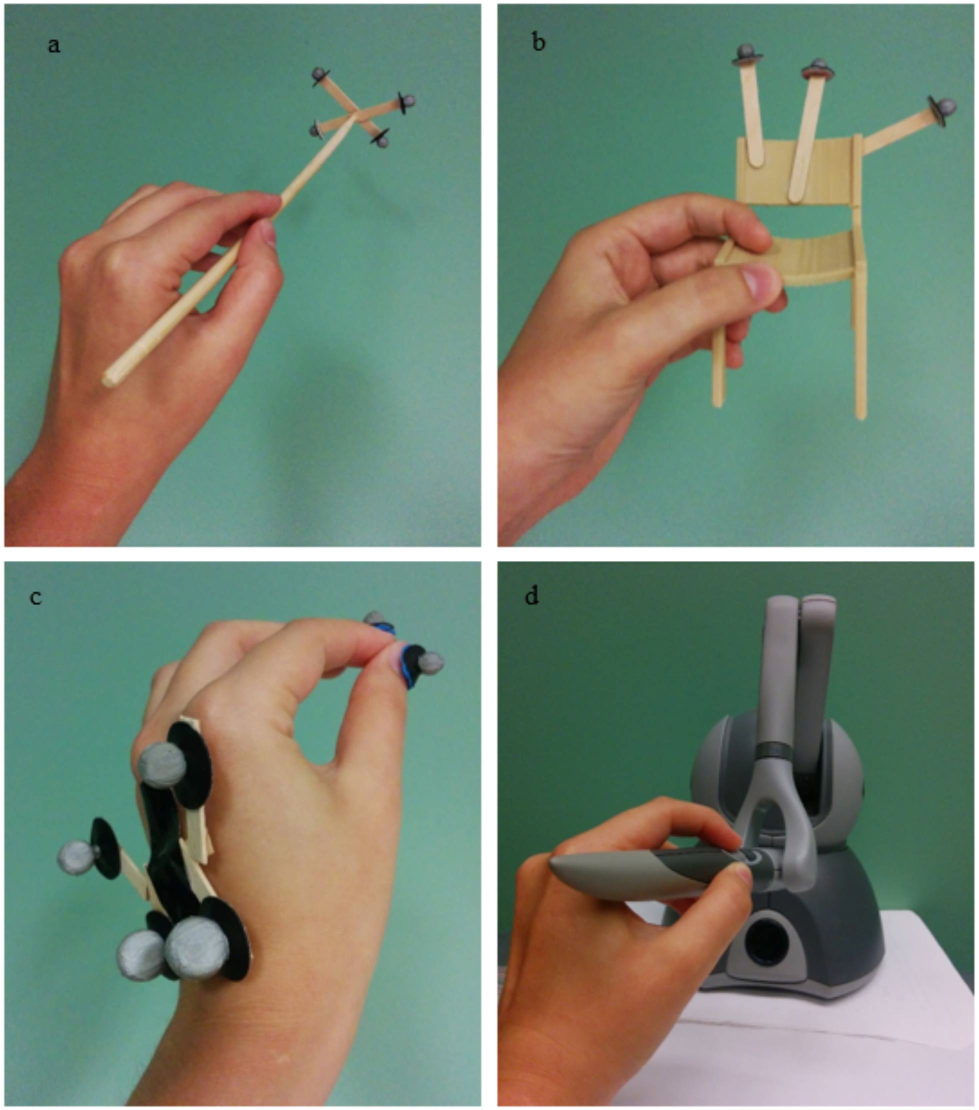
Effect of Grip (& Jitter)

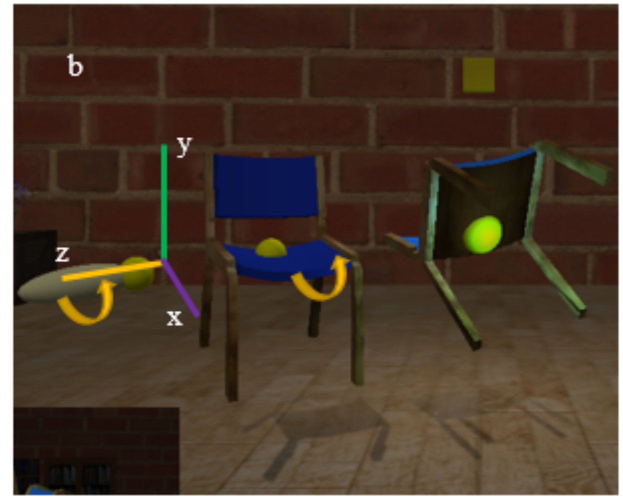
Only difference in errors, but jitter ~ ±1°

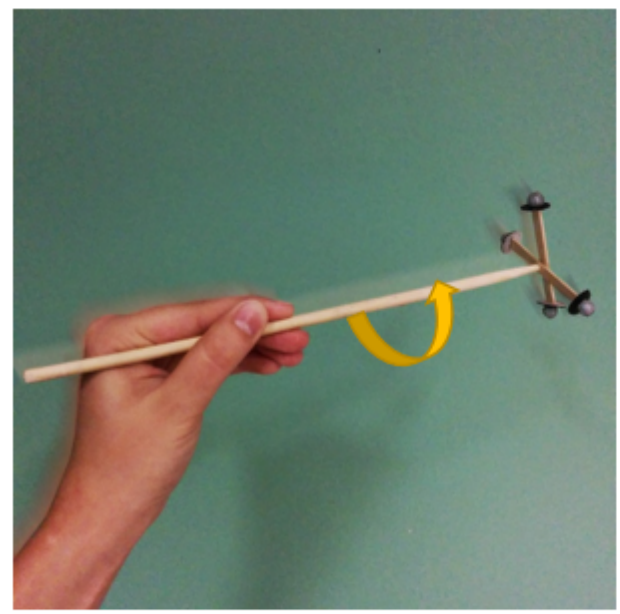
- Likely influenced outcome [submitted work]

[A. U. Batmaz, NIDIT20]

Docking







[V. Vuibert, J. Cooperstock SUI 15]

HawKEY

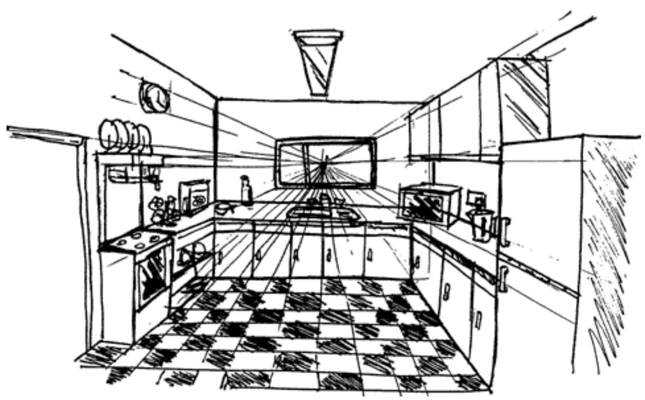
77+ WPM while standing

Video best condition

[D. Pham, VRST19]

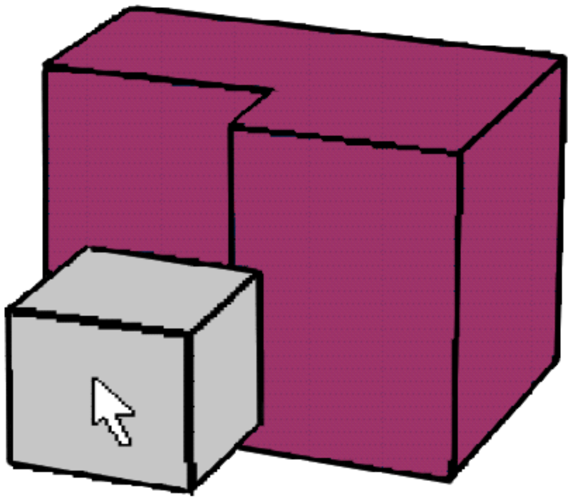
V4-Space – 7x85” 4K@60Hz w. Stereo

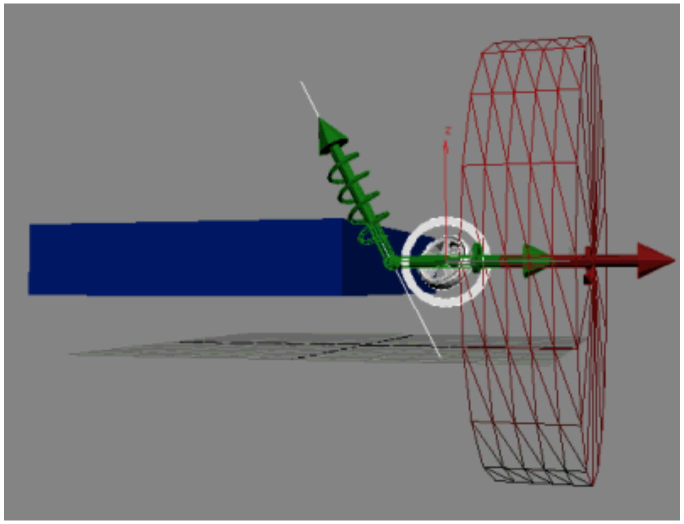
New Ideas for 3D UI's (1)

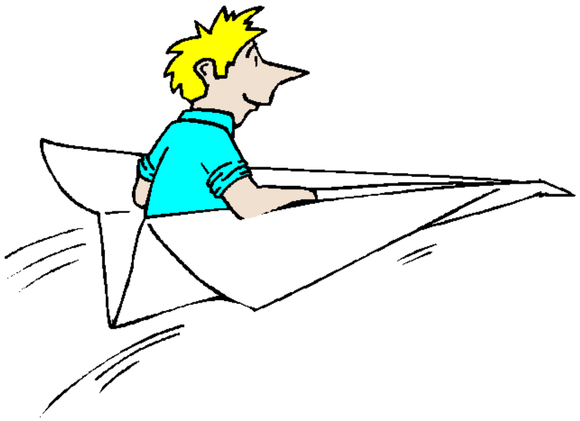


[with C. Wingrave, Dagstuhl08]

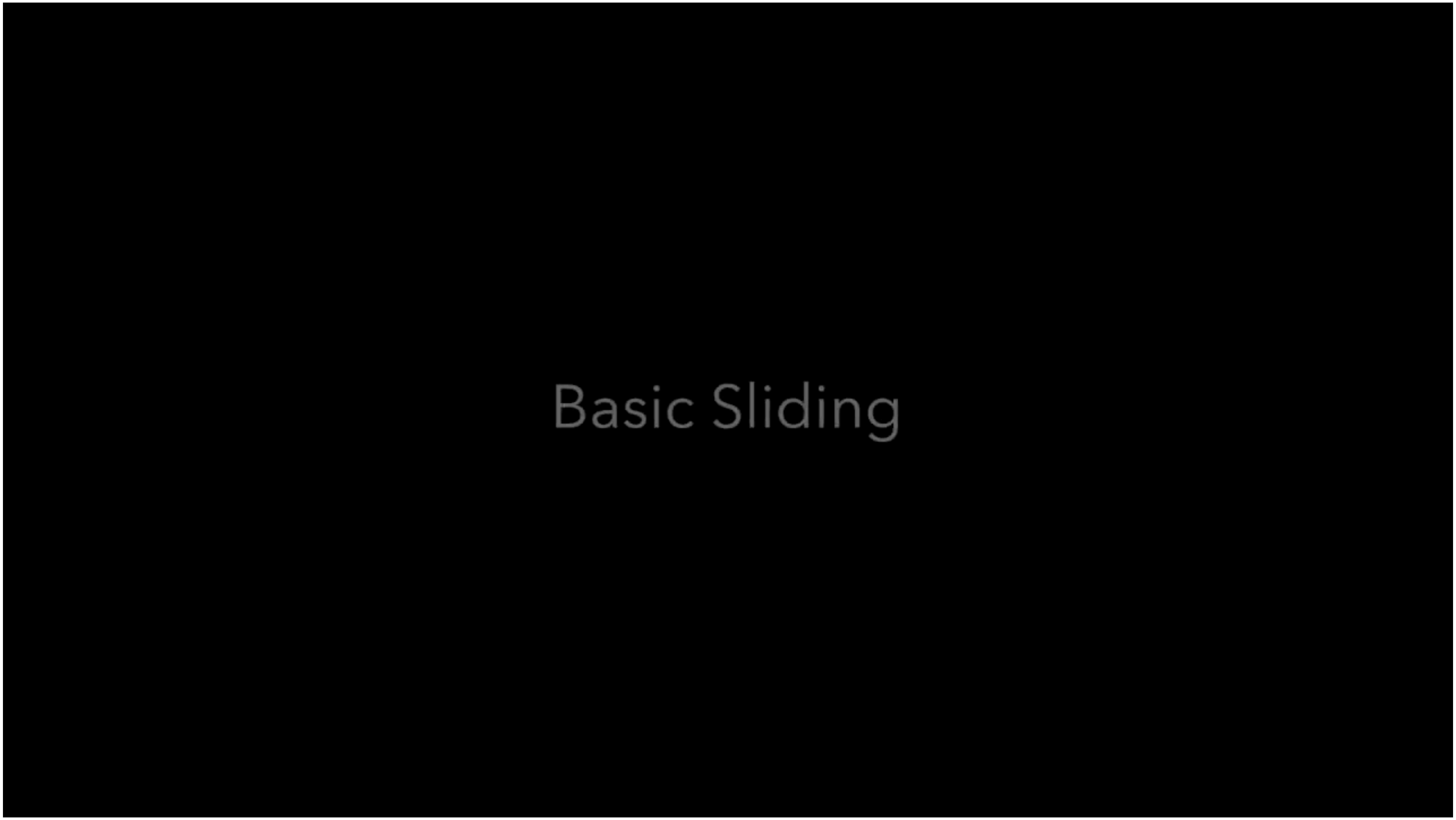
New Ideas for 3D UI’s (3)





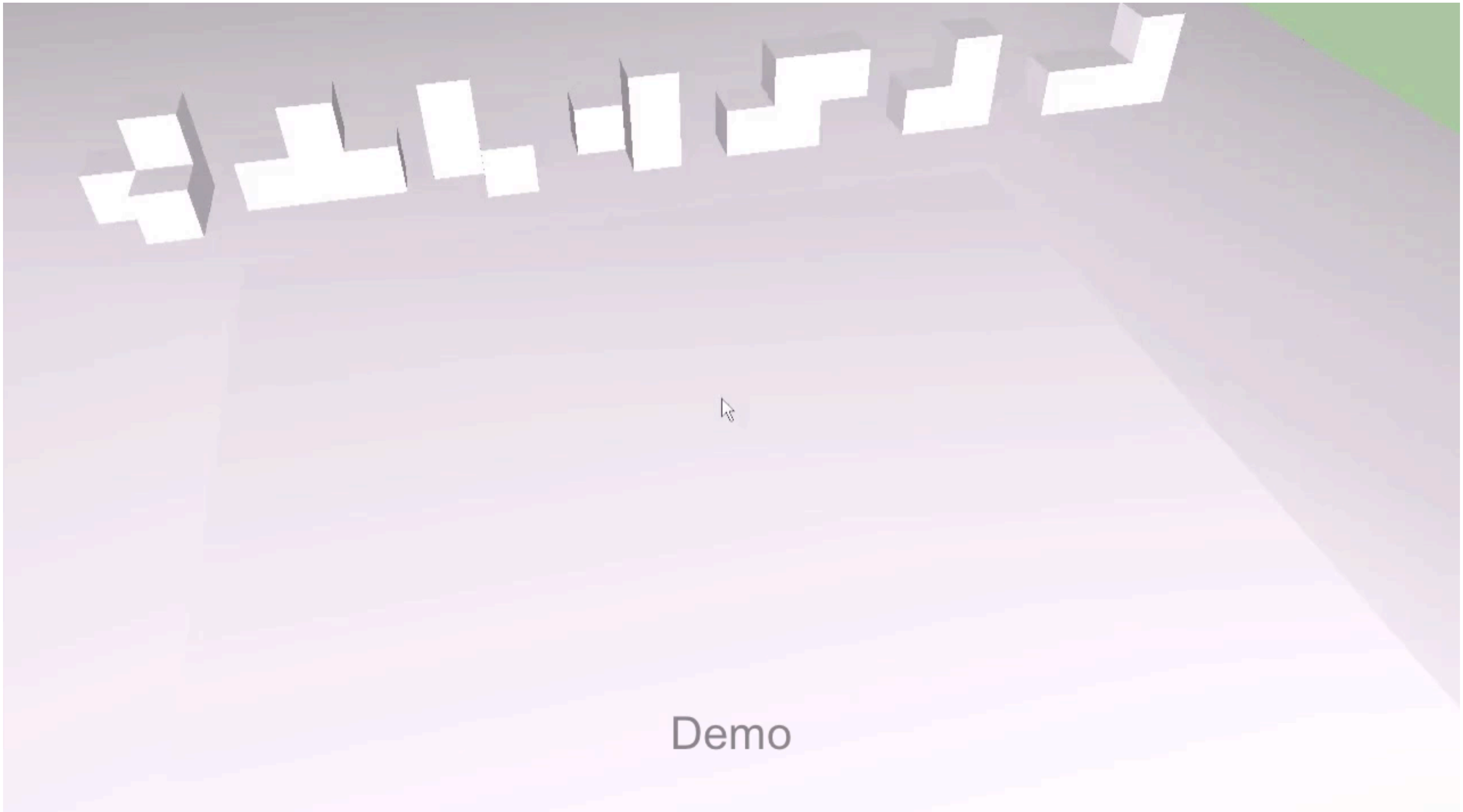


(Basic) Sliding



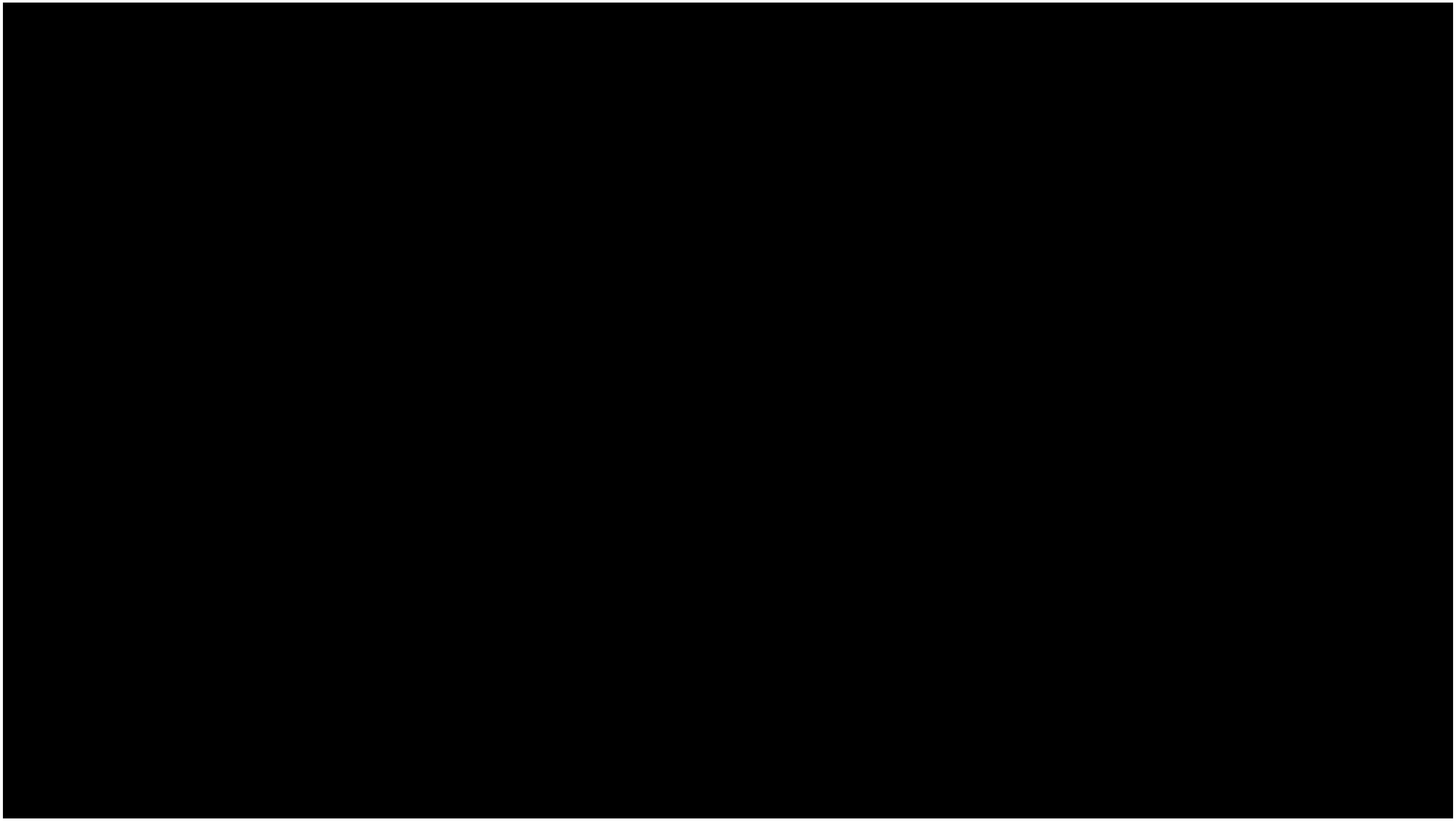
[J.-Y. Oh, GI05]

Puzzle Task Video



[D. Shuralyov, 3DUI 11]

Shift-Sliding & Depth-Pop

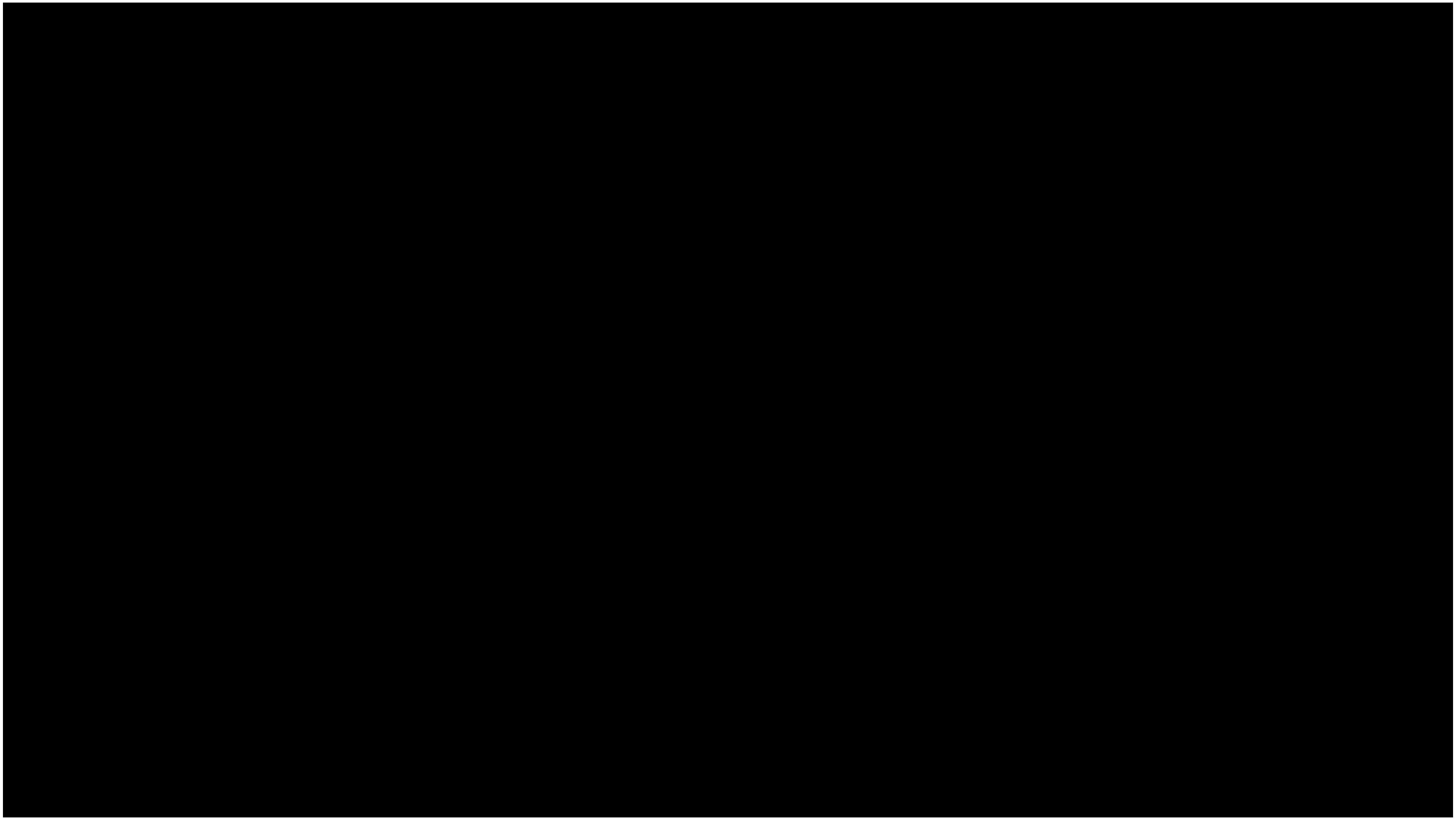


[J. Sun, D. Shuryalov SUI 16]

Depth-Pop

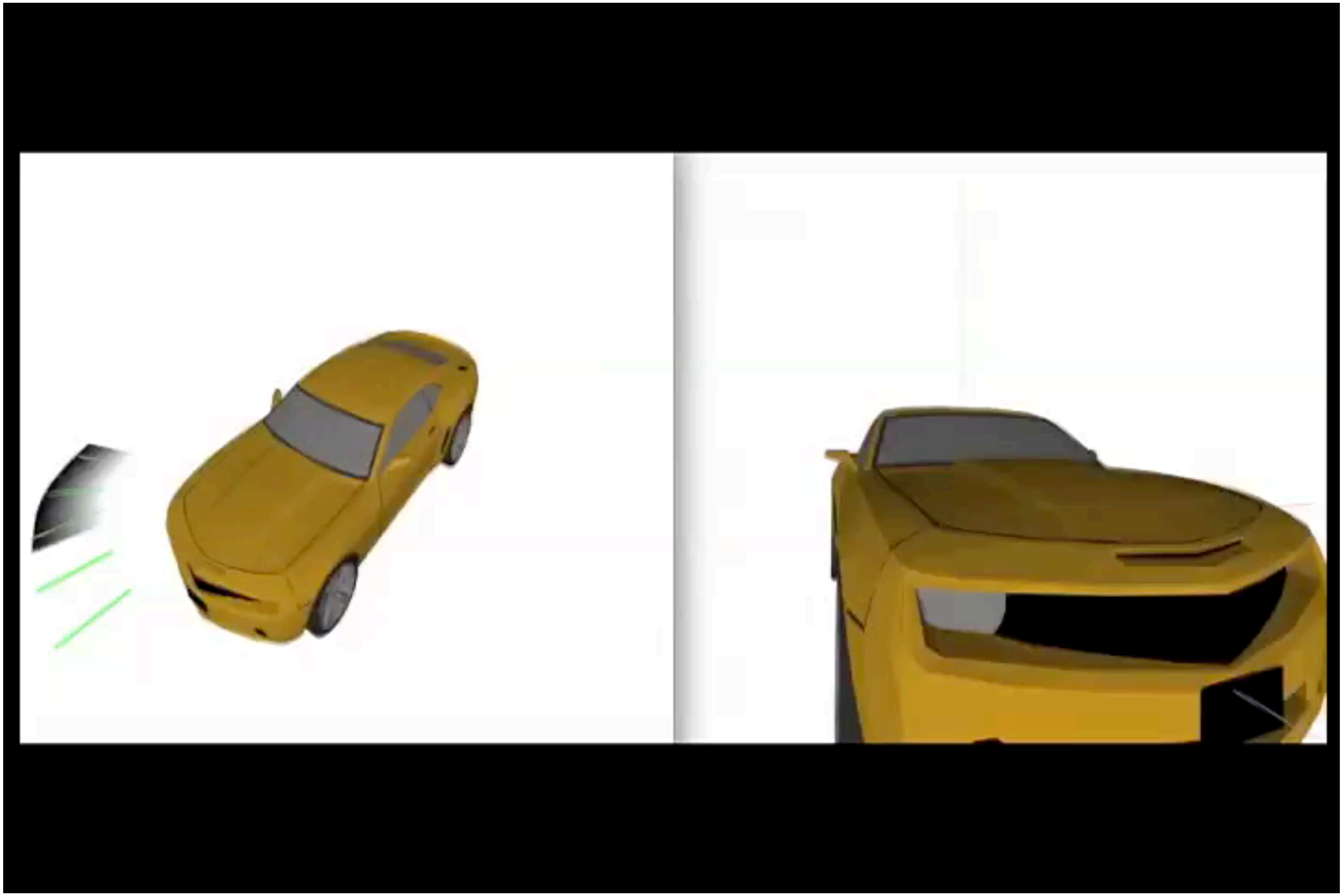
[J. Sun, D. Shuryalov SUI 16]

Transparency Sliding



[J. Sun, GI 19]

SHOcam: Enhanced Navigation



[M. Ortega, D. Scheurich, UIST 15]

TIVES - 8’x6’, 7’ high

Future 3D User Interfaces

End

Thanks

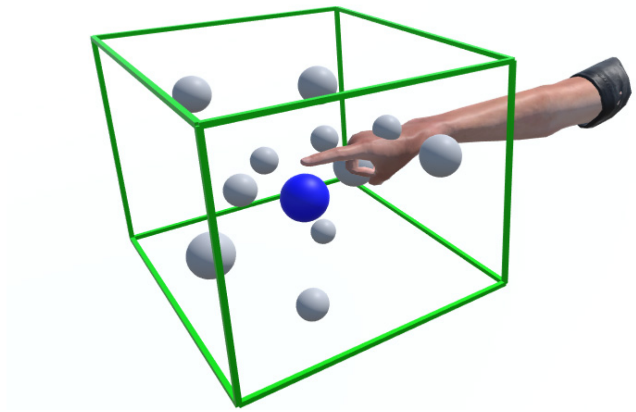
- Ji-Young Oh
- Rob Teather
- Dmitri Shuralyov
- Doug Scheurich
- Andriy Pavlovych
- Junwei Sun
- Domi Papoi
- Duc-Minh Pham
- Michelle Brown
- Vanessa Vuibert
- Mayra Barrera Machuca
- A. Ufuk Batmaz
- …

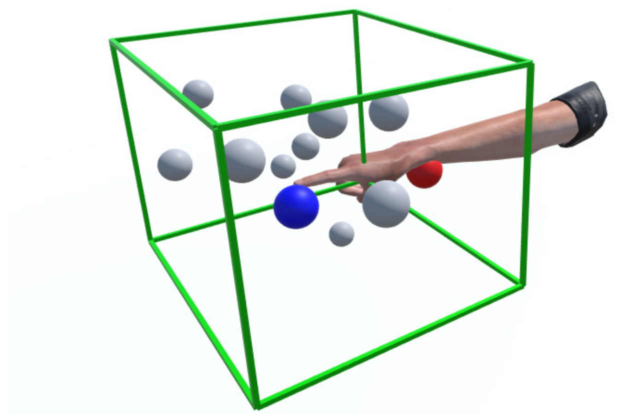
Graphisme, animation et nouveaux médias

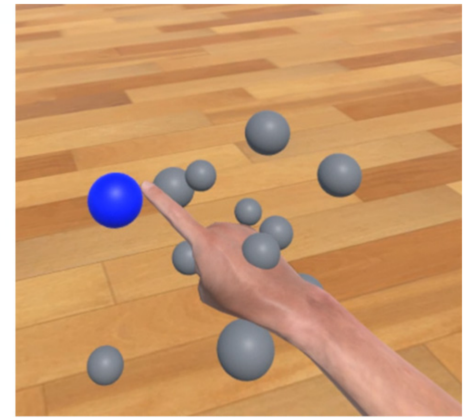
Graphics, Animation and New Media

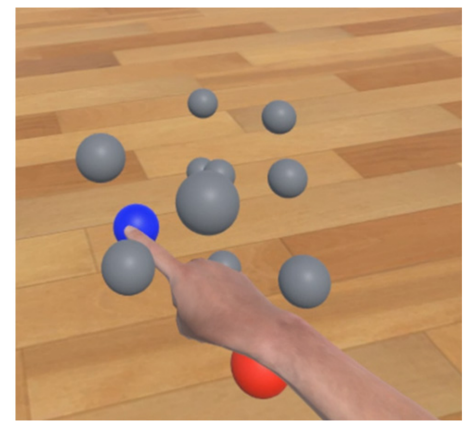
NSERC CRSNG

Arm Representations





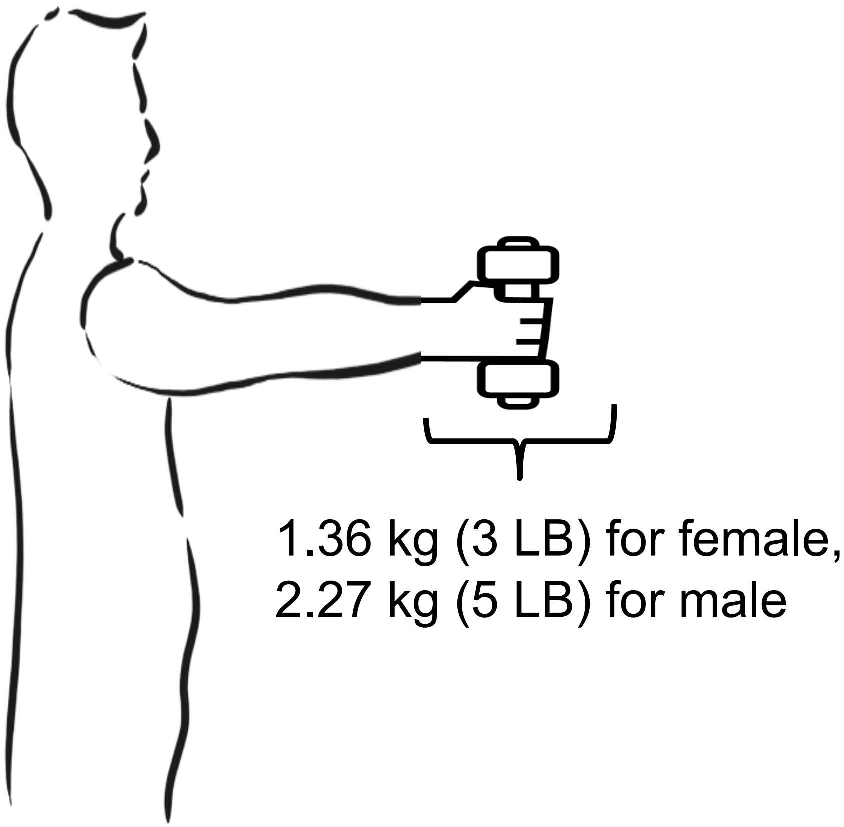




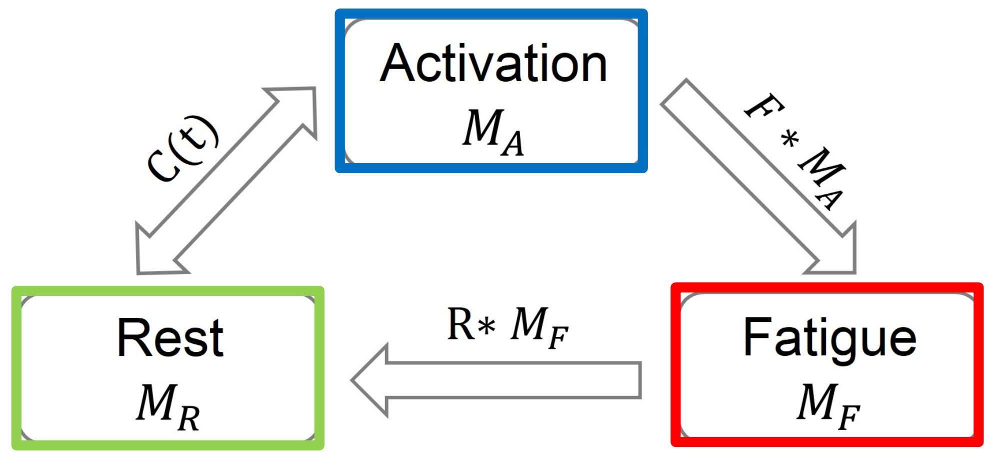
[with T. Tran, H. Shin, J. Han, VRST'17]

In-Air Interaction Fatigue Model

Strength Measurement Method

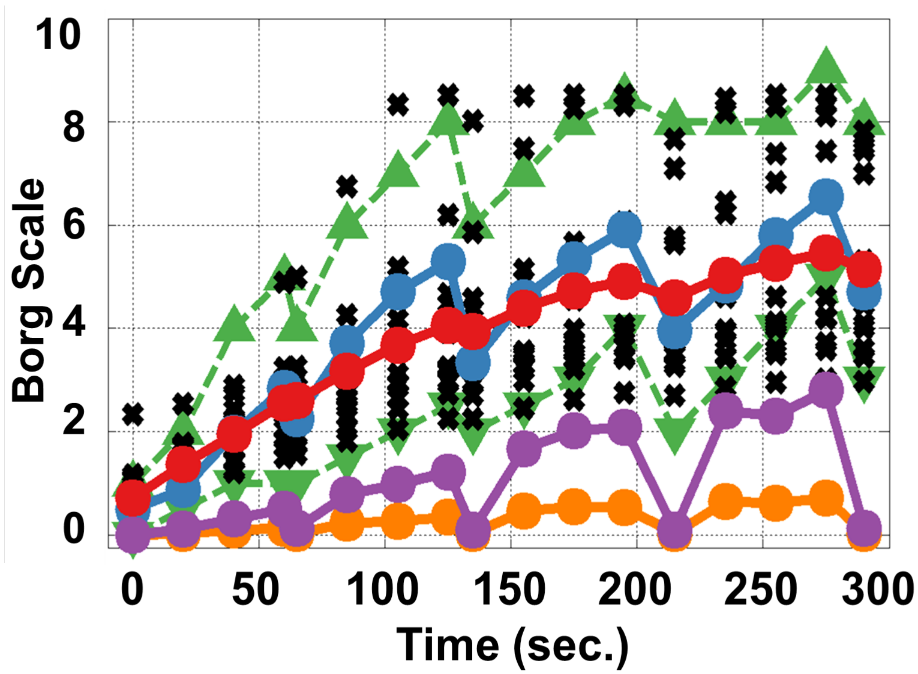


Three-Compartment Muscle (TCM) Model



[with S. Jang, S. Ambike, K. Ramani, CHI'17]

In-Air Interaction Fatigue Model



Blue circles: averaged ground truth (Borg CR-10 Ratings),

Red circles: averaged TCM (ours) estimates,

Black crosses: TCM (ours) estimates,

Green-upward/downward triangles: upper/lower bound of ground truth,

Orange circles: averaged CE (Hincapié-Ramos et al. [2014]) estimates,

Purple circles: averaged CE estimates (averaged exertion > 15%)

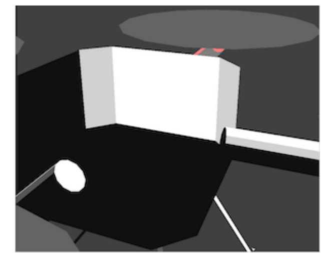
Overall-RMSE = 1.46 (Range=[0.83,1.9])

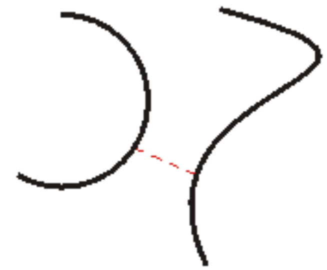
[S. Jang, S. Ambike, K. Ramani, CHI17]

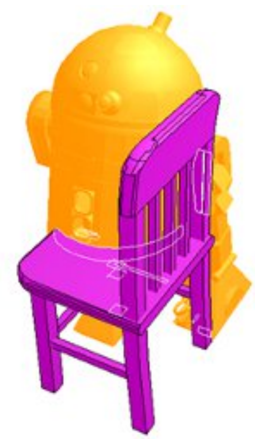
(Basic) Sliding technique

Find contact behind area of moving object

1. Draw background (z-buffer)
2. Draw back-faces of moving object
3. Identify min distance
4. Use geometry to position object
5. Collision detection (GPU)
6. If collision, go to 2.







[J.-Y. Oh, GI 05]

OK/Cancel on Minority Report