This is a revised version of the slides Charlie Kemp presented at the following workshop.

https://a3de-hri.github.io/

Assistive Applications, Accessibility, and Disability Ethics (A3DE)

HRI 2024 Workshop
Friday, March 15, 2024
Boulder, CO

1pm - 1:45pm MT
Keynote Speaker: Charlie Kemp
“Together, We Can Get There: An Open Community Approach to Accessible Home Robots”
45 minute talk with questions held for a subsequent panel session

Speaker Bio
Dr. Charlie Kemp is a cofounder and the chief technology officer (CTO) of Hello Robot Inc., which is working toward a future where mobile manipulators enhance life for everyone. Hello Robot sells Stretch, a compact, lightweight, and capable mobile manipulator that is empowering a growing community of innovators to create a better future. Prior to joining Hello Robot full time in September of 2023, Dr. Kemp was a tenured faculty member at Georgia Tech where beginning in 2006 his research focused on enabling intelligent mobile manipulators to assist older adults and people with disabilities. He sees Hello Robot as the next step in this long-term mission.

Together, We Can Get There

An Open Community Approach to Accessible Home Robots

Charlie Kemp, PhD

Cofounder & Chief Technology Officer

Stretch 3

robot

hello robot®

Professional Timeline

1997-2005 : Earned degrees at MIT

2006 : Joined Georgia Tech

2017 : Co-founded Hello Robot

2023 : Joined Hello Robot full-time

Professional Timeline

1997-2005 : Earned degrees at MIT

2006 : Joined Georgia Tech

2017 : Co-founded Hello Robot

2023 : Joined Hello Robot full-time

relinquished tenure & closed my lab

Why give up tenure? To make this a reality

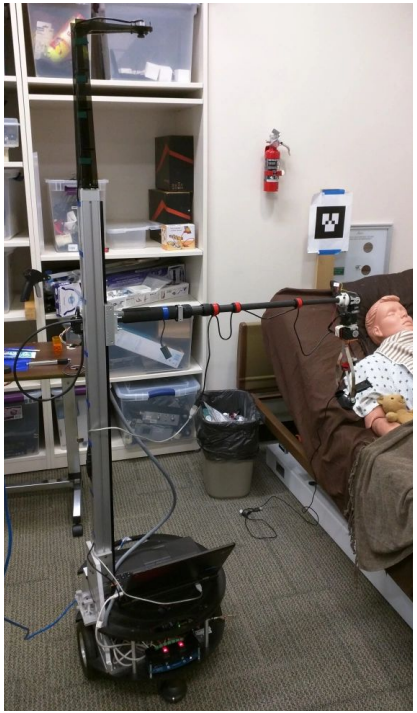


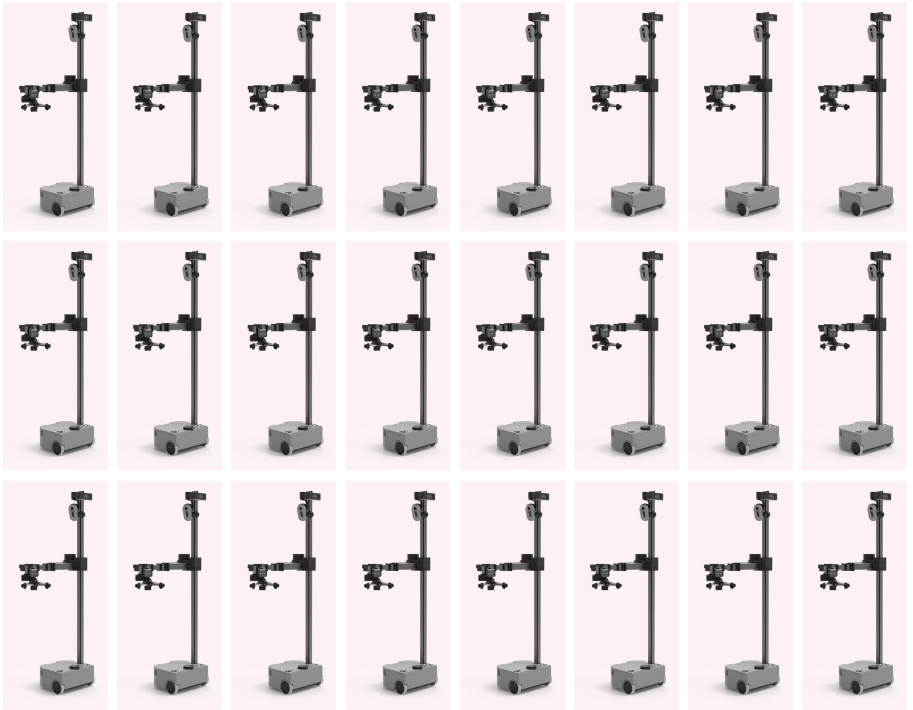



research from the Healthcare Robotics Lab (healthcare-robotics.com) at Georgia Tech

Georgia Tech

A Company can Produce and Support Many Robots





Georgia Tech

hello robot®

Many Robots can Support an Open Research Community

The Open Research Community Using Stretch

An Open Research Community can Change the World

Photo by Peter Adams

Together, We Can Get There

An Open Community Approach to Accessible Home Robots

- The assistive origins of Stretch
- The design of Stretch
- Hello Robot's open community approach
- The Robots for Humanity project

hello robot®

Commercially Available Assistive Robots

JACO by Kinova

- On your wheelchair
- On a table or desk
- On your body

Obi by Obi

Ability Hand by Psyonic

Myomo by Myomo Inc.

Advantages of Mobile Manipulators

- Operate independently from the user
- No don/doff
- Assist diverse users
- Potential for mass market product

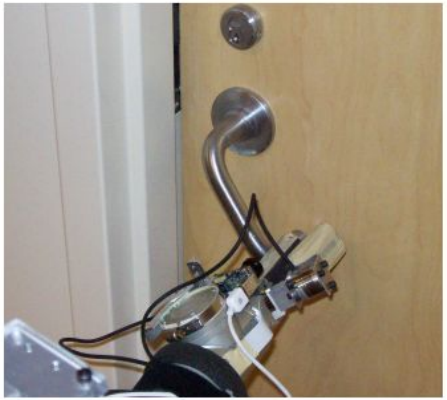
Stretch's Ancestor

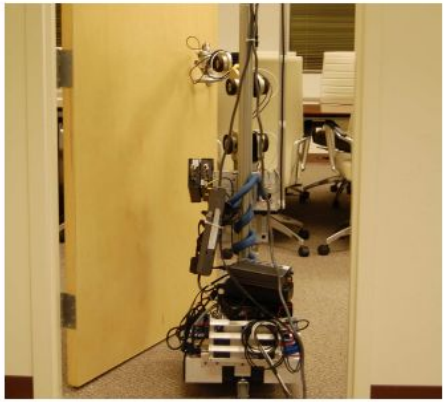
EL-E from 2008

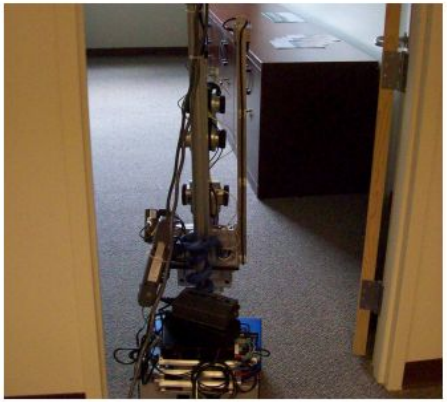
- Statically stable
- Small footprint
- Cameras high
- Reach flat surfaces

A Point-and-Click Interface for the Real World: Laser Designation of Objects for Mobile Manipulation, Charles C. Kemp, Cressel Anderson, Hai Nguyen, Alex Trevor, and Zhe Xu, 3rd ACM/IEEE International Conference on Human-Robot Interaction (HRI), 2008



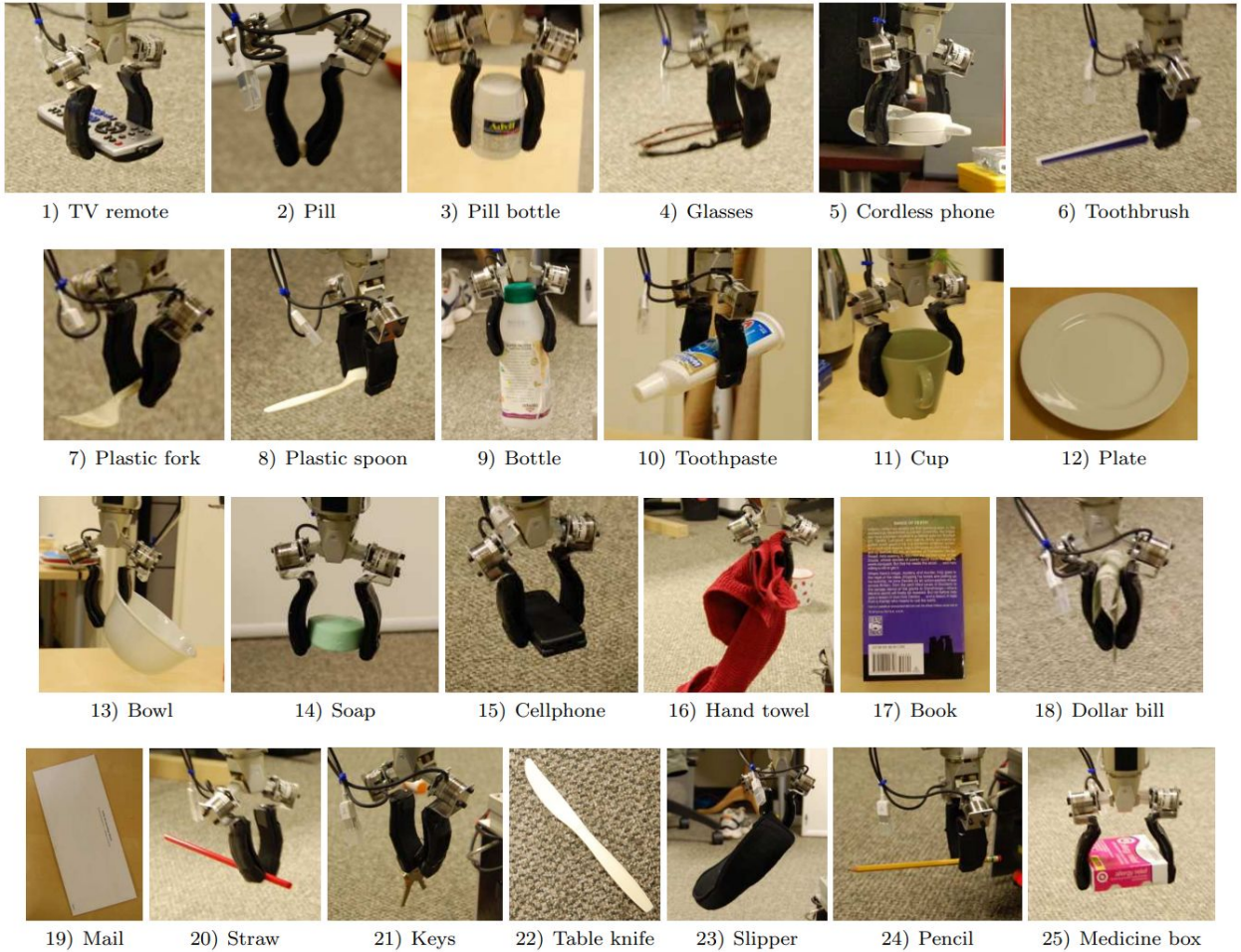







Behaviors for Robust Door Opening and Doorway Traversal with a Force-Sensing Mobile Manipulator, Advait Jain and Charles C. Kemp, RSS Manipulation Workshop: Intelligence in Human Environments, 2008.

Georgia Tech

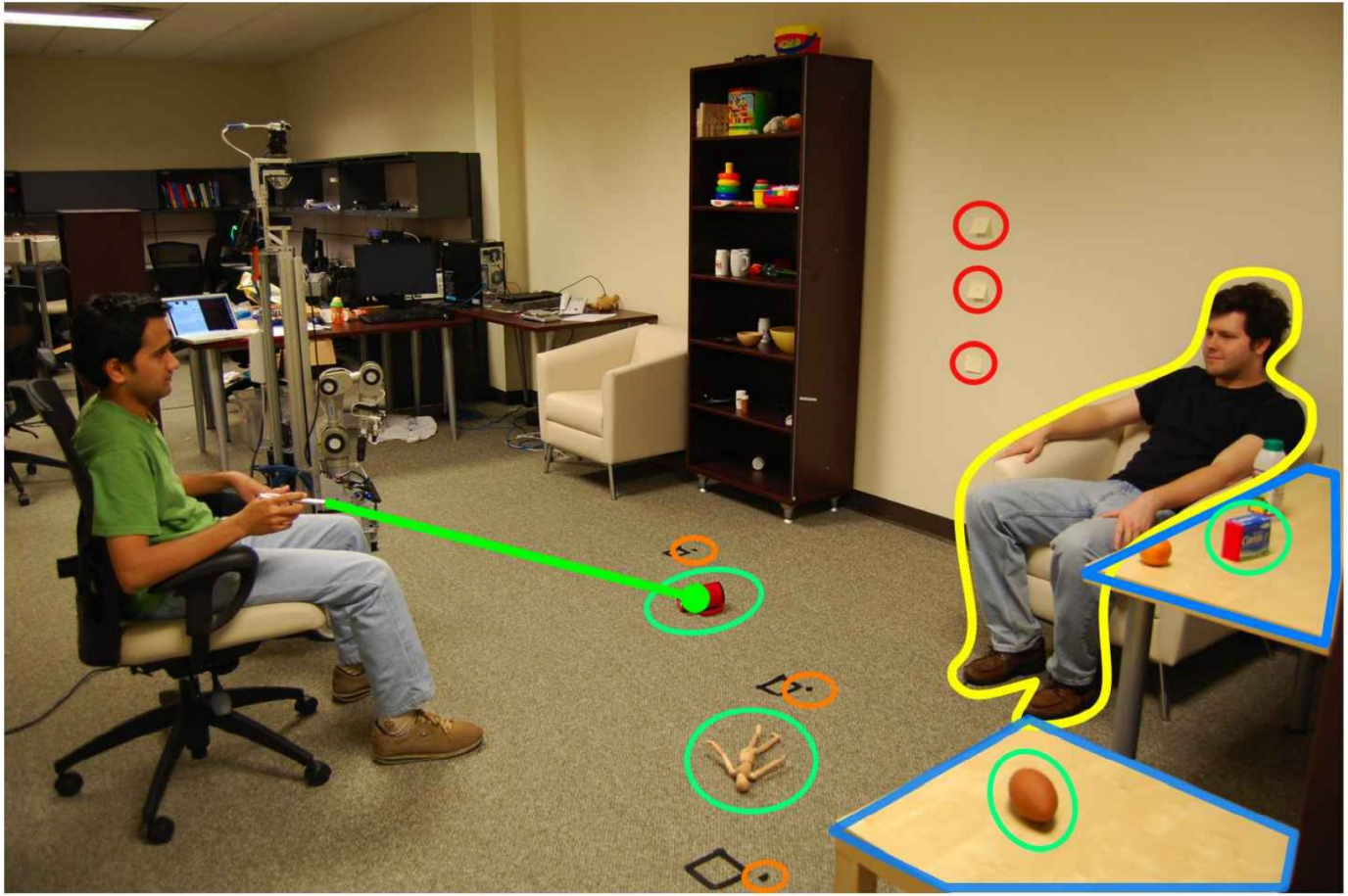


EL-E: An Assistive Mobile Manipulator that Autonomously Fetches Objects from Flat Surfaces, Advait Jain and Charles C. Kemp, Autonomous Robots, 2010

Georgia Tech

PPS-Tags: Physical Perceptual and Semantic Tags for Autonomous Mobile Manipulation, Hai Nguyen, Travis Deyle, Matt Reynolds, and Charles C. Kemp, IROS 2009 workshop: Semantic Perception for Mobile Manipulation, 2009.

Georgia Tech



[A Clickable World: Behavior Selection Through Pointing and Context for Mobile Manipulation](), Hai Nguyen, Advait Jain, Cressel Anderson, and Charles C. Kemp, IEEE/RJS International Conference on Intelligent Robots and Systems (IROS), 2008.

Georgia Tech

Hand It Over or Set It Down: A User Study of Object Delivery with an Assistive Mobile Manipulator, Young Sang Choi, Tiffany L. Chen, Advait Jain, Cressel Anderson, Jonathan D. Glass, and Charles C. Kemp, IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN), 2009.

Georgia Tech

Norma was an advocate for my lab's research to create assistive robots to benefit people with ALS. She was a visionary who saw the future potential. She encouraged us and enthusiastically tested and demonstrated our research systems. She was a remarkable person whom I think of often. I am deeply grateful for her contributions.

Norma Margeson

"She was a talented and award winning artist, and continued to study and paint all of her life. To use her words, *"I try to capture a part of God's beautiful creation on canvas."* She contributed time and talent to ALS research. Two of her paintings are on display at the MDA art museum in Arizona. She was recently on ABC's Good Morning America, demonstrating a new robot being developed through Emory University by Georgia Tech."

— Excerpt from her obituary that originally appeared in the Atlanta Journal-Constitution on May 26, 2009

In 2010, Willow Garage Began Shipping Many Robots

Images from
https://www.flickr.com/photos/willowgarage/4648144203/
https://www.roboticstoday.com/institutions/willow-garage

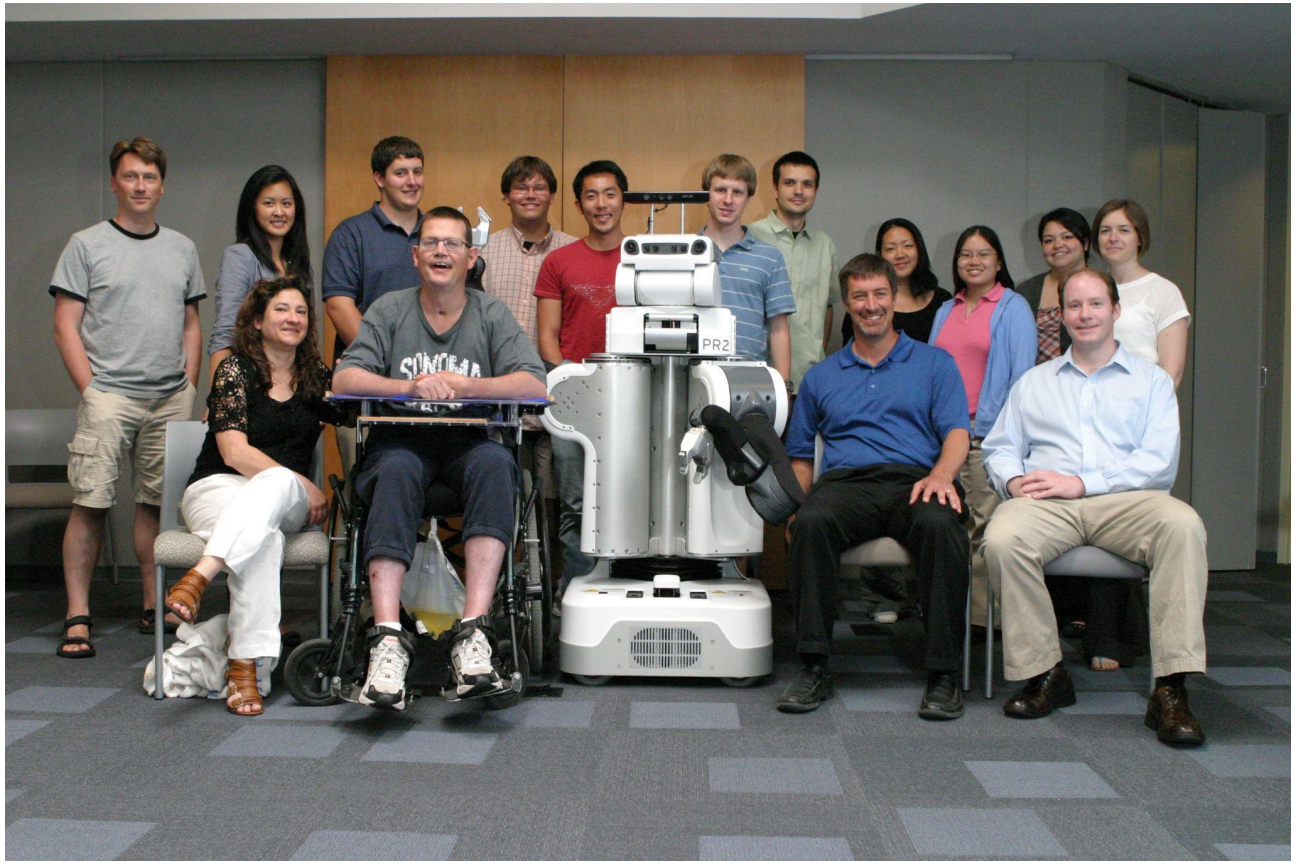
Willow Garage

The PR2 Research Community Changed the World

[“Robot Operating System (ROS or ros)”]

Image from
https://www.roboticstoday.com/institutions/willow-garage

The Robots for Humanity Project



Robots for humanity: using assistive robotics to empower people with disabilities, Tiffany L. Chen, Matei Ciocarlie, Steve Cousins, Phillip Grice, Kelsey Hawkins, Kaijen Hsiao, **Charles C. Kemp**, Chih-Hung King, Daniel A. Lazewatsky, Adam Leeper, Hai Nguyen, Andreas Paepcke, Caroline Pantofaru, William D. Smart, and Leila Takayama, IEEE Robotics & Automation Magazine, 2013

Photo taken on June 16, 2011 at Willow Garage during the second Robots for Humanity workshop. Image from https://www.flickr.com/photos/willowgarage/5941309642 .

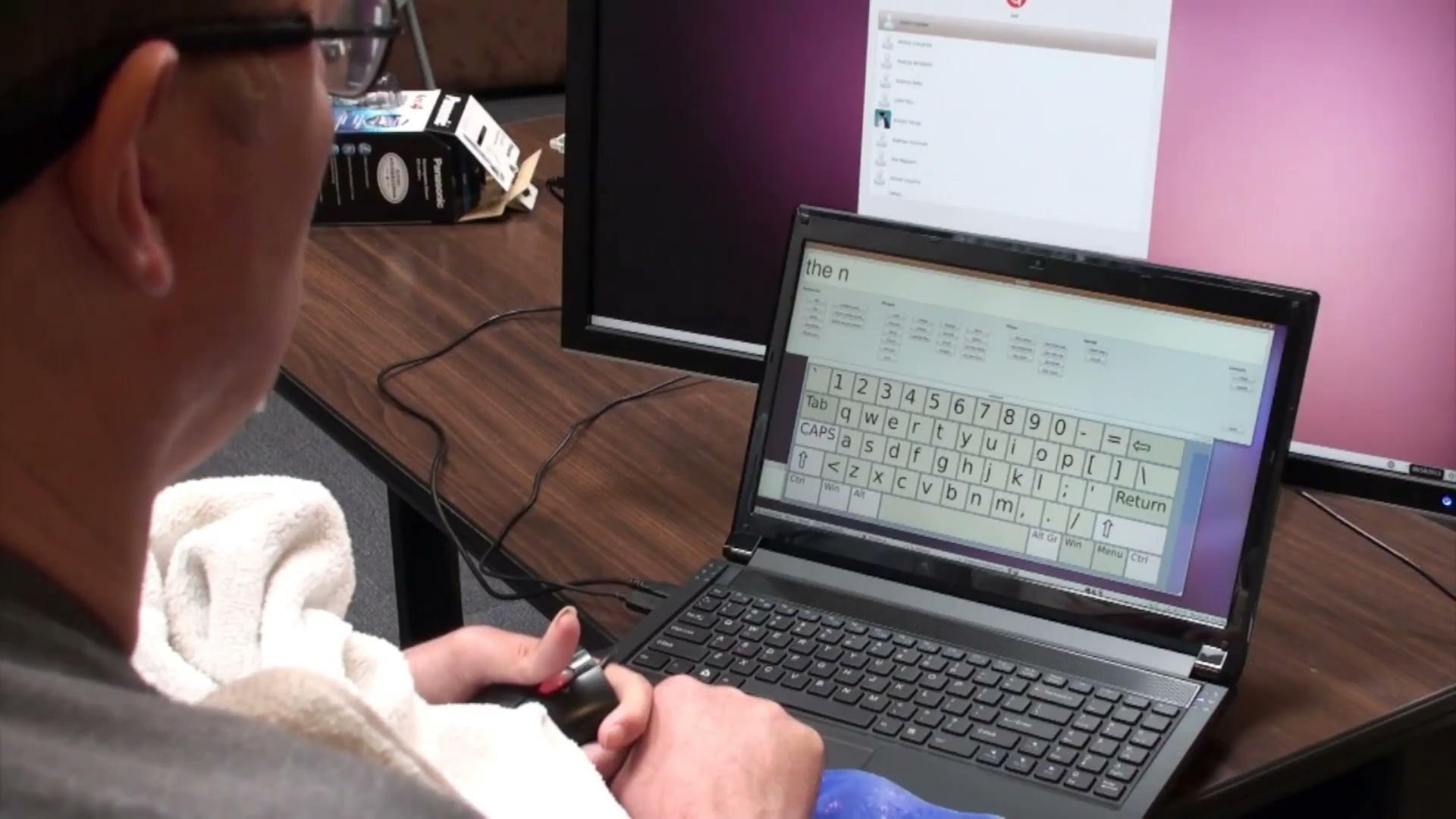
Henry Evans & Jane Evans

I am deeply grateful for my collaboration and friendship with Henry Evans and Jane Evans. Henry saw me demonstrating research from my lab with a PR2 robot for Ali Velshi on CNN on October 15, 2010. Henry was excited about the potential for the technology and reached out to Willow Garage and me. Steve Cousins, the CEO of Willow Garage, hosted the first Robots for Humanity workshop on March 21 & 22, 2011 at Willow Garage in Menlo Park, CA. I've been collaborating with Henry and Jane ever since. They are truly remarkable. They've made important contributions to research. They've also enriched my life through their friendship. I've written the following brief descriptions to help you get to know them a little.

Henry is humorous, playful, inventive, romantic, relentless, outgoing, fearless, and a test pilot for home robots with the potential to enhance life.

Jane is adventurous, insightful, creative, steadfast, driven, welcoming, caring, supportive, and an advocate for people with disabilities and their care partners.

They are explorers, innovators, influencers, and pioneers in home robotics who are working hard to make the world better.


the n
Tab
CAPS
Return
Panasonic

Assistive Mobile Manipulation for Self-Care Tasks Around the Head, Kelsey Hawkins, Phillip M. Grice, Tiffany L. Chen, Chih-Hung King, and Charles C. Kemp, 2014 IEEE Symposium on Computational Intelligence in Robotic Rehabilitation and Assistive Technologies, 2014.

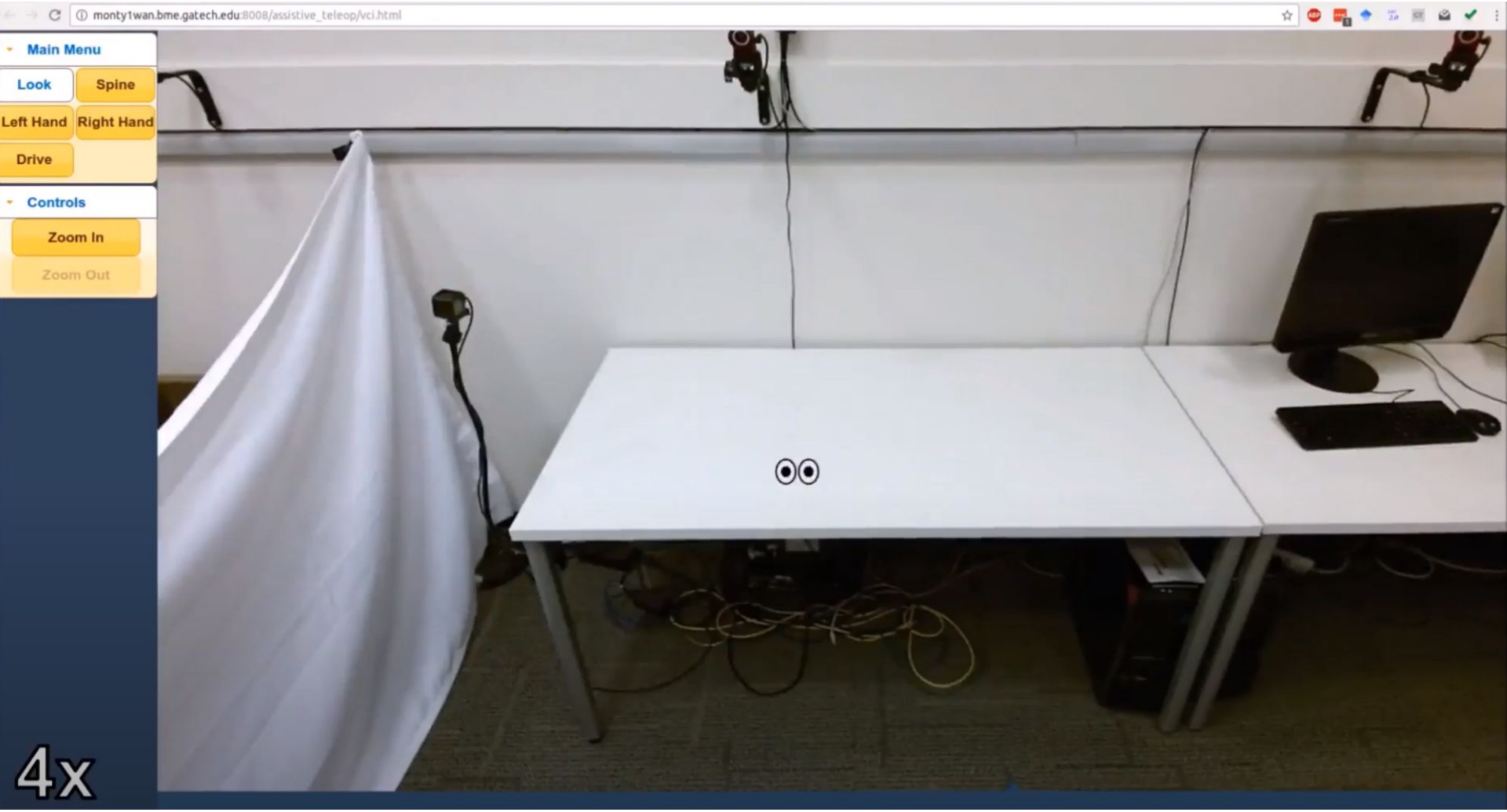
Georgia Tech

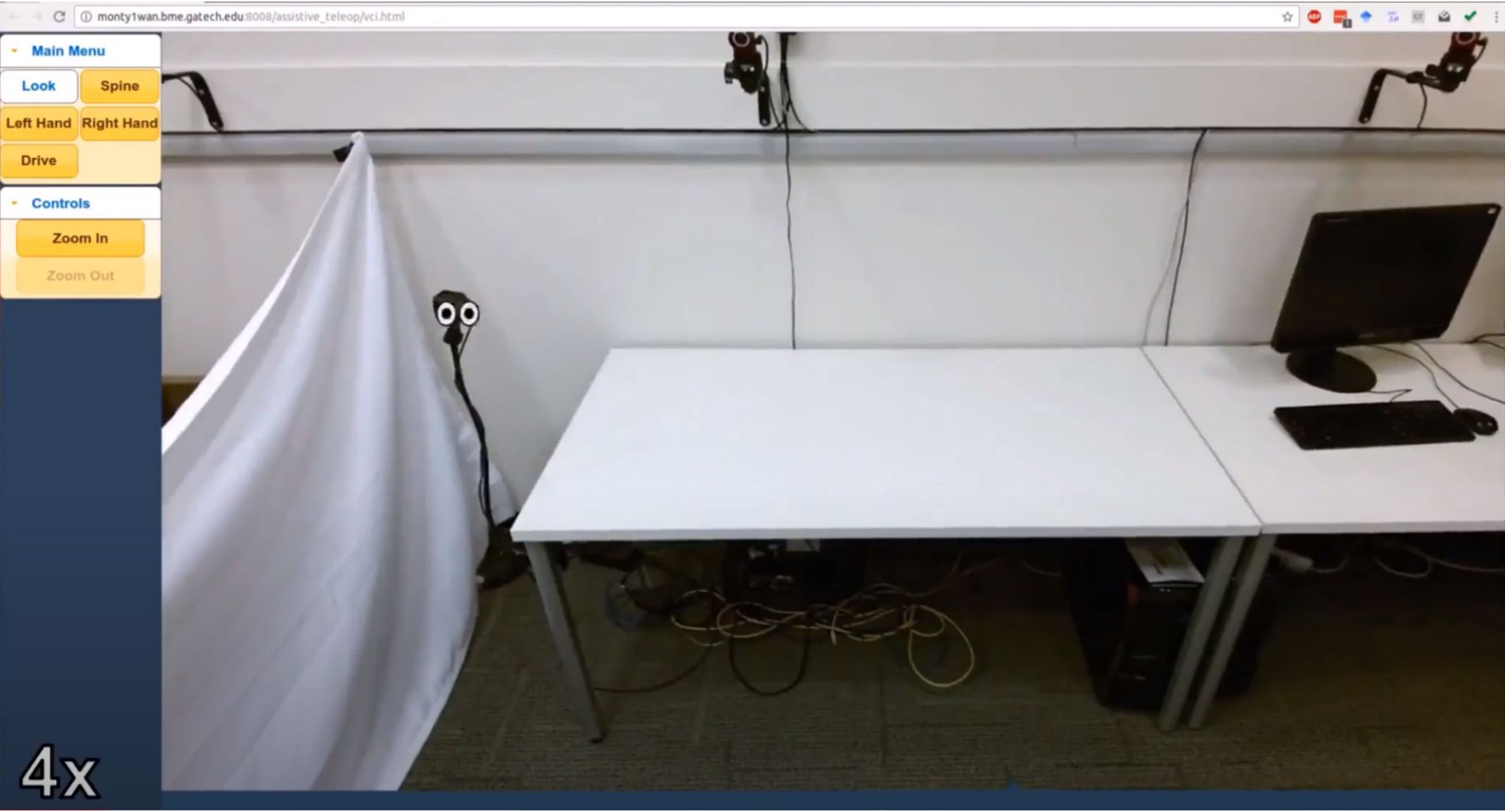
Assistive Mobile Manipulation for Self-Care Tasks Around the Head, Kelsey Hawkins, Phillip M. Grice, Tiffany L. Chen, Chih-Hung King, and Charles C. Kemp, 2014 IEEE Symposium on Computational Intelligence in Robotic Rehabilitation and Assistive Technologies, 2014.

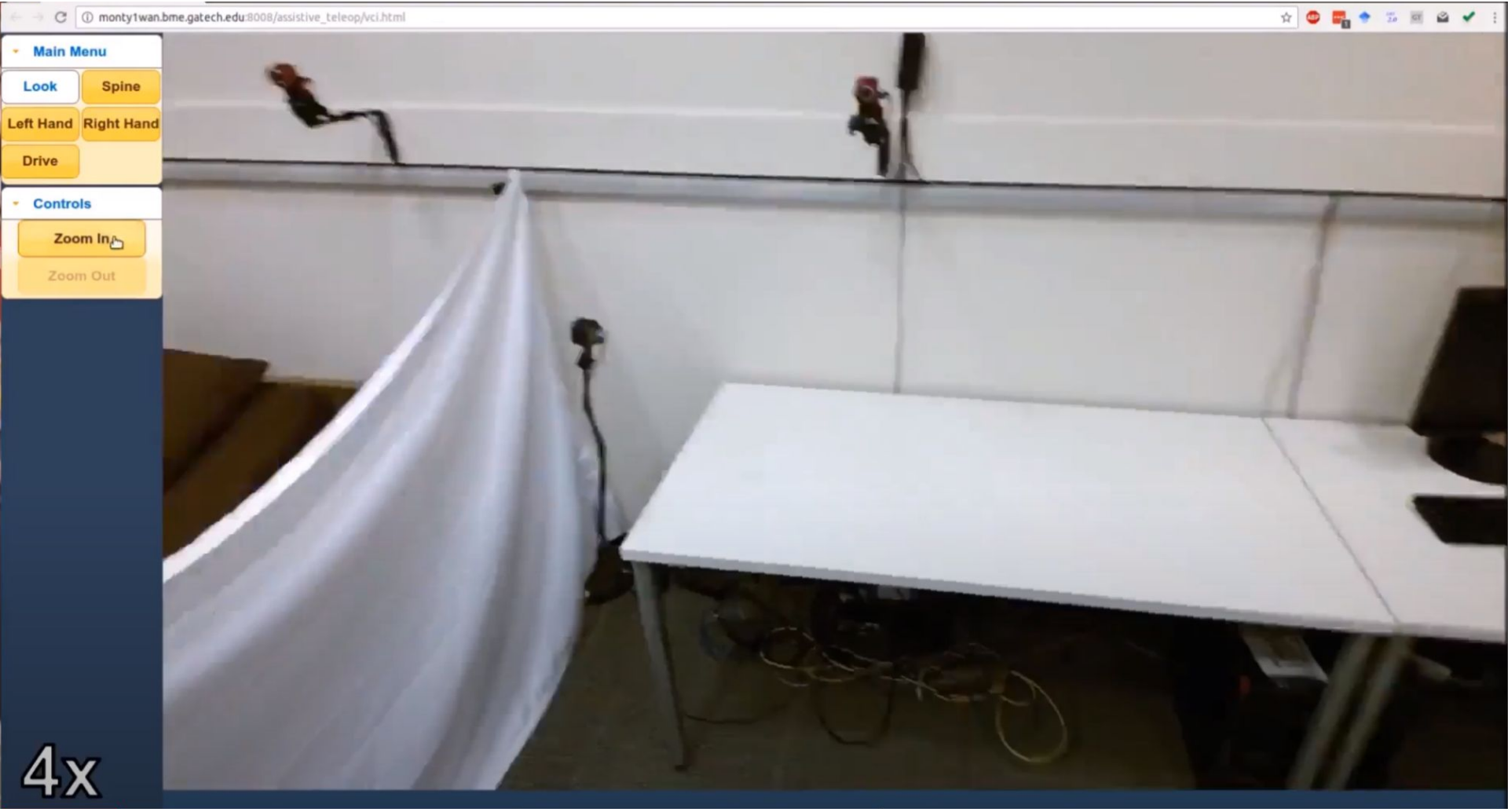
Georgia Tech

In-home and remote use of robotic body surrogates by people with profound motor deficits, Phillip M. Grice and Charles C. Kemp, PLoS ONE 14(3), 2019.

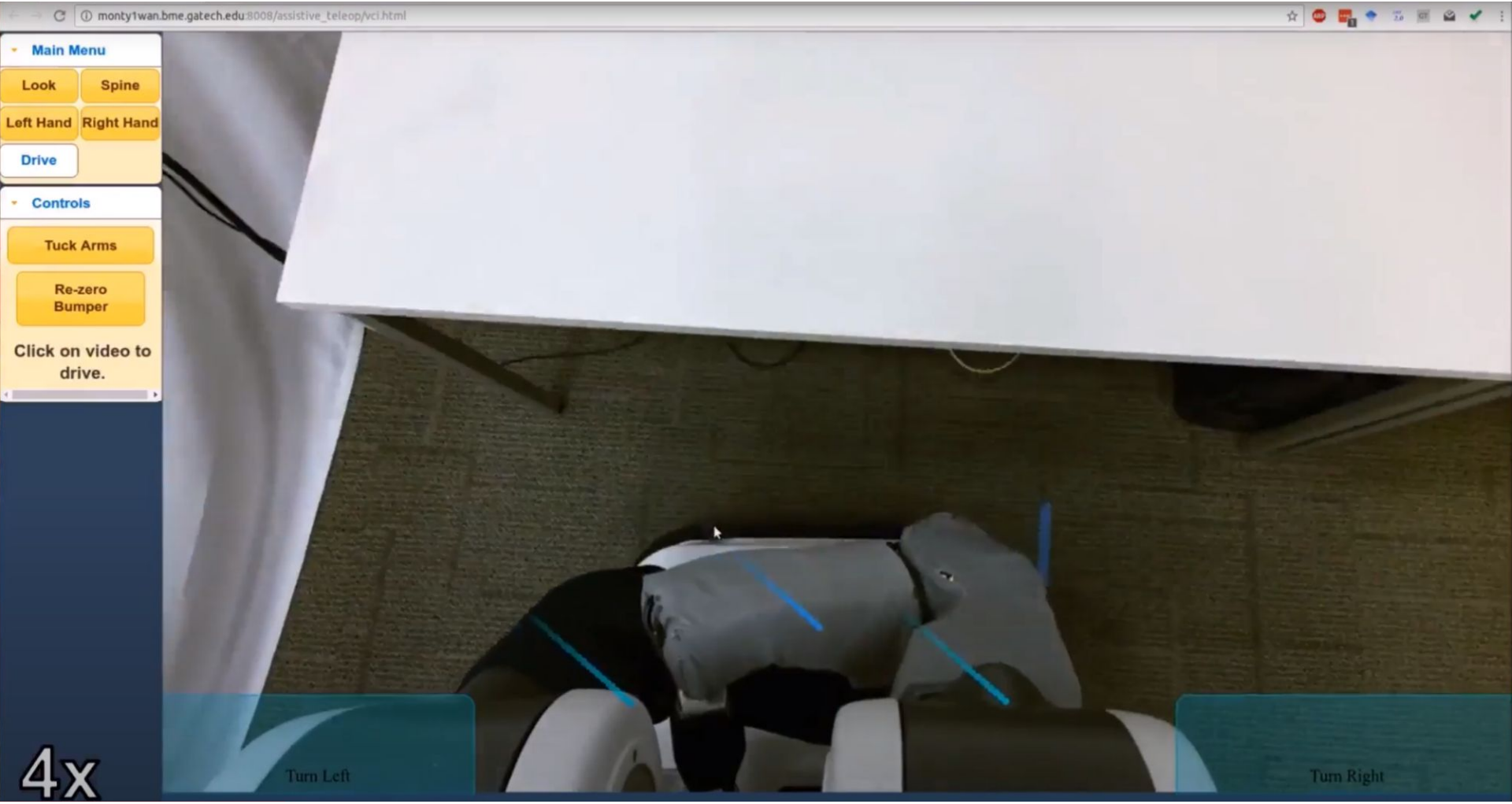
Georgia Tech

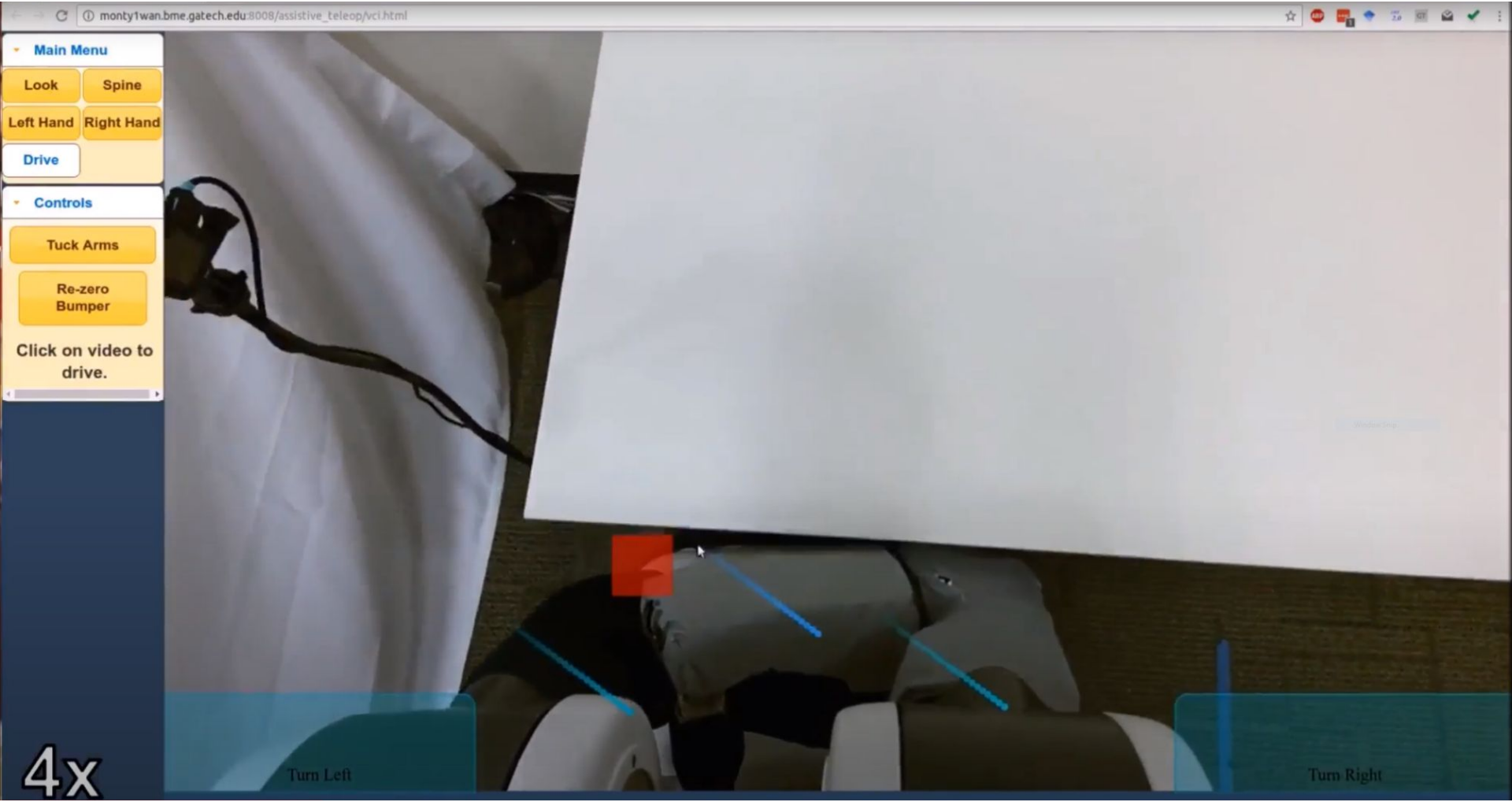

monty1wan.bme.gatech.edu:8008/assistive_teleop/vci.html
Main Menu
Look
Spine
Left Hand
Right Hand
Drive
Controls
Zoom In
Zoom Out
4x


monty1wan.bme.gatech.edu:8008/assistive_teleop/vci.html
Main Menu
Look
Spine
Left Hand
Right Hand
Drive
Controls
Zoom In
Zoom Out
4x

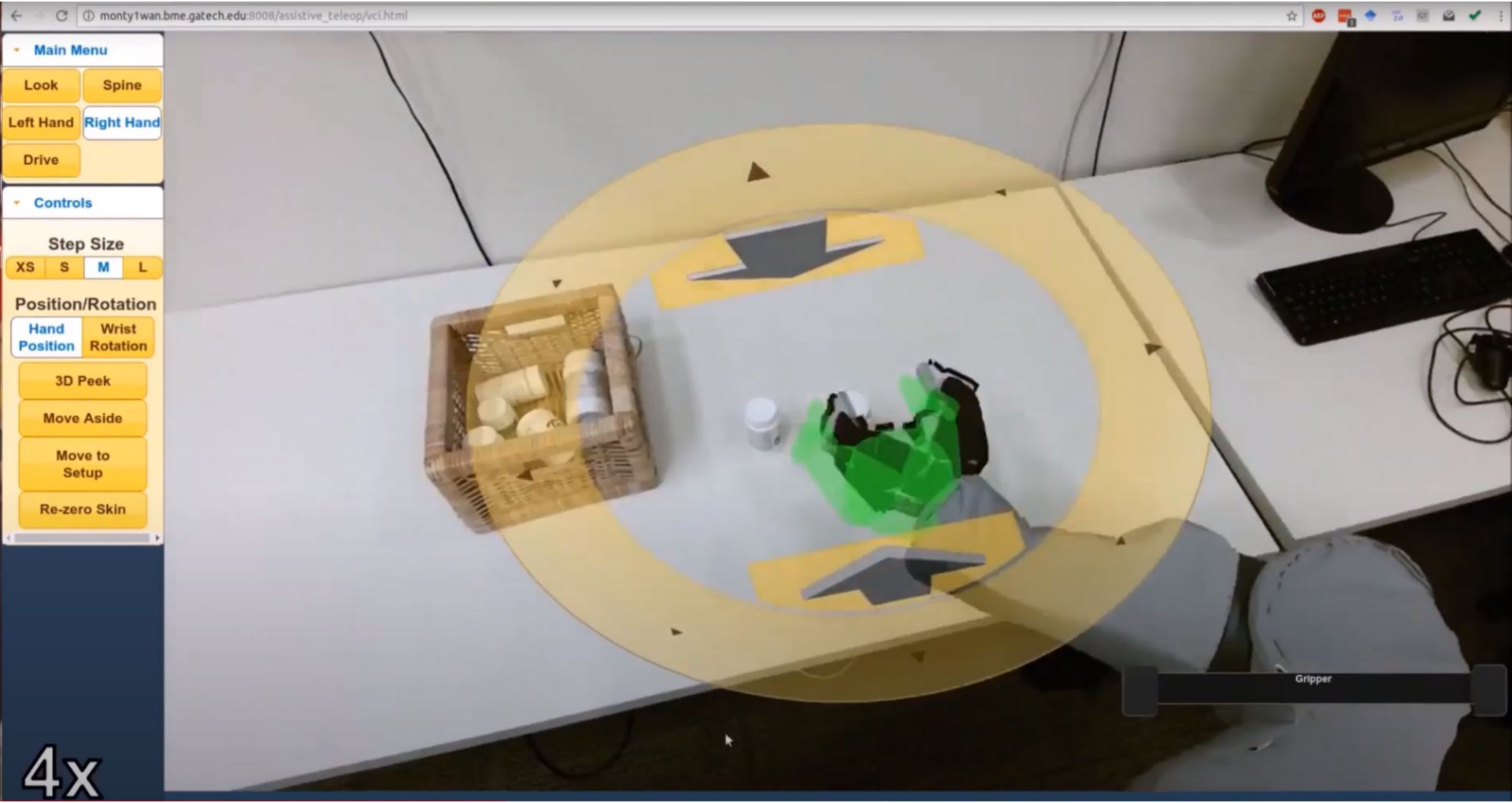

monty1wan.bme.gatech.edu:8008/assistive_teleop/vci.html
Main Menu
Look
Spine
Left Hand
Right Hand
Drive
Controls
Zoom In
Zoom Out
4x


monty1wan.bme.gatech.edu:8008/assistive_teleop/vci.html
Main Menu
Look
Spine
Left Hand
Right Hand
Drive
Controls
Zoom In
Zoom Out
4x

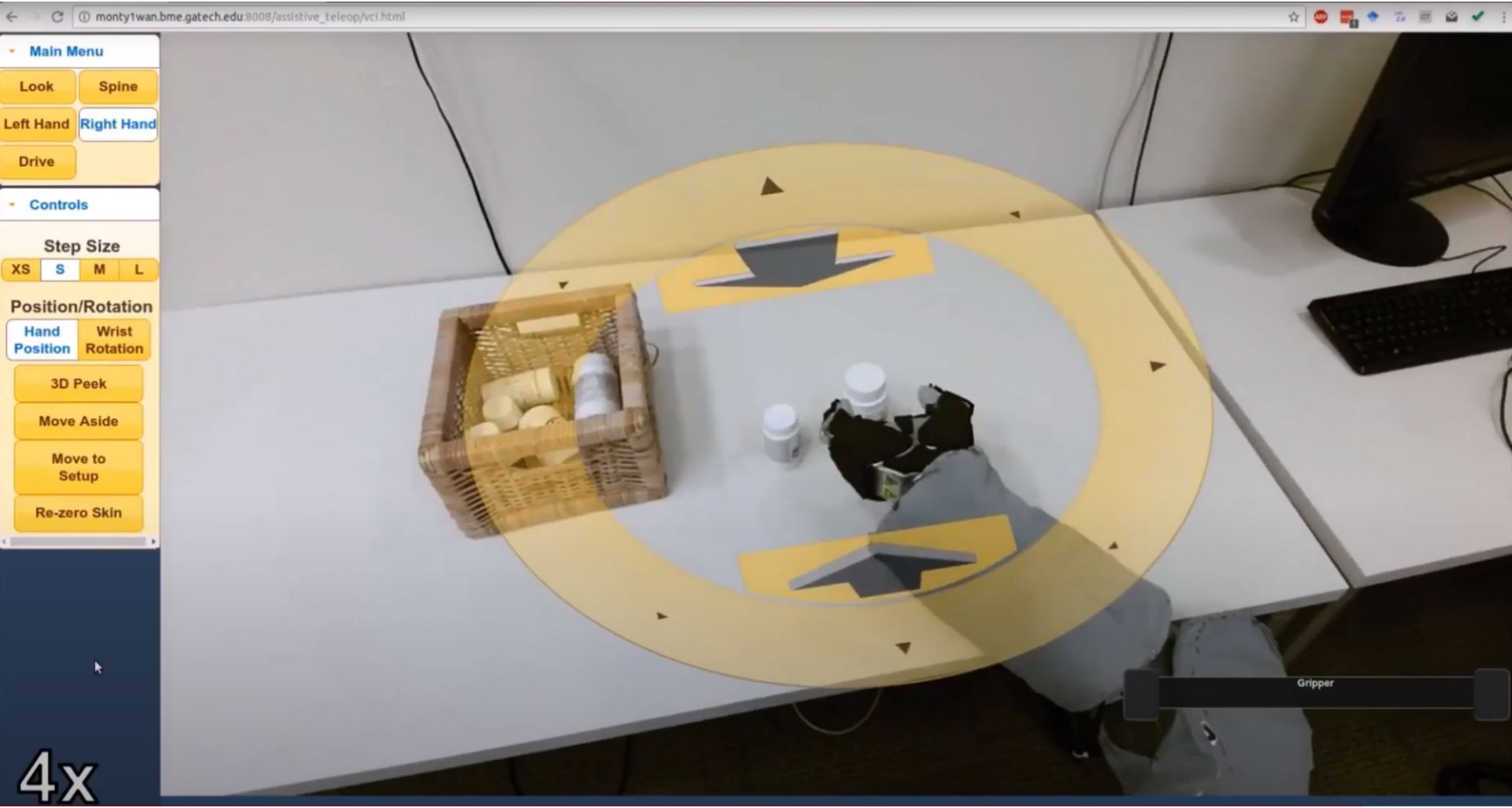

monty1wan.bme.gatech.edu:8008/assistive_teleop/vci.html
Main Menu
Look
Spine
Left Hand
Right Hand
Drive
Controls
Tuck Arms
Re-zero Bumper
Click on video to drive.
Turn Left
Turn Right
4x

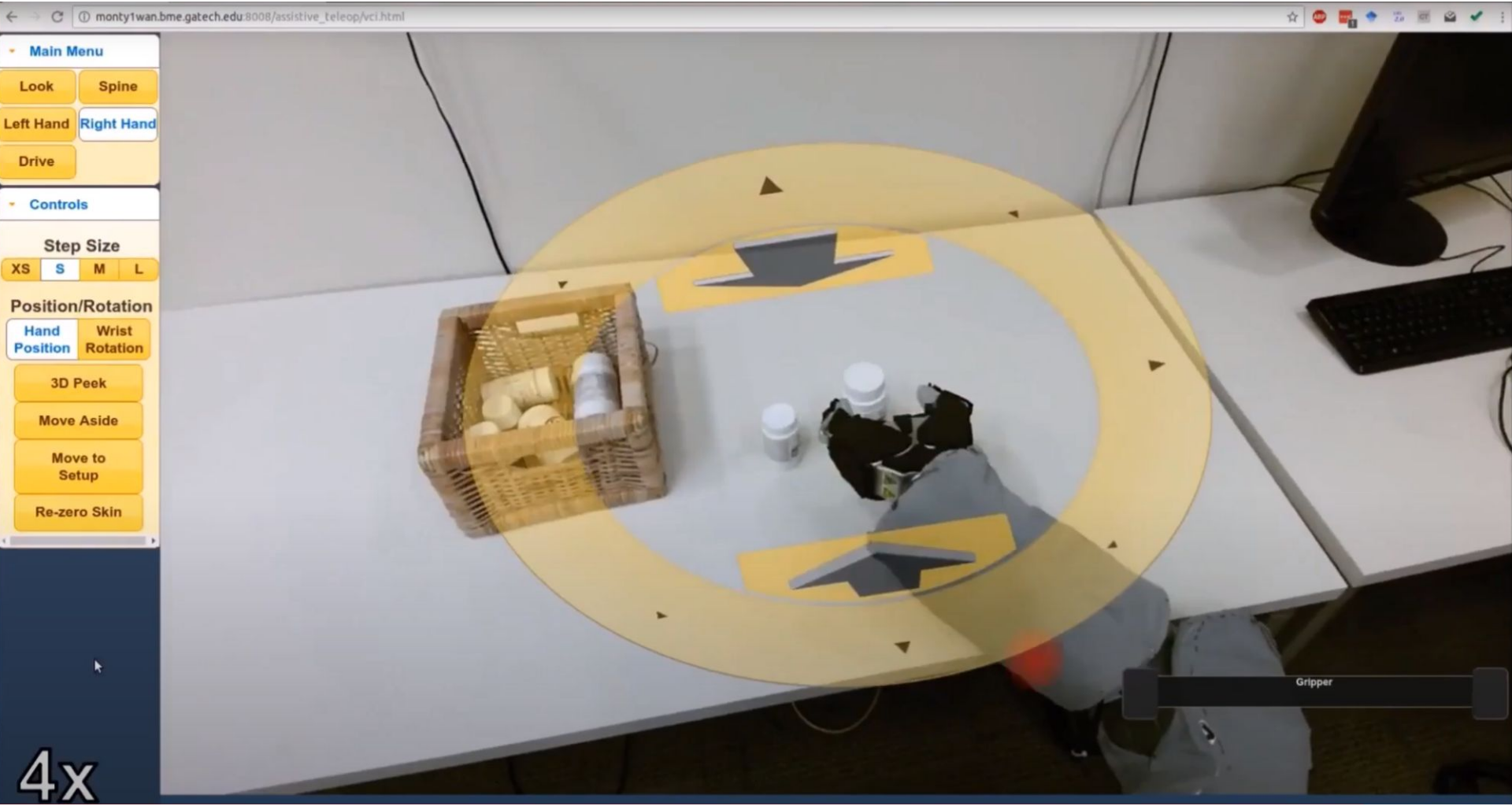

monty1wan.bme.gatech.edu:8008/assistive_teleop/vci.html
Main Menu
Look
Spine
Left Hand
Right Hand
Drive
Controls
Tuck Arms
Re-zero Bumper
Click on video to drive.
Turn Left
Turn Right
4x

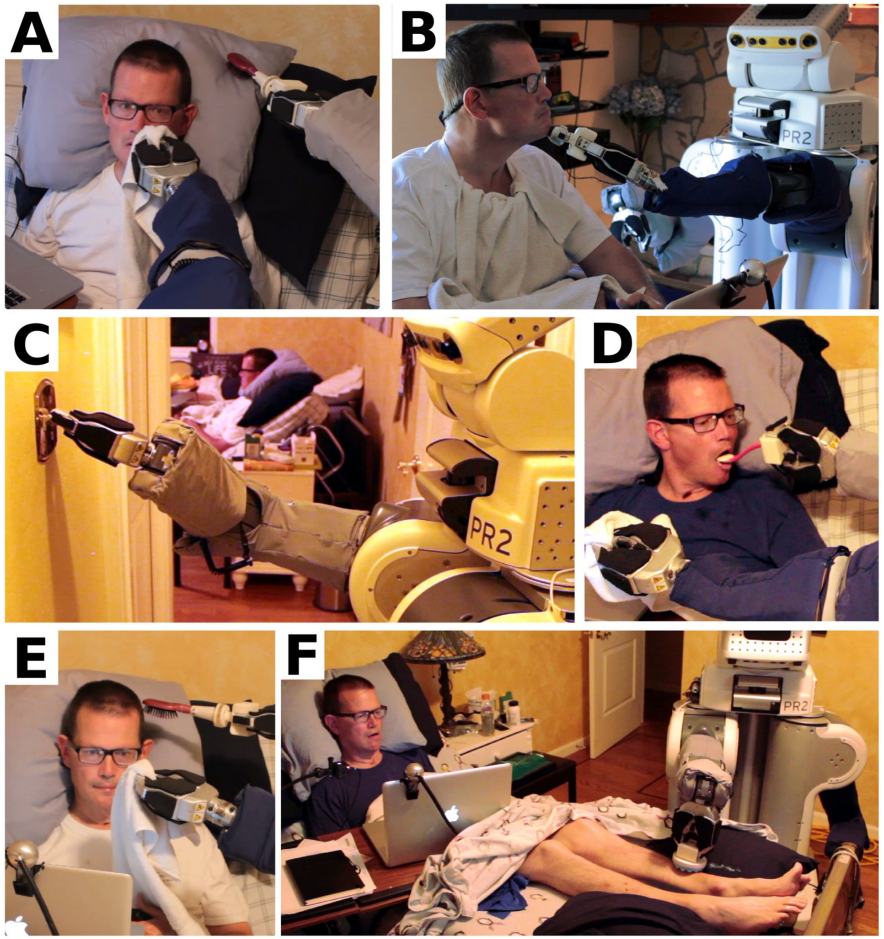

monty1wan.bme.gatech.edu:8008/assistive_teleop/vci.html
Main Menu
Look
Spine
Left Hand
Right Hand
Drive
Controls
Step Size
XS
S
M
L
Position/Rotation
Hand Position
Wrist Rotation
3D Peek
Move Aside
Move to Setup
Re-zero Skin
Gripper
4x


monty1wan.bme.gatech.edu:8008/assistive_teleop/vci.html
Main Menu
Look
Spine
Left Hand
Right Hand
Drive
Controls
Step Size
XS
S
M
L
Position/Rotation
Hand Position
Wrist Rotation
3D Peek
Move Aside
Move to Setup
Re-zero Skin
Gripper
4x


monty1wan.bme.gatech.edu:8008/assistive_teleop/vci.html
Main Menu
Look
Spine
Left Hand
Right Hand
Drive
Controls
Step Size
XS
S
M
L
Position/Rotation
Hand Position
Wrist Rotation
3D Peek
Move Aside
Move to Setup
Re-zero Skin
Gripper
4x


monty1wan.bme.gatech.edu:8008/assistive_teleop/vci.html
Main Menu
Look
Spine
Left Hand
Right Hand
Drive
Controls
Step Size
XS
S
M
L
Position/Rotation
Hand Position
Wrist Rotation
3D Peek
Move Aside
Move to Setup
Re-zero Skin
Gripper
4x

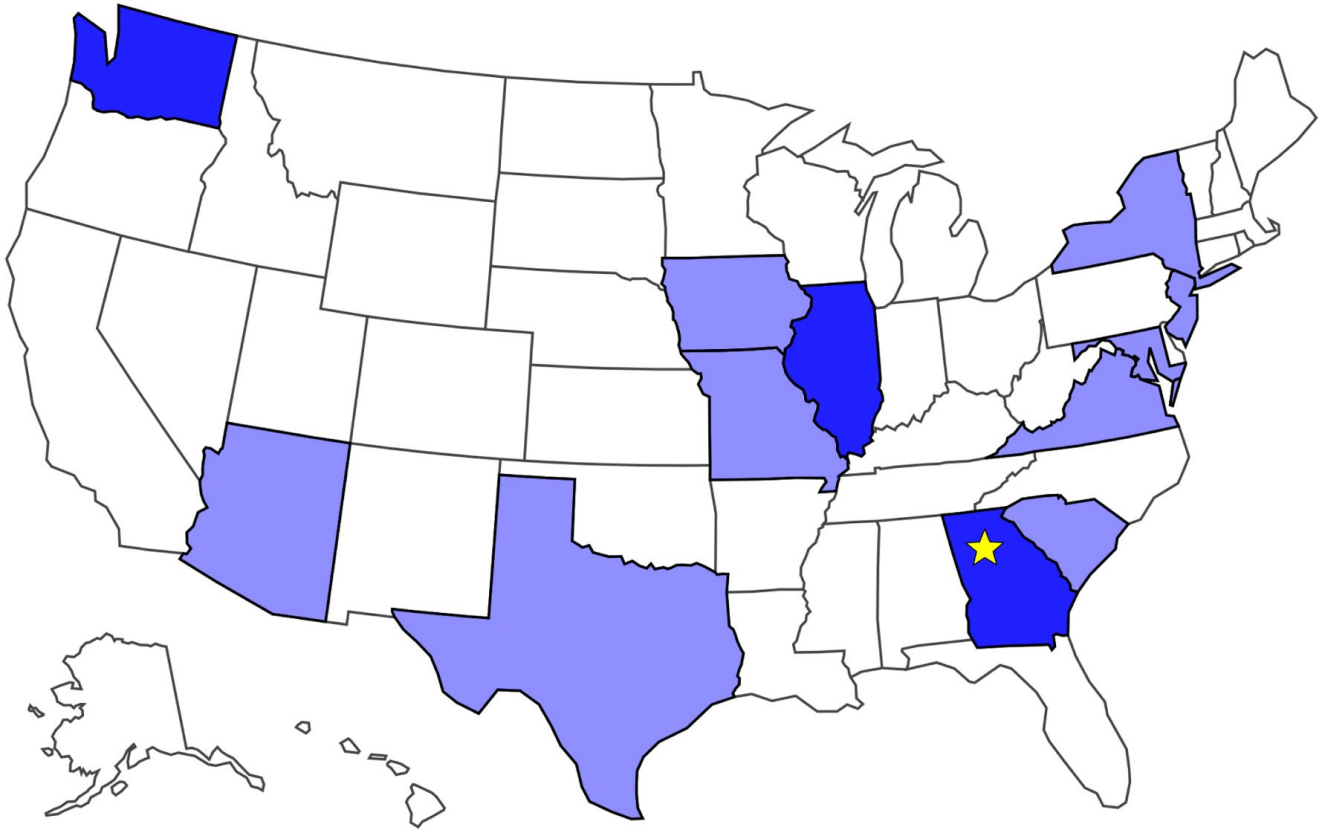

monty1wan.bme.gatech.edu:8008/assistive_teleop/vci.html
Main Menu
Look
Spine
Left Hand
Right Hand
Drive
Controls
Step Size
XS
S
M
L
Position/Rotation
Hand Position
Wrist Rotation
3D Peek
Move Aside
Move to Setup
Re-zero Skin
Gripper
4x



In-home and remote use of robotic body surrogates by people with profound motor deficits, Phillip M. Grice and Charles C. Kemp, PLoS ONE 14(3), 2019.

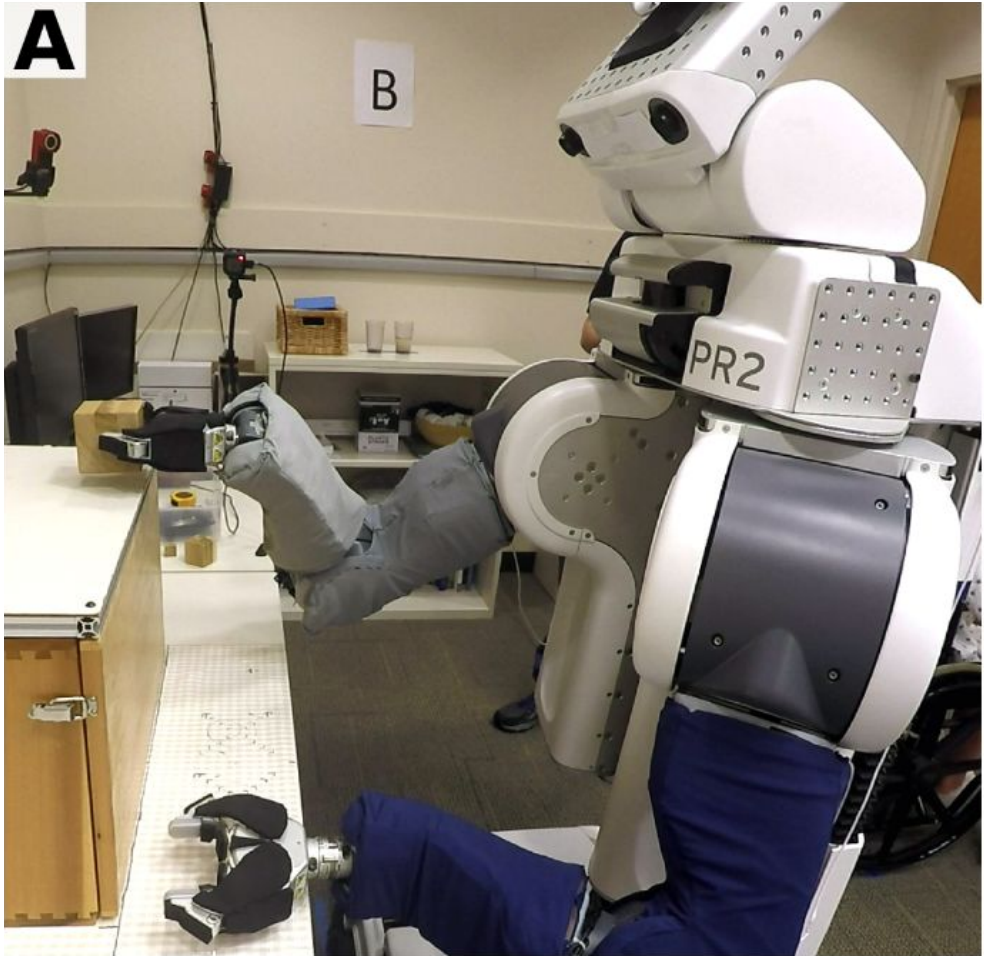
Georgia Tech

15 Participants



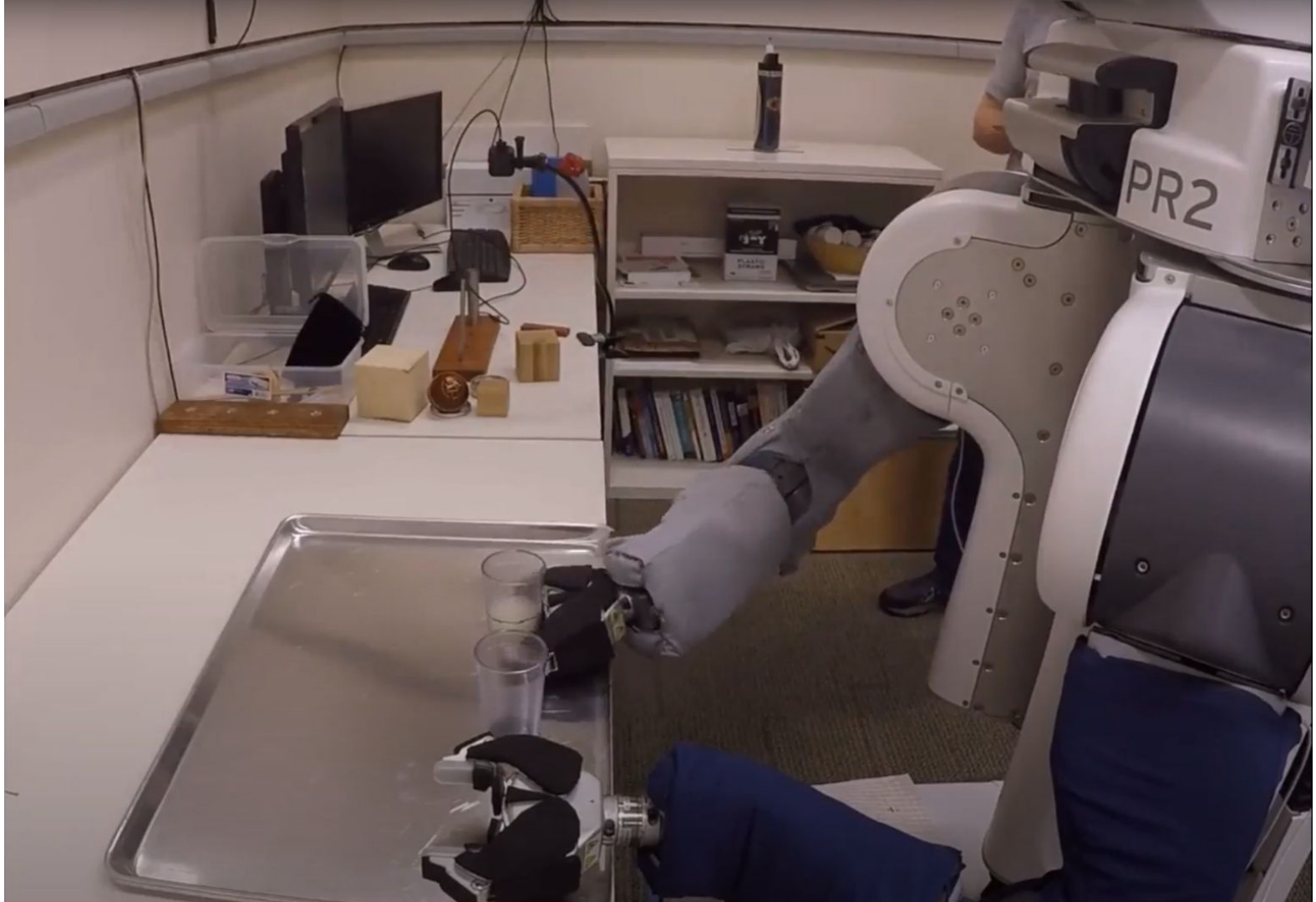
In-home and remote use of robotic body surrogates by people with profound motor deficits, Phillip M. Grice and Charles C. Kemp, PLoS ONE 14(3), 2019.

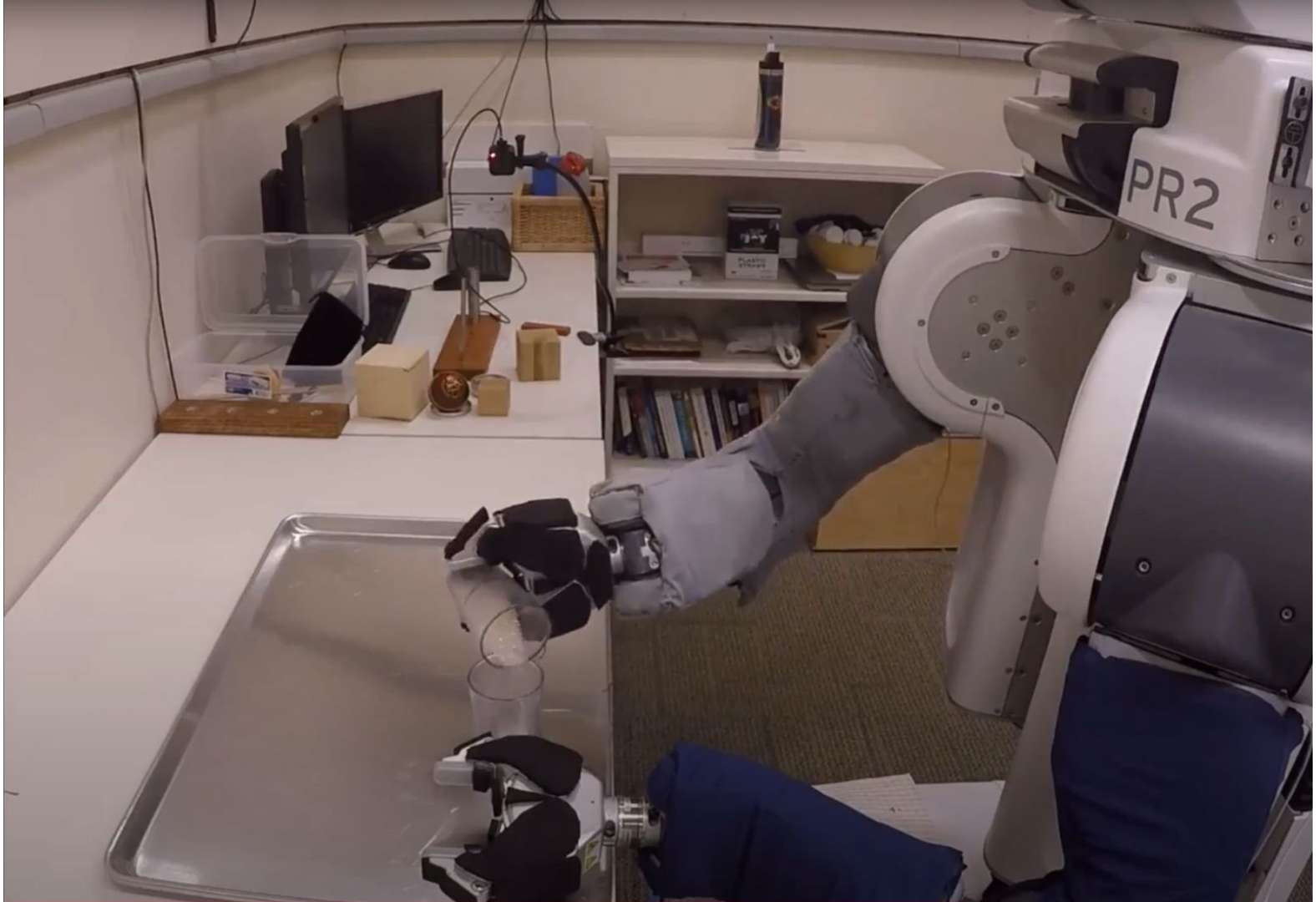
Georgia Tech

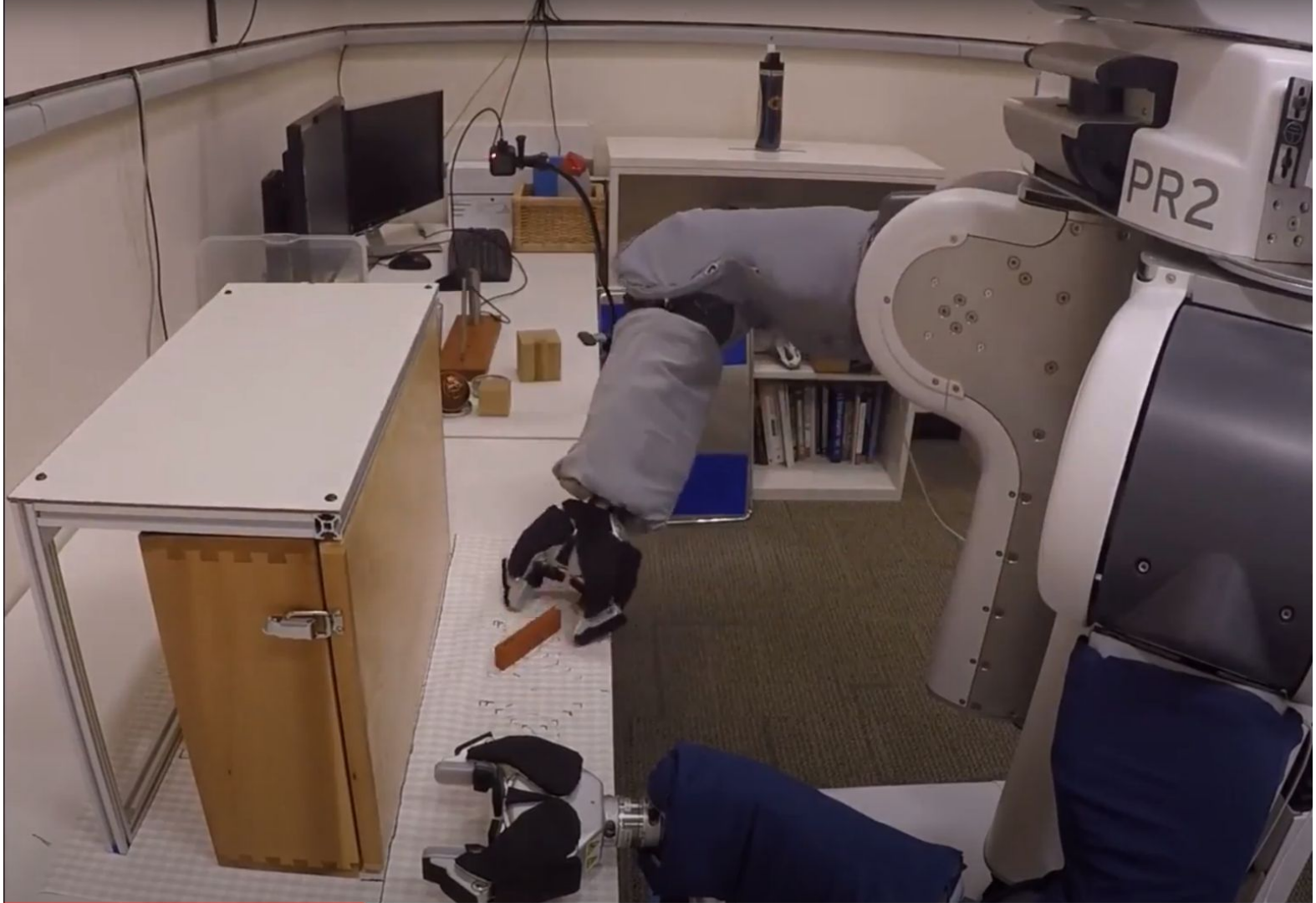


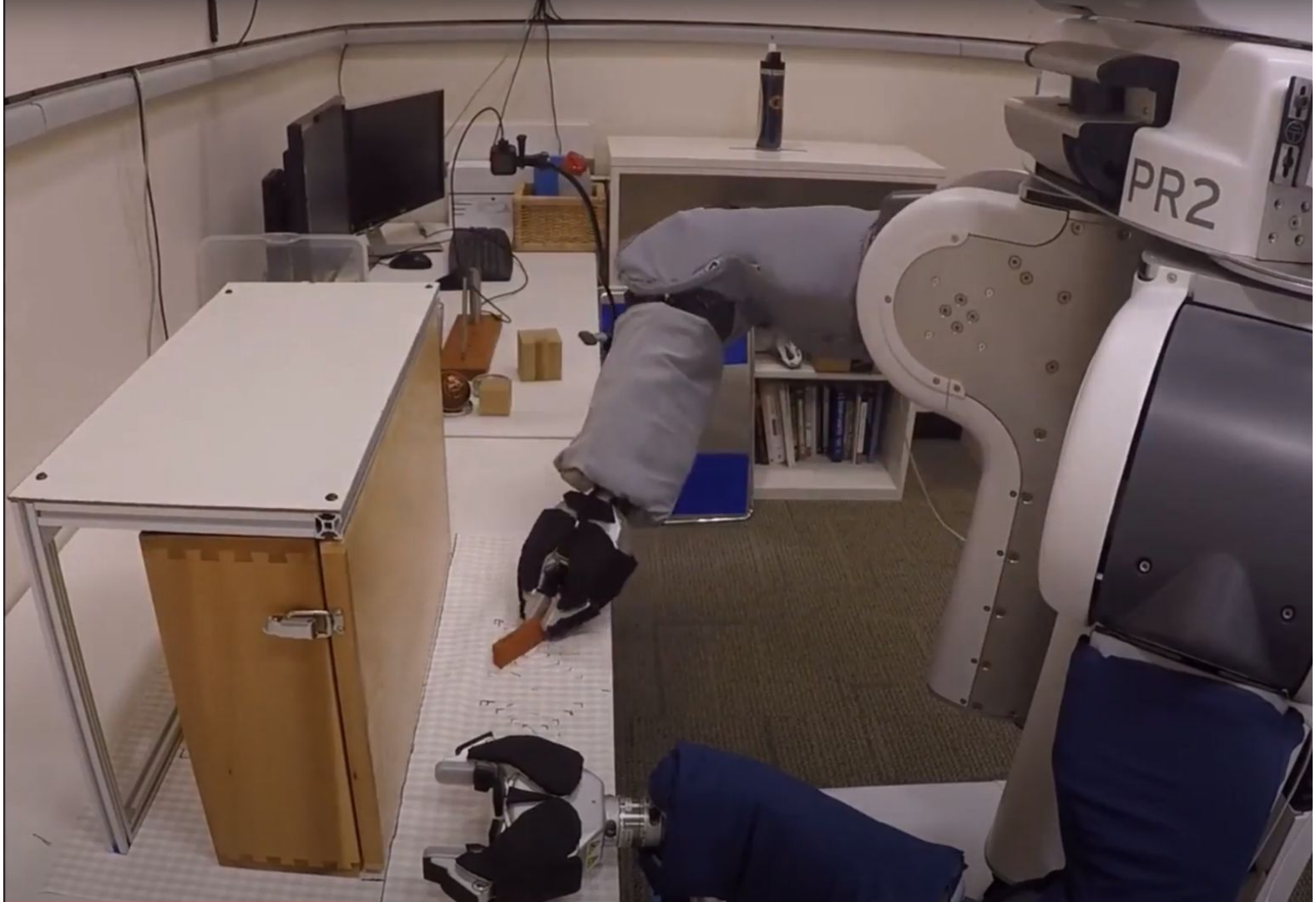
In-home and remote use of robotic body surrogates by people with profound motor deficits, Phillip M. Grice and Charles C. Kemp, PLoS ONE 14(3), 2019.

Georgia Tech

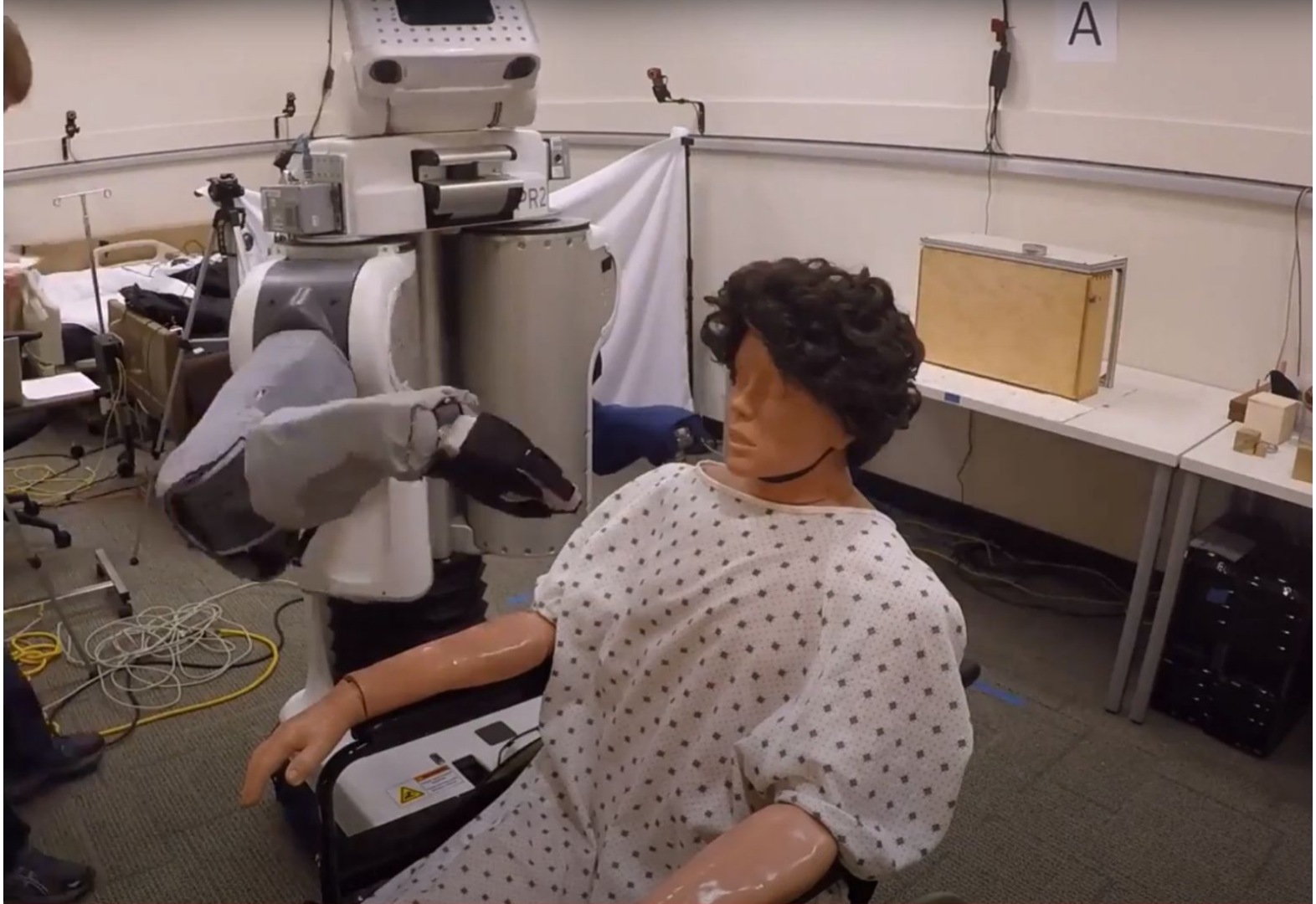

PR2

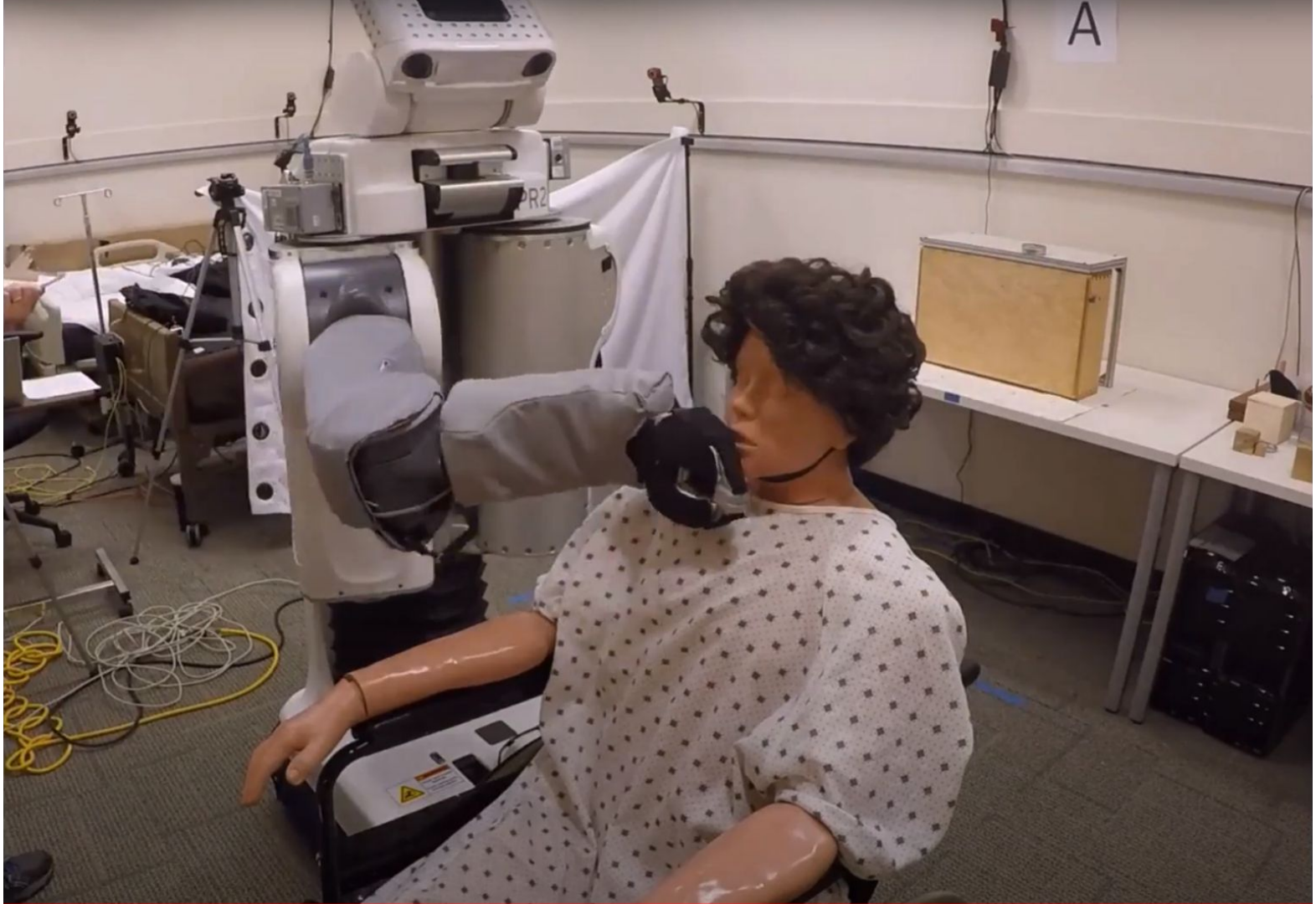

PR2


PR2


PR2


PR2


A


A

Causes of Motor Impairment

6 Spinal Muscular Atrophy (SMA)

3 Muscular Dystrophy (Duchenne/Becker)

3 Spinal Cord Injury

1 Amyotrophic Lateral Sclerosis (ALS)

1 Arthrogryposis

1 Dejerine-Sottas

ARAT Threshold: 9/57 with best arm

Computer Access Devices

4 – Trackball

3 – Touchpad

3 – Head-mouse (TrackerPro, 2x HeadMouse Extreme)

2 – Standard mouse

1 – Eye-gaze (Tobii)

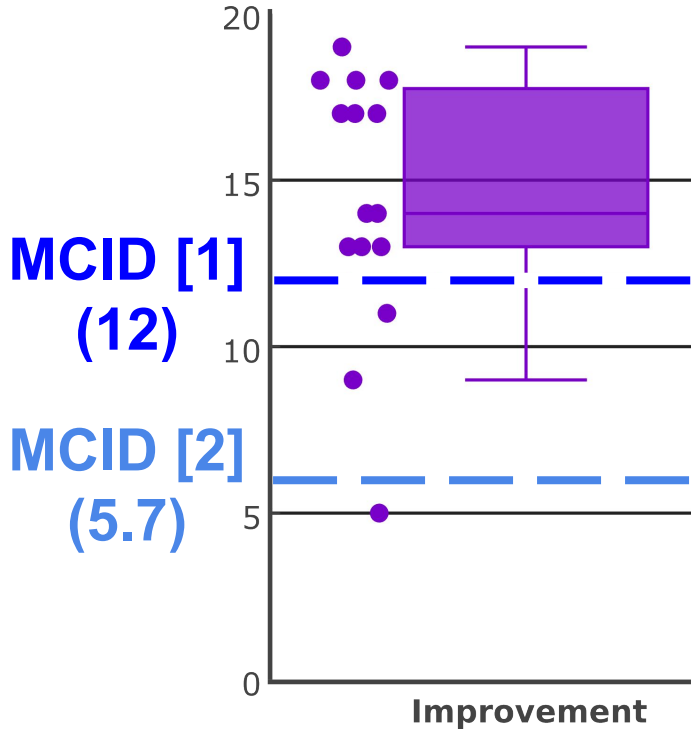
1 – Touchpad w/Stylus held in mouth

1 – Speech (Dragon MouseGrid)

In-home and remote use of robotic body surrogates by people with profound motor deficits, Phillip M. Grice and Charles C. Kemp, PLoS ONE 14(3), 2019.

Georgia Tech

Improvement Exceeded Conservative Minimal Clinically Important Difference (MCID)

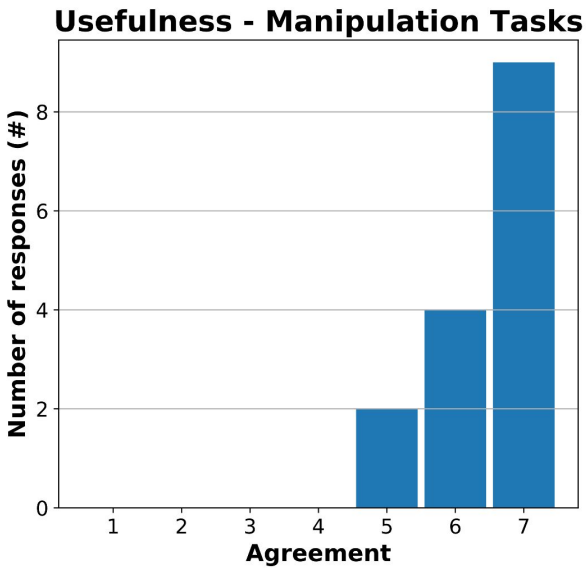


[1] C. E. Lang, D. F. Edwards, R. L. Birkenmeier, and A. W. Dromerick, **"Estimating minimal clinically important differences of upper-extremity measures early after stroke,"** Archives of physical medicine and rehabilitation, vol. 89, no. 9, pp. 1693– 1700, 2008.

[2] J. H. Van der Lee, V. De Groot, H. Beckerman, R. C. Wagenaar, G. J. Lankhorst, and L. M. Bouter, **"The intra-and interrater reliability of the action research arm test: A practical test of upper extremity function in patients with stroke,"** Archives of physical medicine and rehabilitation, vol. 82, no. 1, pp. 14–19, 2001.

1-tailed Wilcoxon signed-rank test vs MCID: W=96, **p=.021**

Perceived Usefulness

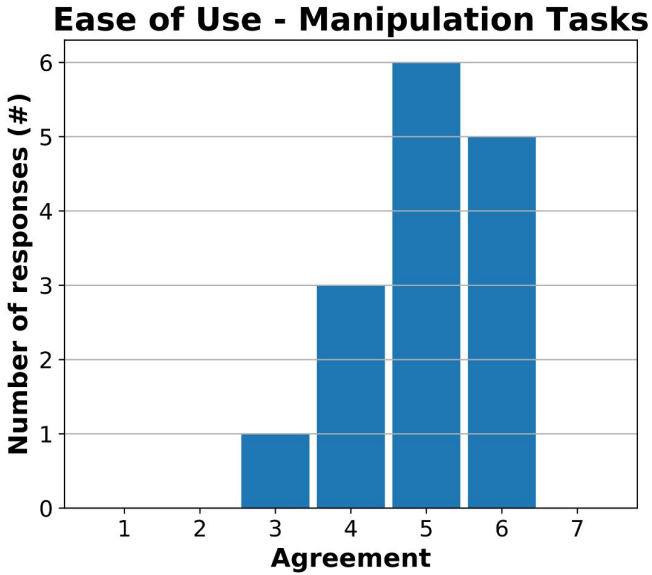


Wilcoxon signed-rank test vs neutral:
W=120, p=.000258

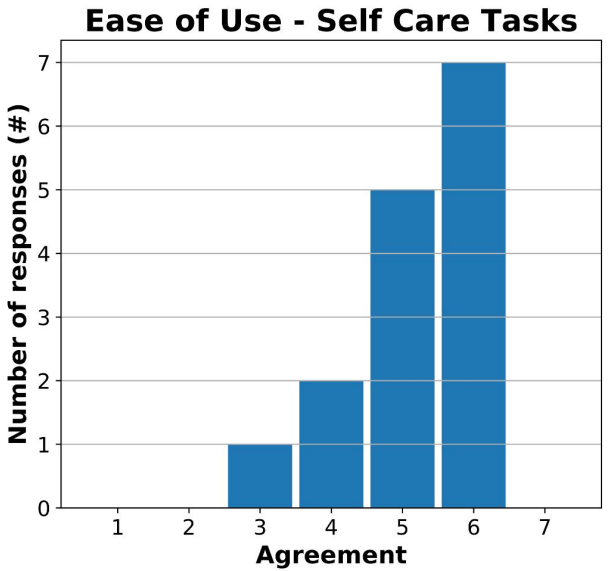
Wilcoxon signed-rank test vs neutral:
W=105, p=.000402

1: Strongly Disagree
2: Disagree
3: Somewhat Disagree
4: Neither Agree nor Disagree
5: Somewhat Agree
6: Agree
7: Strongly Agree

Perceived Ease of Use



Wilcoxon signed-rank test vs neutral:
W=74, p=.00264



Wilcoxon signed-rank test vs neutral:
W=87.5, p=.00142

1: Strongly Disagree
2: Disagree
3: Somewhat Disagree
4: Neither Agree nor Disagree
5: Somewhat Agree
6: Agree
7: Strongly Agree

Limitations

- Slow operation
- Errors
- Depth perception

Limitations

- Slow operation
- Errors
- Depth perception
- **The robot**

The Robot

- Willow Garage shut down in 2014
- PR2 was impractical
  - 227 kg (~500 lb)
  - 67 cm wide (~2.2 ft)
  - $400,000

Photo from Willow Garage

Photo from Willow Garage

The Core Design Problem

Smaller

Lighter Weight

Lower Cost

Shorter Reach

Lower Force

Less Dexterity

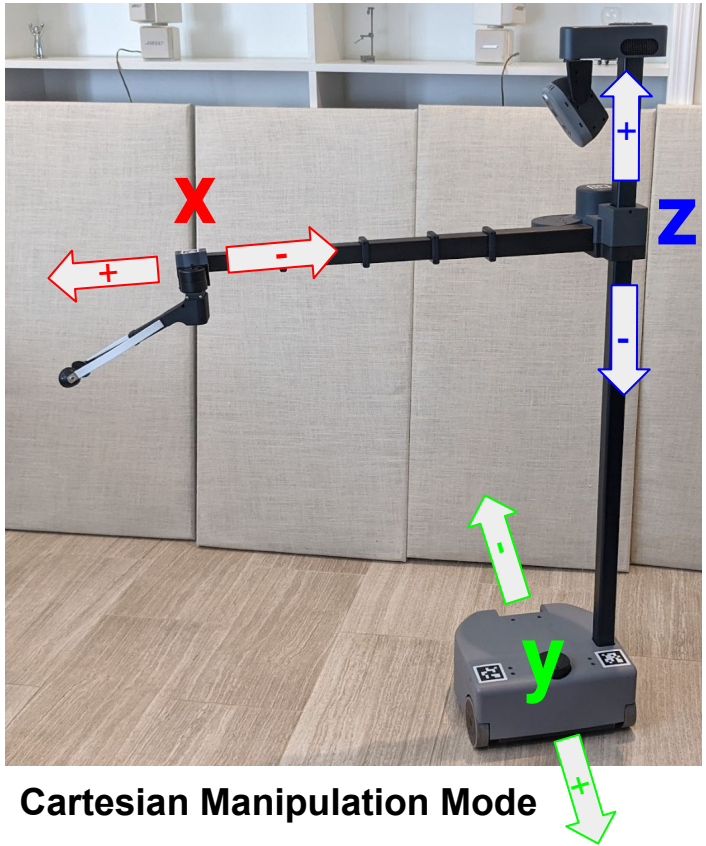
The Design of Stretch: A Compact, Lightweight Mobile Manipulator for Indoor Human Environments, Charles C. Kemp, Aaron Edsinger, Henry M. Clever and Blaine Matulevich, IEEE International Conference on Robotics and Automation (ICRA), 2022. [4-min video presentation]

The Design of Stretch

The Design of Stretch: A Compact, Lightweight Mobile Manipulator for Indoor Human Environments, Charles C. Kemp, Aaron Edsinger, Henry M. Clever and Blaine Matulevich, IEEE International Conference on Robotics and Automation (ICRA), 2022. [4-min video presentation]

hello robot™

Manipulation Depends on the Mobile Base



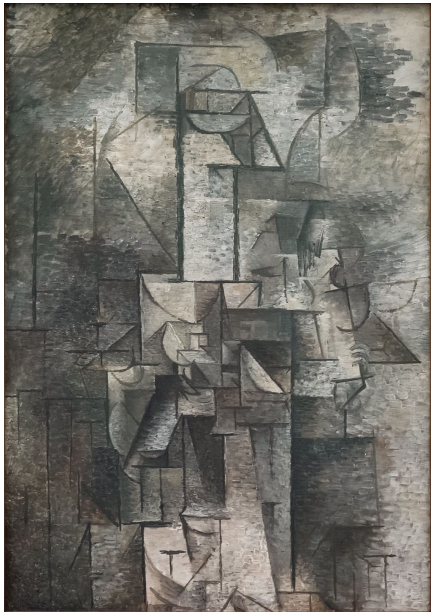
Cartesian Manipulation Mode

hello robot™

Robotic Cubism

- Dimensions matched to human environments
- The human form deconstructed and reassembled

La Femme au Violon - Pablo Picasso, 1911



“In Cubist artwork, objects are analyzed, broken up and reassembled in an abstracted form”
- https://en.wikipedia.org/wiki/Cubism

Image: https://openclipart.org/detail/260142/arms-akimbo-male

< 50th Percentile Hip Width

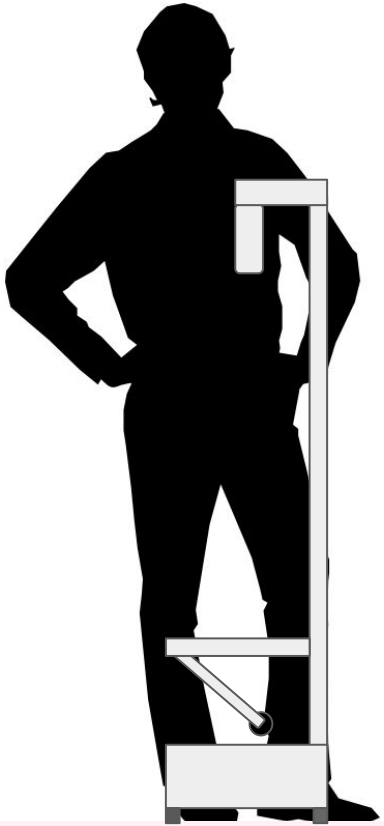
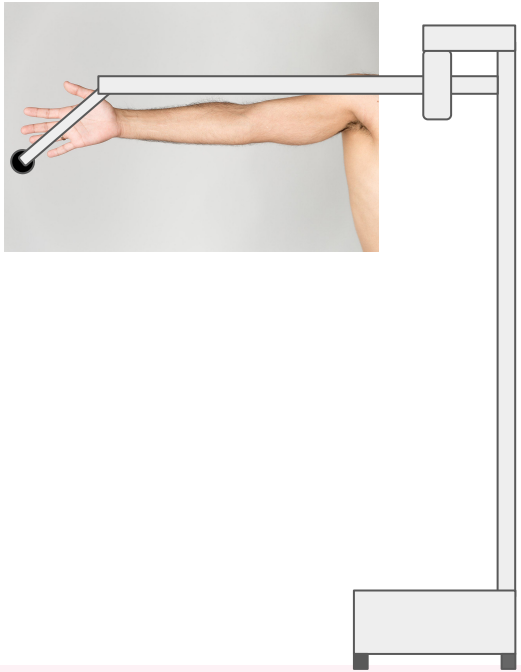
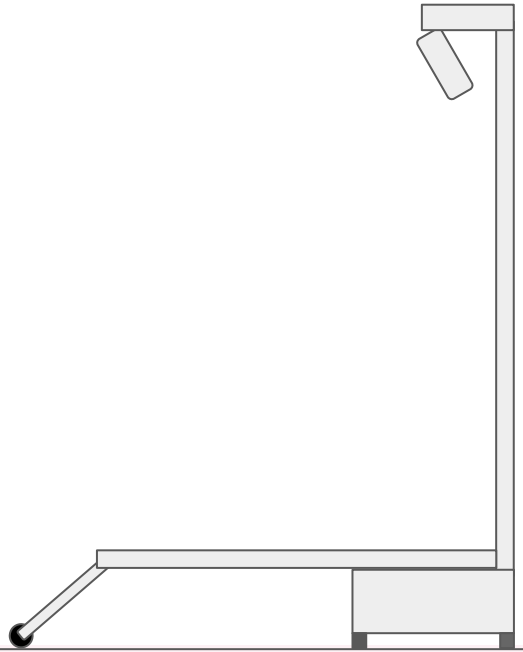


Image: https://en.wikipedia.org/wiki/Arm#/media/File:Extended_arm.jpg

50th Percentile Arm Length



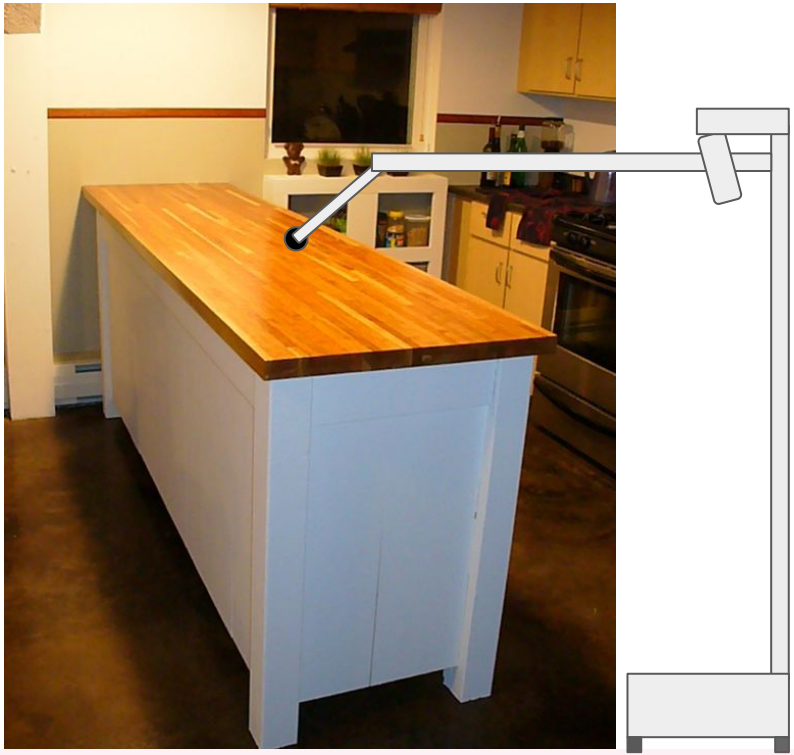
Reaches the Floor



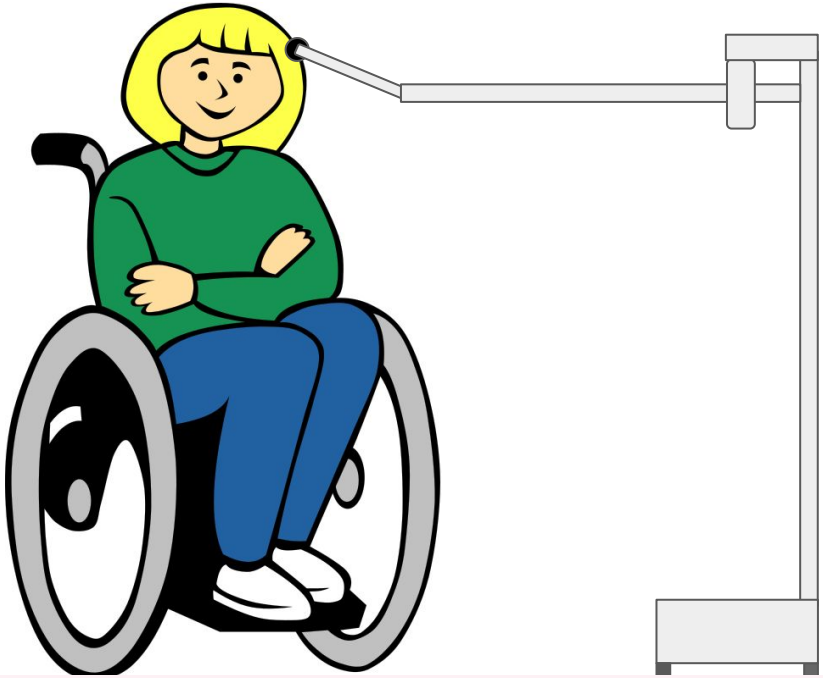
The Design of Stretch: A Compact, Lightweight Mobile Manipulator for Indoor Human Environments, Charles C. Kemp, Aaron Edsinger, Henry M. Clever and Blaine Matulevich, IEEE International Conference on Robotics and Automation (ICRA), 2022. [4-min video presentation]

Image: https://commons.wikimedia.org/wiki/File:Butcher_block_counter_top.jpg

Reaches 36” Countertops



Reaches Above 95th Percentile Eye Height for Wheelchair Users (1.33 m)



Edward Steinfeld, Jordana Maisel, and Dave Feathers. *Standards and anthropometry for wheeled mobility*. Center for Inclusive Design and Environmental Access, School of Architecture and Planning, University at Buffalo, July, 2005.

Image: https://openclipart.org/detail/510/girl-in-wheelchair

hello robot™

Soft Gripper

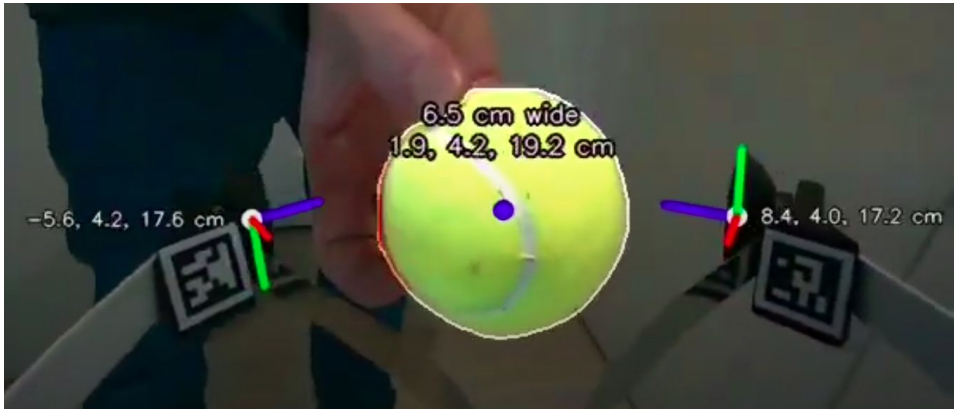
- Core design **tested in 1000s of homes**
  - Initially selected based on Amazon reviews
  - Used by staff at Disney World!
- Reduces consequences of unintended contact

The Design of Stretch: A Compact, Lightweight Mobile Manipulator for Indoor Human Environments, Charles C. Kemp, Aaron Edsinger, Henry M. Clever and Blaine Matulevich, IEEE International Conference on Robotics and Automation (ICRA), 2022. [4-min video presentation]

hello robot™

Soft Gripper

- 6 DOF pose for each fingertip
- Compliance enables visual estimation of forces, torques, and contact pressure.

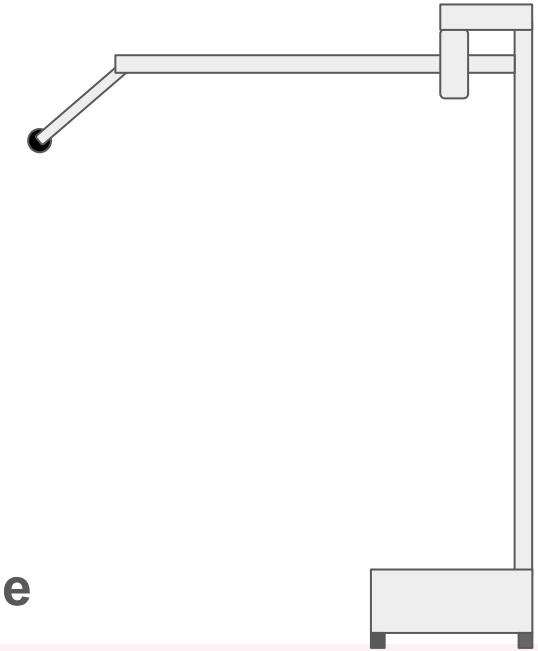


Force/Torque Sensing for Soft Grippers using an External Camera, Jeremy A. Collins, Patrick Grady, Charles C. Kemp, IEEE International Conference on Robotics and Automation (ICRA), 2023.

Visual Contact Pressure Estimation for Grippers in the Wild, Jeremy A. Collins, Cody Houff, Patrick Grady, Charles C. Kemp, Accepted to IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2023.

Low Center of Mass

lightweight arm



heavy mobile base

The Design of Stretch: A Compact, Lightweight Mobile Manipulator for Indoor Human Environments, Charles C. Kemp, Aaron Edsinger, Henry M. Clever and Blaine Matulevich, IEEE International Conference on Robotics and Automation (ICRA), 2022. [4-min video presentation]

hello robot™

24.5 kg (54 lb)

Image: https://www.seekpng.com/ipng/u2q8y3i1o0r5a9o0_beautiful-silhouettes-of-children-boy-silhouette-transparent-background/

hello robot™

Easy to Transport to Real Homes

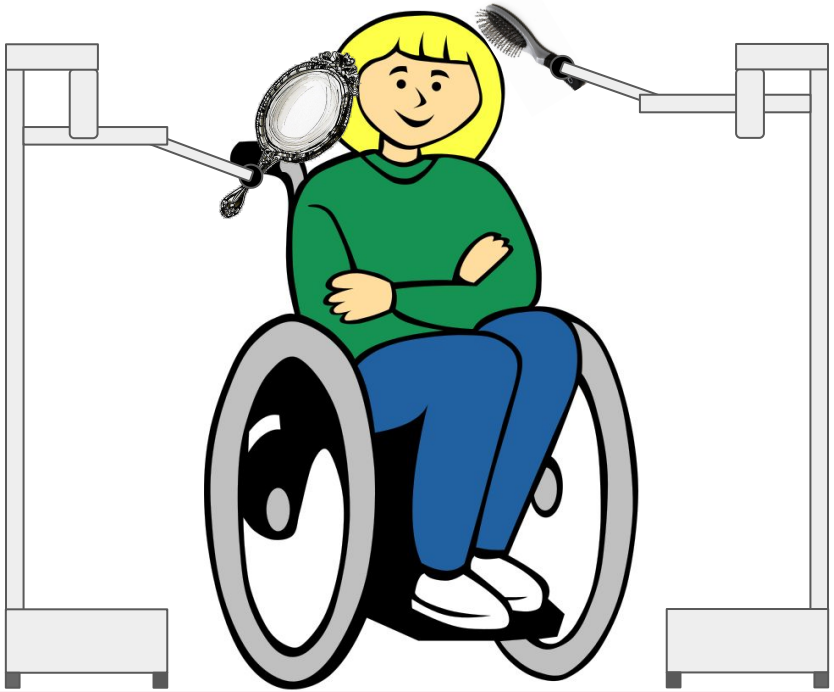
three robots in a hatchback

hello robot™


Teleoperated
4x Speedup

Two Robots with a Person Between Them?

this might be more effective than a humanoid form

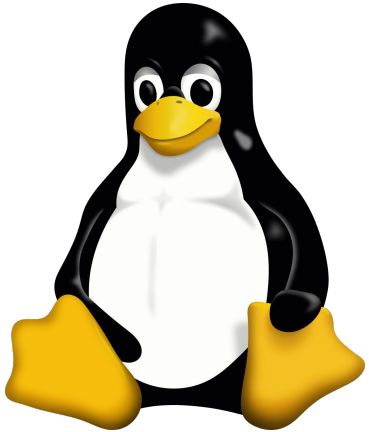


Images from
https://openclipart.org/detail/510/girl-in-wheelchair
https://upload.wikimedia.org/wikipedia/commons/a/ae/Hairbrush_with_metal_bristles.jpg
https://upload.wikimedia.org/wikipedia/commons/5/51/Hand_mirror.jpg

hello robot™

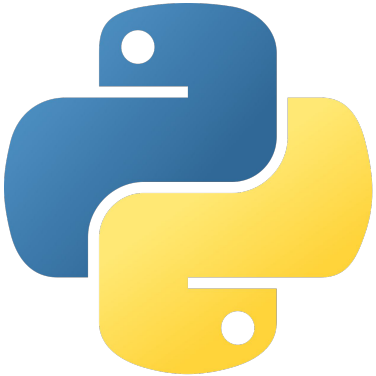
Hello Robot's Open Community Approach

A Few of My Favorite Things from Open Communities



Linux

Wikipedia



Python

Georgia Tech's Prototype
March 2017

Hello Robot's Product - A Robot for Research
July 2020

2016	2017		2018	2019	2020

Georgia Tech

hello robot™

3 years
8 versions
tested in my home

hello robot™

Designed for Accessibility

screenshot of the spreadsheet I used

Data Driven Robot Development

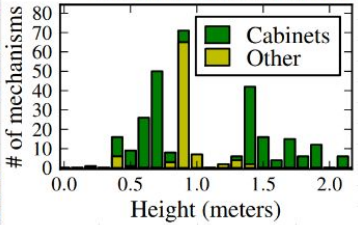
File Edit View Insert Format Data Tools Extensions Help

Share

86:86 | Counter Height Table (from web)

	A	B	C	D	E
63	*Heights*	*inches*	*feet*	*meters*	
64	Hand of person seated in wheelchair				
65	Top of head of person seated in wheelchair	55		1.40	
66	Eye level for person seated in a wheelchair	51		1.30	
67	**Mouth of person seated in wheelchair**	**48**		**1.22**	
68	Head of person in medical bed				
69	Refrigerator: Second to Lowest Shelf	52		1.32	
70	Lightswitch Top	48.5	48" to 52" defact	1.23	
71	Light Dimmer Slide	48.5		1.23	
72	Lightswitch Top	47.5		1.21	
73	Lightswitch Top	47.5		1.21	
74	Lightswitch Top	47.5		1.21	
75	Toaster Oven Top on Kitchen Counter	46.5		1.18	
76	Deadbolt Top	45.5		1.16	
77	Lightswitch Top	44		1.12	
78	Deadbolt Top	44		1.12	
79	Refrigerator: Lowest Shelf	44	3.7	1.12	
80	Bar Height Table (from web)	41		1.04	40" - 42"

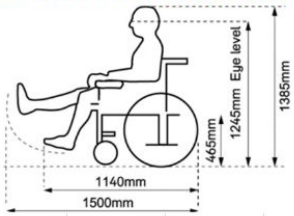
"Histograms of height of the handles of rotary mechanisms in our kinematic dataset. Each bin represents a range of 10c
of heights of cabinets are in green, and of other mechanism classes (doors, freezers, and refrigerators) are in yellow."



http://answers.google.com/answers/threadview?id=14109 approx 4" between eyes and top of the head? -ck

https://www.karmanhealthcare.com/average-height-wheelchair-user/ approx 3" between eyes and mouth? - ck

"The eye level of a wheelchair user can range from 43 to 51 inches from the floor to their eye level."



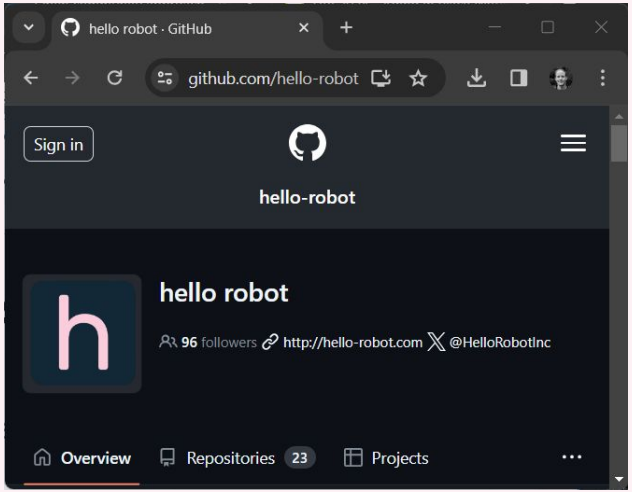
An Open Platform

Open source code from the firmware up
github.com/hello-robot

Open hardware accessories
github.com/hello-robot/stretch_tool_share

Open forum
forum.hello-robot.com

The core robot hardware is proprietary



hello robot

The Iterations Continue with the Community

Stretch RE1
2020

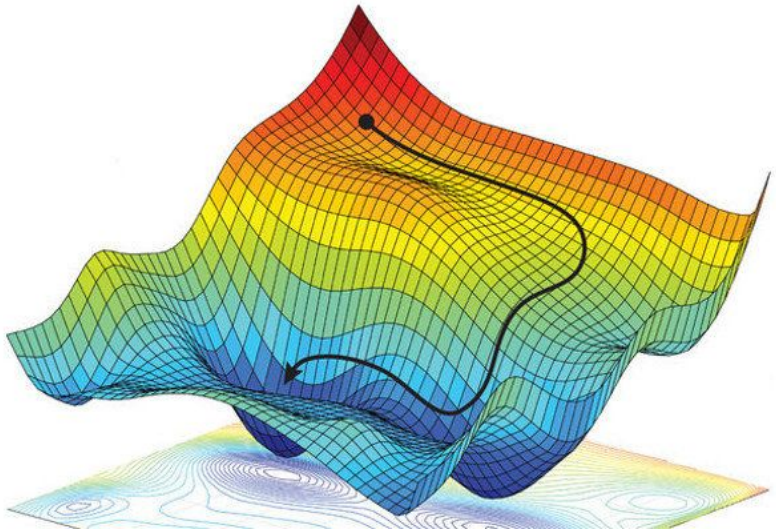
Stretch 2
2022

Stretch 3
2024

Today's Open Community

Analogous to Gradient Descent

Hello Robot iteratively improves Stretch based on feedback from the open community. Software steps happen more frequently than hardware steps.



https://en.wikipedia.org/wiki/Stochastic_gradient_descent

image from https://arxiv.org/abs/1805.04829

Robots for Humanity

from Henry & Jane Evans, UIUC, UW, Hello Robot and others!

https://spectrum.ieee.org/stretch-assistive-robot

Assistive Robotics at the University of Washington

21 people, **including 3 people with disabilities**, remotely operated Stretch

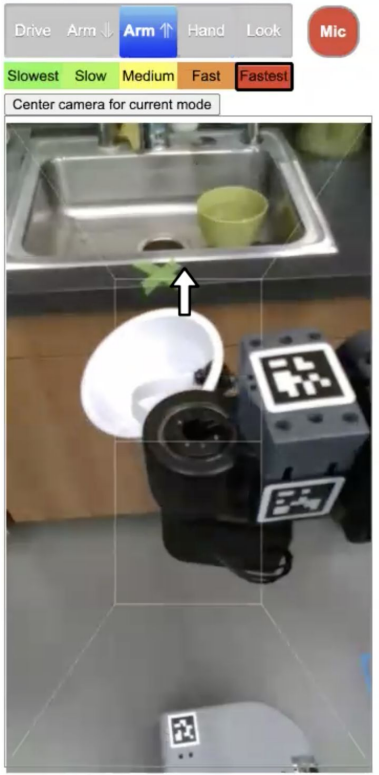
Cabrera, Maria E., Tapomayukh Bhattacharjee, Kavi Dey, and Maya Cakmak. "An Exploration of Accessible Remote Tele-operation for Assistive Mobile Manipulators in the Home." In *2021 30th IEEE International Conference on Robot & Human Interactive Communication (RO-MAN)*, pp. 1202-1209. IEEE, 2021.

Maru Cabrera
Assistant Professor
UMass Lowell

Tapo Bhattacharjee
Assistant Professor
Cornell University

Kavi Dey
Research Intern
Seattle Academy

Maya Cakmak
Associate Professor
University of Washington

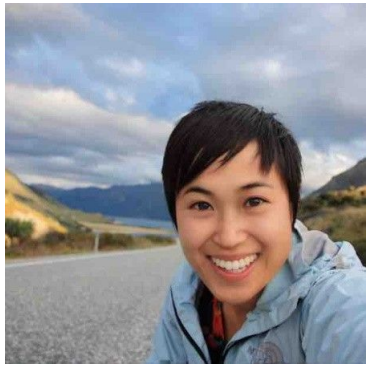


UW's initial open source web interface, which significantly improved Hello Robot's original version.

hello robot™

The Power of a Community with an Open Platform

Henry & Jane Evans
Robots for Humanity leads



Dr. Vy Nguyen
Hello Robot lead

Prof. Wendy Rogers
UIUC lead

Prof. Maya Cakmak
UW lead

Vinitha Ranganeni
Web Teleop lead


Master Default

Home Robots Can Enhance Life in Unexpected Ways

Photo by Peter Adams

This Approach Benefits Everyone

Stretch 3®

The world's only lightweight, capable, developer-friendly mobile manipulator

Greater dexterity

Enhanced support for Embodied AI

Ready for researchers, educators, and explorers

Now with standard gripper camera,
second head camera, and dexterous wrist!

AVAILABLE NOW
FOR $24,950

The Washington Post

"The robot was doing far more for (him) than taking care of his body. It was also feeding his soul."

The Seattle Times

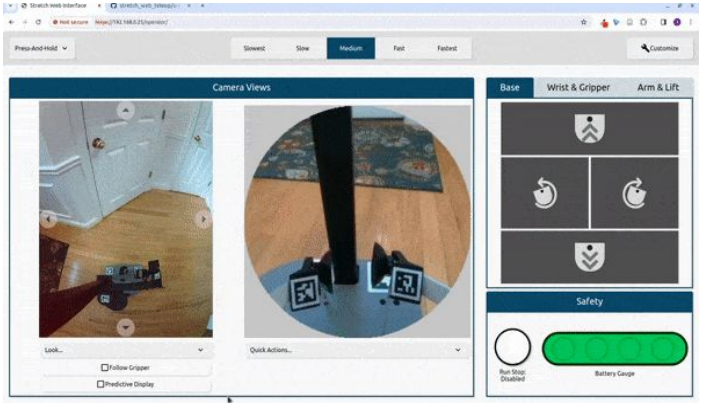
"Astounding in its potential."

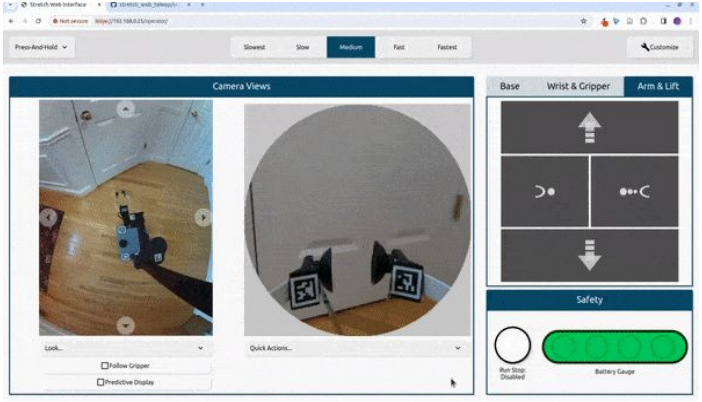
IEEE Spectrum

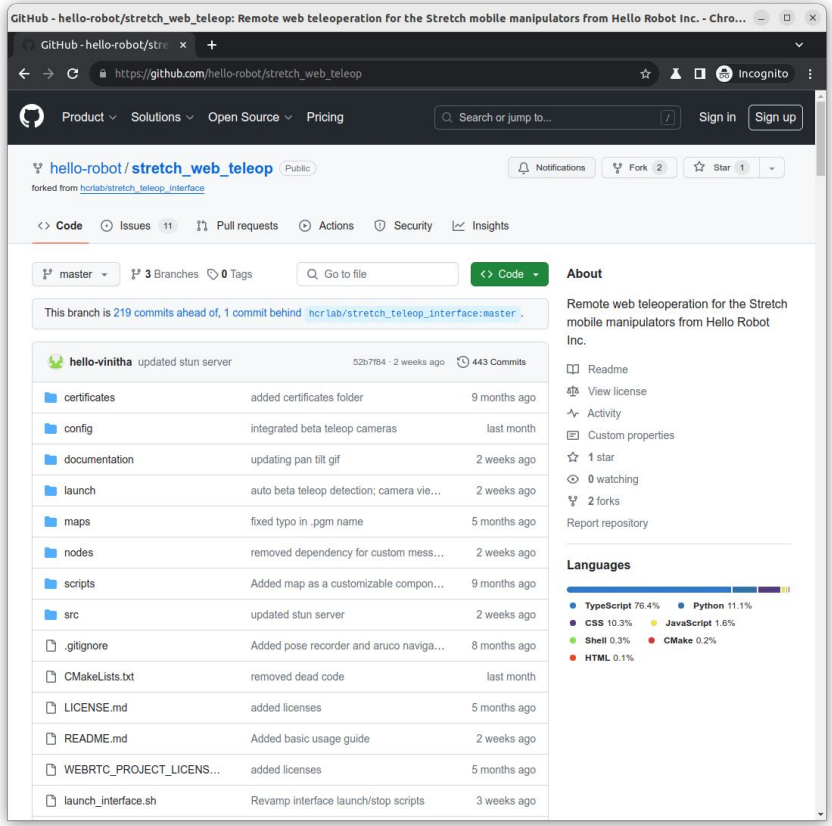
"Beautifully simple, clever robot design."

Stretch 3 Comes with an Open Source Accessible Web Interface Pre-installed and Tested

Web Teleop development was led by Vinitha Ranganeni and Prof. Maya Cakmak in collaboration with the Robots for Humanity project







https://github.com/hello-robot/stretch_web_teleop


Remote Teleop (4x)

HRI 2024 Awards for Work with Stretch!

BEST PAPER

Independence in the Home: A Wearable Interface for a Person with Quadriplegia to Teleoperate a Mobile Manipulator

- Papers

Akhil Padmanabha, Janavi Gupta, Chen Chen, Jehan Yang, Vy Nguyen, Douglas Weber, Carmel Majidi, Zackory Erickson

Best Video

Robots for Humanity: In-Home Deployment of Stretch RE2

- Posters

Vinitha Ranganeni, Vy Nguyen, Henry Evans, Jane Evans, Julian Mehu, Samuel Olatunji, Wendy Rogers, Aaron Edsinger, Charles Kemp, Maya Cakmak

BEST PAPER

Using 3D Mice to Control Robot Manipulators

- Posters

Varad Dhat, Nick Walker, Maya Cakmak

Together, We Can Get There

An Open Community Approach to Accessible Home Robots

- The assistive origins of Stretch
- The design of Stretch
- Hello Robot's open community approach
- The Robots for Humanity project

hello robot®

Together, We Can Get There

An Open Community Approach to Accessible Home Robots

This talk illustrates the benefits of

- Iteration
- An open community
- A diverse community
- Working with people with disabilities from the start

hello robot®