



Enabling Hands in VR

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Video



GLEECHI



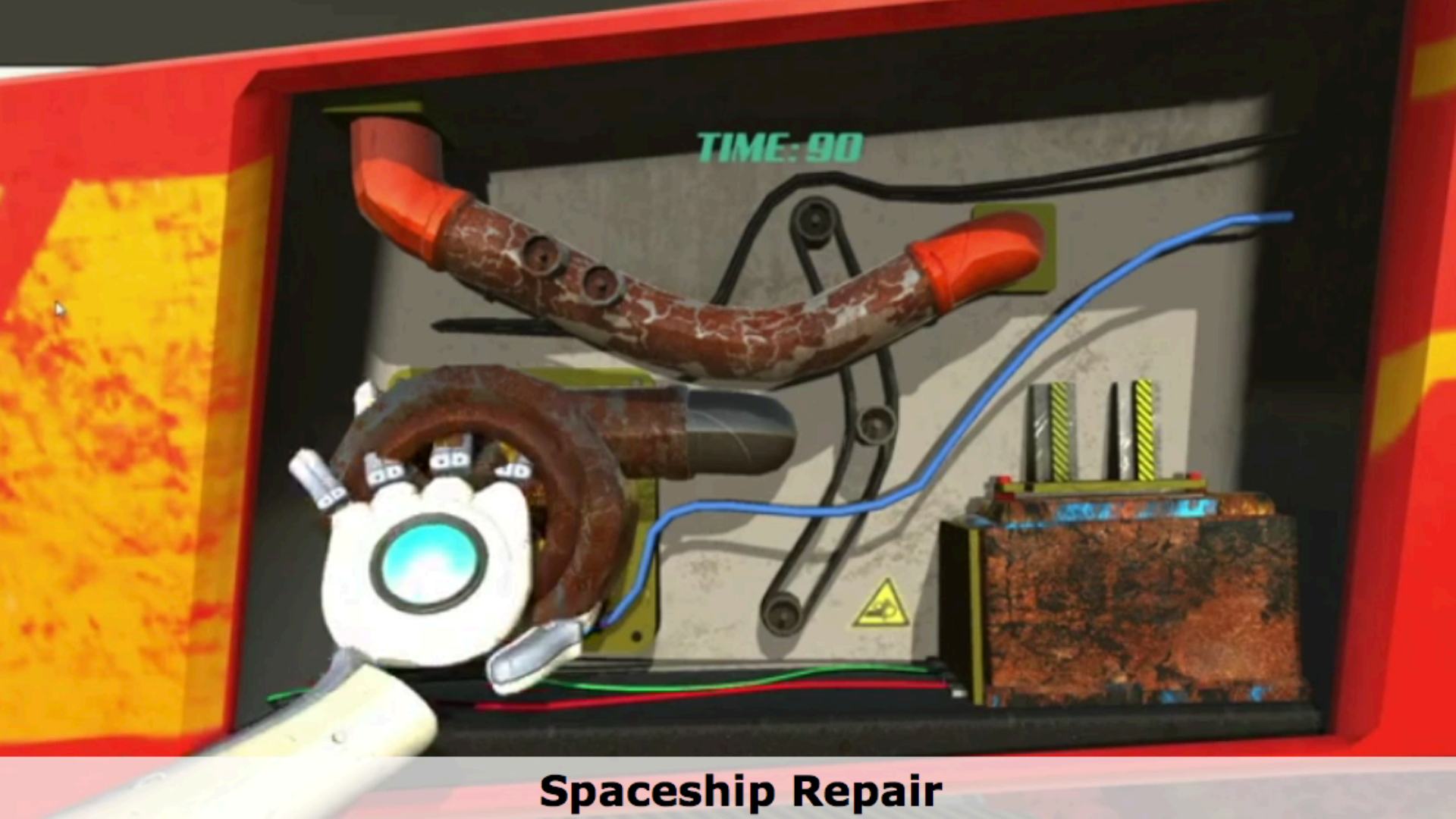
03:05

5481m

Surgeon Simulator by Bossa Studios



Toybox Demo by Oculus



TIME: 90

Spaceship Repair



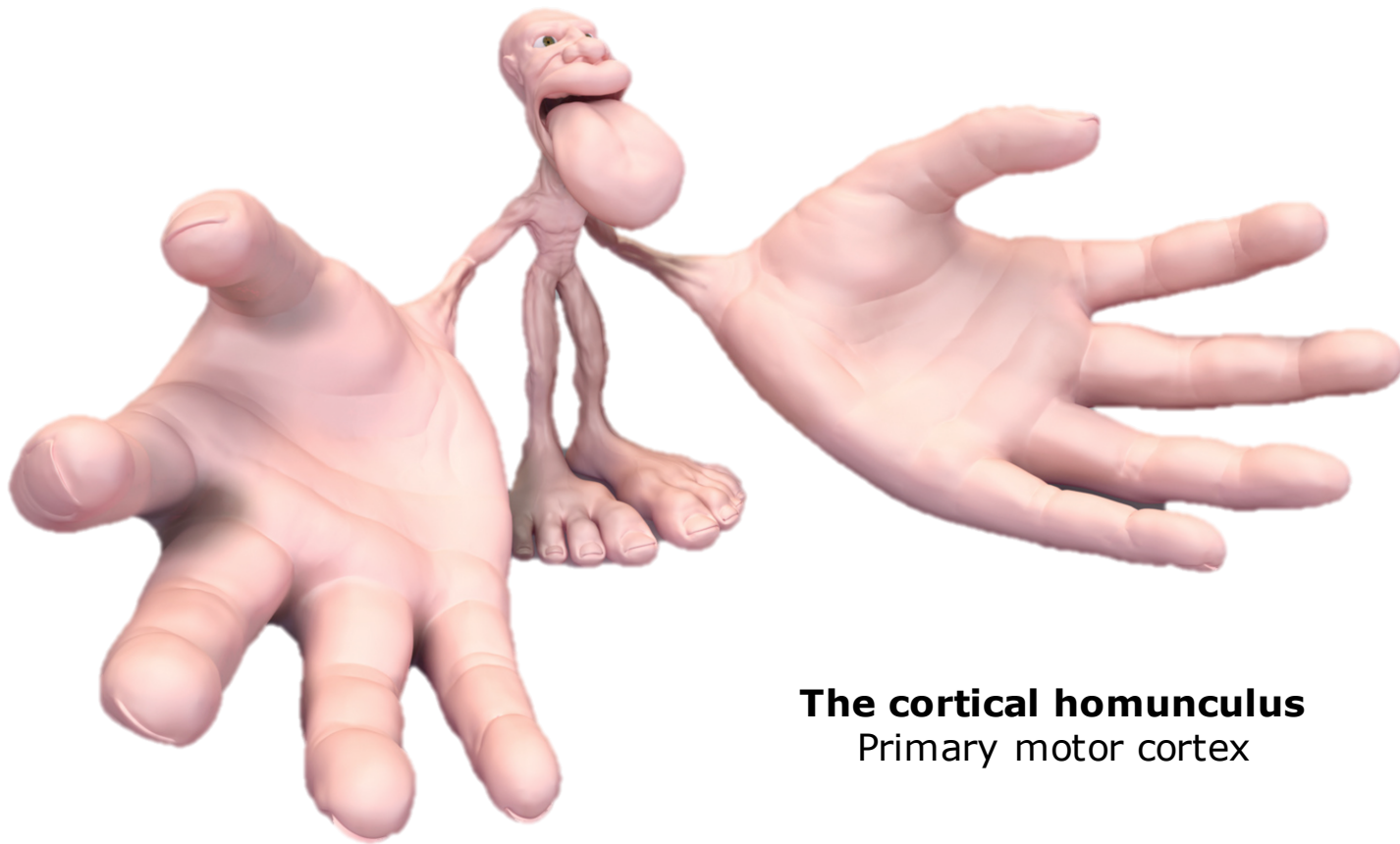
Giant Cop by Other Ocean



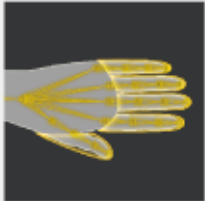
ADR1FT by Three One Zero



Job Simulator by Owlchemy Labs



The cortical homunculus
Primary motor cortex

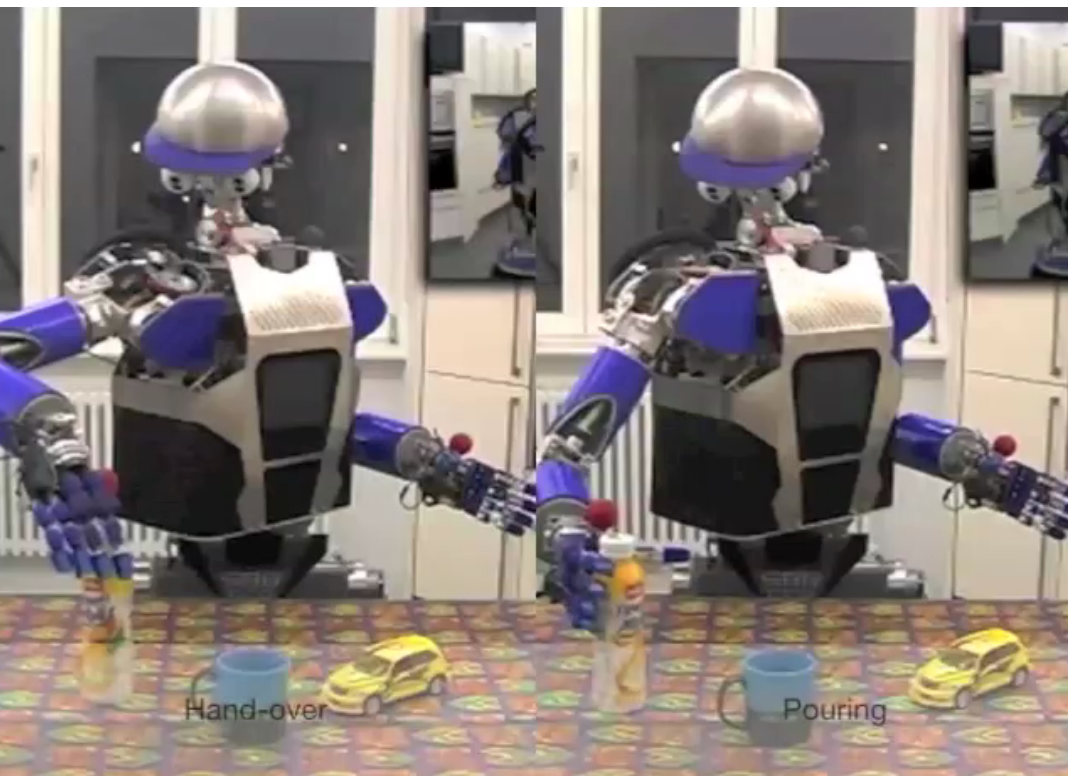
			
65 Total Joints	49 Total Joints	41 Total Joints	25 Total Joints
Full Articulation	Joint Chains For:	Joint Chains For:	No Articulation
	- Thumb	- Thumb	
	- Index Finger	- All Four Fingers	
	- Middle, Ring, and Pinky Combined		

The **cortical Mixamo** uncus
Primary motor cortex



"The world's first robotic hand", Devol & Engelberger, Unimate (1960s)



**Observation**

Sensors

Object
Perception**Planning**Artificial
IntelligenceGrasp
Synthesis**Execution**

Actuators

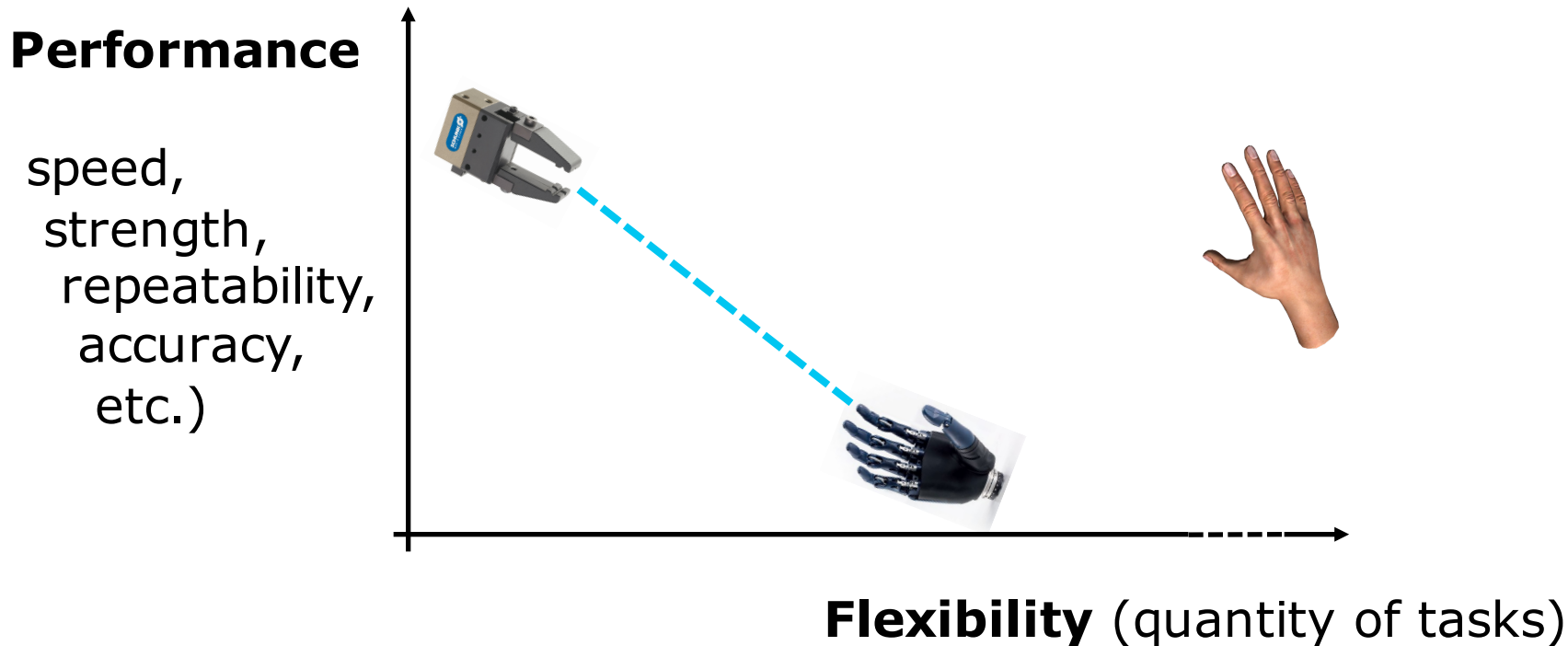
Robot
KinematicsObject
Interaction**2.**Hand Design
& Animation

Input

1.

1. Hand Design & Inputs

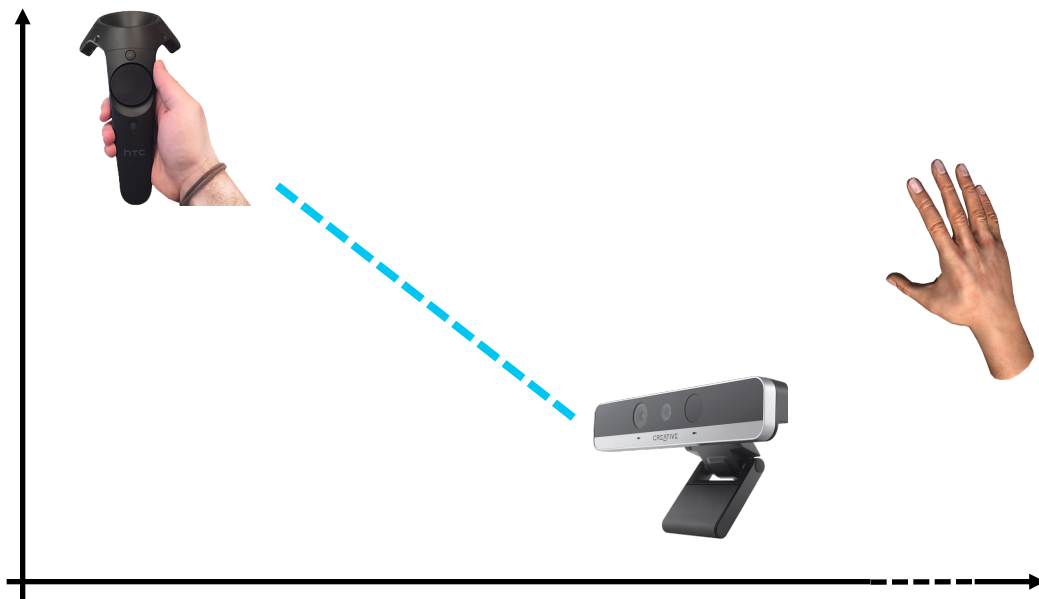
What Hand do you need for your Application?



What Input do you need for your Application?

Performance

simple,
user-friendly,
dev-friendly,
responsive,
etc.



Flexibility (quantity of tasks)



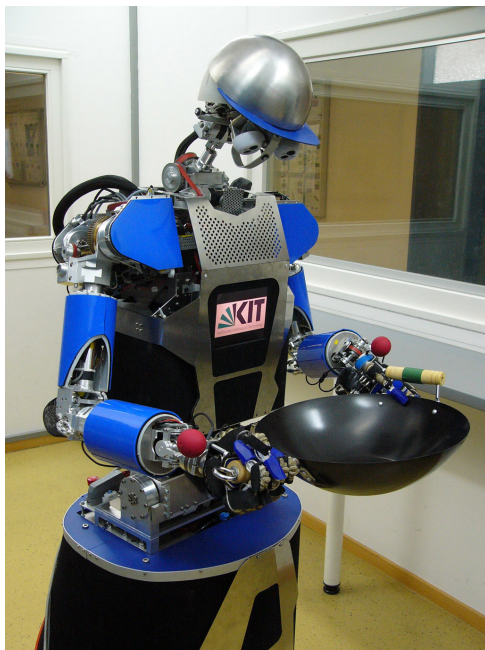
Bullet Train by Epic Games



Surgeon Simulator by Bossa Studios

2. Object Interaction

The Concept of Affordances



“An **affordance** is ...

a relation between an
object [...] and an **organism** that,
through a collection of stimuli,
affords the opportunity for that
organism to perform an **action**.”

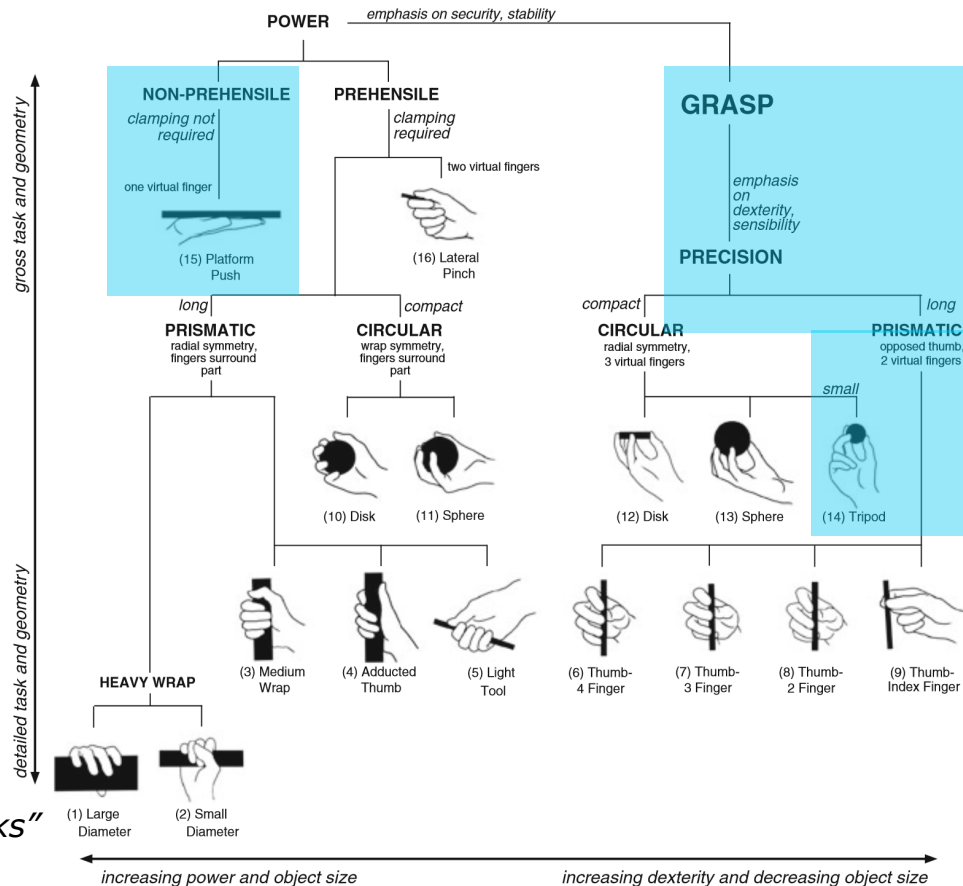
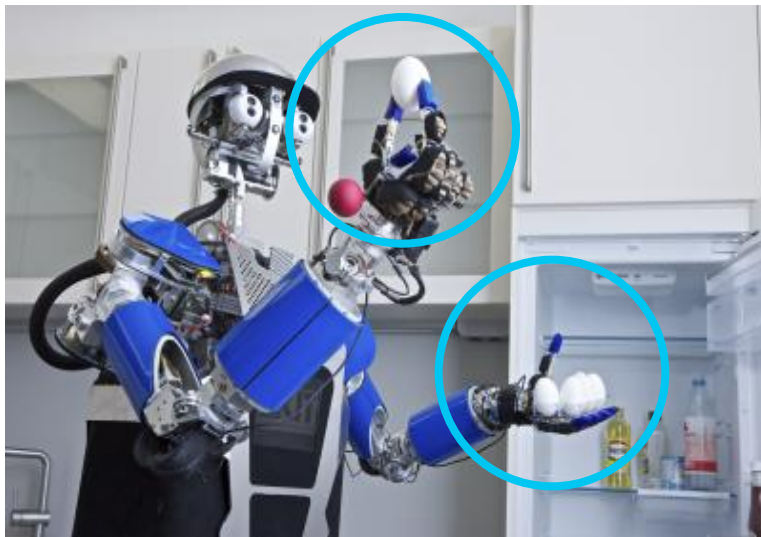
(Wikipedia)

J. J. Gibson (1977). “*The Theory of Affordances*”



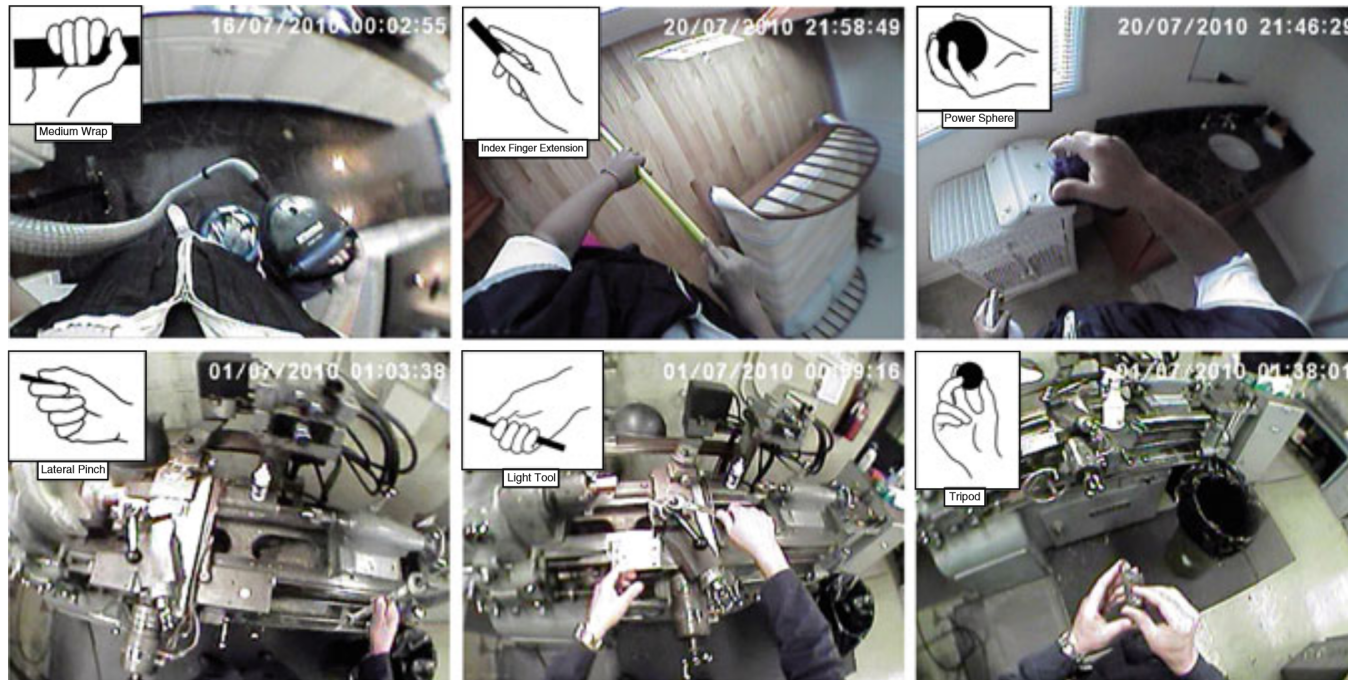
The Gallery by Cloudhead Games

Grasp Taxonomies



M. R. Cutkosky (1989). "On grasp choice, grasp models, and the design of hands for manufacturing tasks"

How We Grasp: Tools, Affordances and Taxonomies



Housemaid

> 50% on 3 grasps
ca. 60% power grasps
ca. 20% prec. grasps

Machinist

> 50% on 3 grasps
ca. 35% power grasps
ca. 40% prec. grasps

A. M. Dollar (2014). "Classifying Human Hand Use and the Activities of Daily Living"



WORK IN PROGRESS
OWLCHERRY LABS
3/1/15

Job Simulator by Owlcherry Labs



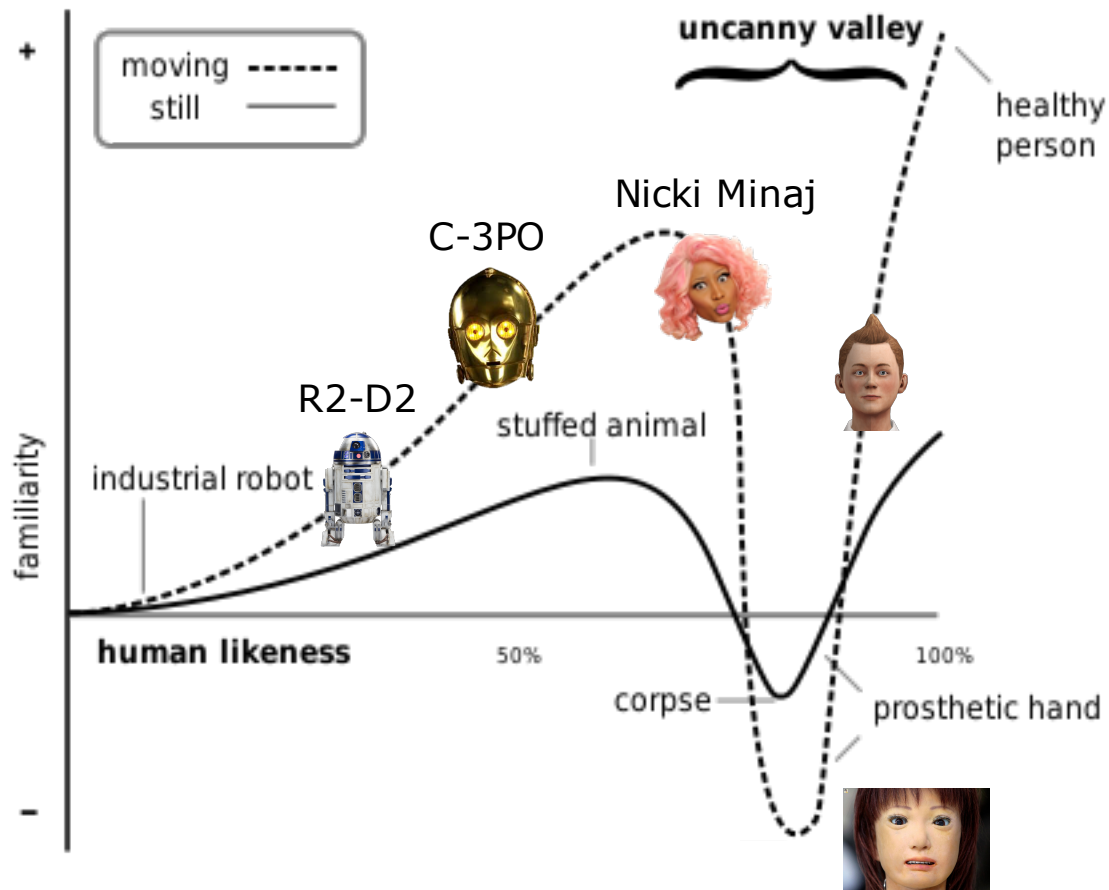
VirtualGrasp

What we have learned...

1. Representation of the hand
2. Object interaction
3. Input

Some things we learned

1. Avoid the uncanny valley



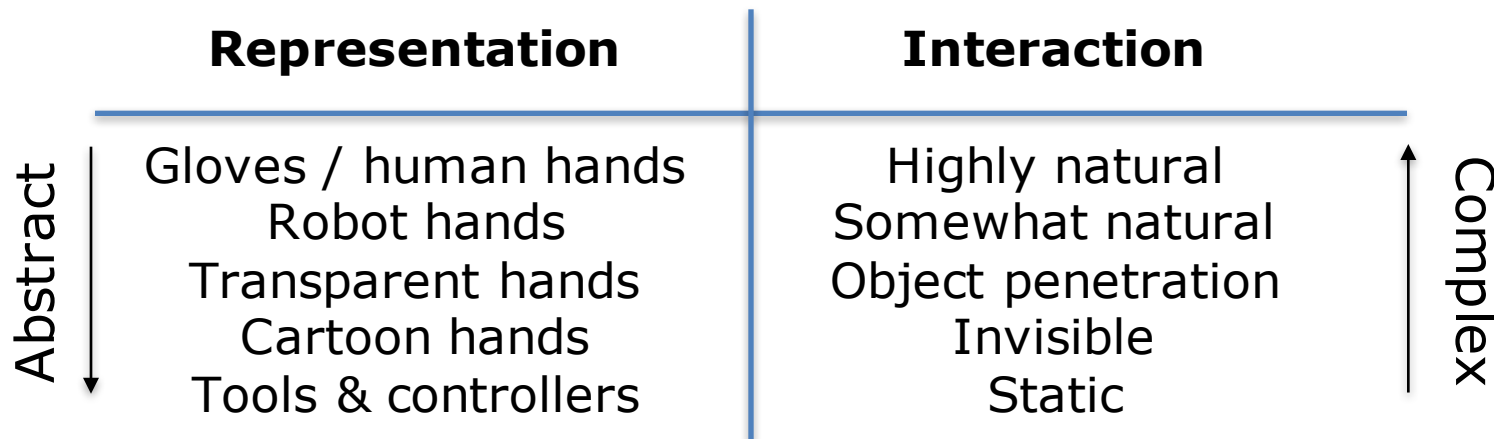
Some things we learned

1. Avoid the uncanny valley
2. **Avoid hand personalities (use gloves)**



Some things we learned

1. Avoid the uncanny valley
2. Avoid hand personalities (use gloves)
- 3. Be consistent**



Some things we learned

1. Avoid the uncanny valley
2. Avoid hand personalities (use gloves)
3. Be consistent
4. **Skip the arms...** for now

Some things we learned

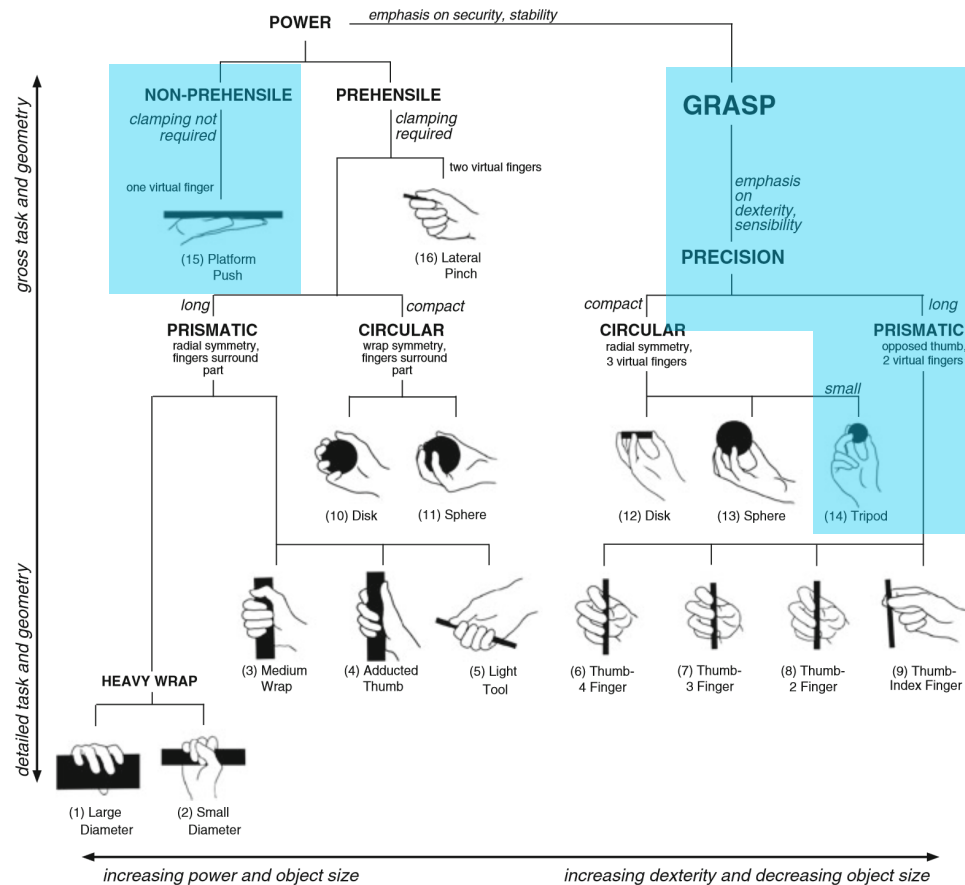
1. Avoid the uncanny valley
2. Avoid hand personalities (use gloves)
3. Be consistent
4. Skip the arms... for now
- 5. Think long and hard about every object in the scene**

Some things we learned

1. Avoid the uncanny valley
2. Avoid hand personalities (use gloves)
3. Be consistent
4. Skip the arms... for now
5. Think long and hard about every object in the scene
- 6. Make it obvious how to interact with the object**

Some things we learned

1. Avoid the uncanny valley
2. Avoid hand personalities (use gloves)
3. Be consistent
4. Skip the arms... for now
5. Think long and hard about every object in the scene
6. Make it obvious how to interact with the object
- 7. Pick the most natural grasps**



Some things we learned

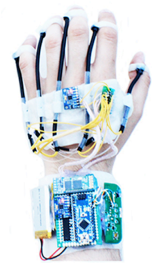
1. Avoid the uncanny valley
2. Avoid hand personalities (use gloves)
3. Be consistent
4. Skip the arms... for now
5. Think long and hard about every object in the scene
6. Make it obvious how to interact with the object
7. Pick the most natural grasps
- 8. Choose controller based on the use case**



Manus Machina



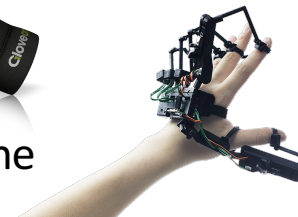
Perception Neuron



T-Glove



GloveOne



Dexmo Glove



LeapMotion



Intel Realsense



Razer Hydra



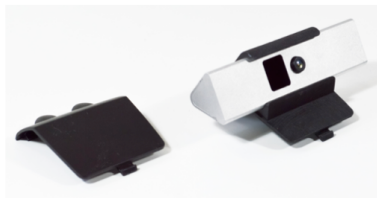
STEM



Sony Move



Kinect One



Nimble VR



HTC Vive

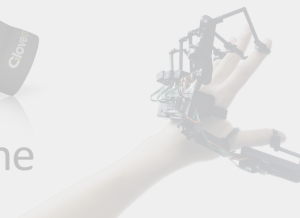
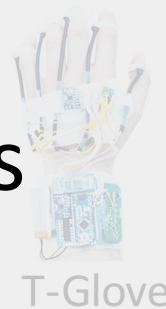


Oculus Touch



Sony PS4 Camera

Gloves

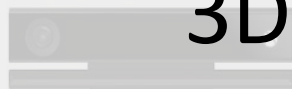


LeapMotion

Intel RealSense

3D

sensors



Sony PS4 Camera



Razer Hydra



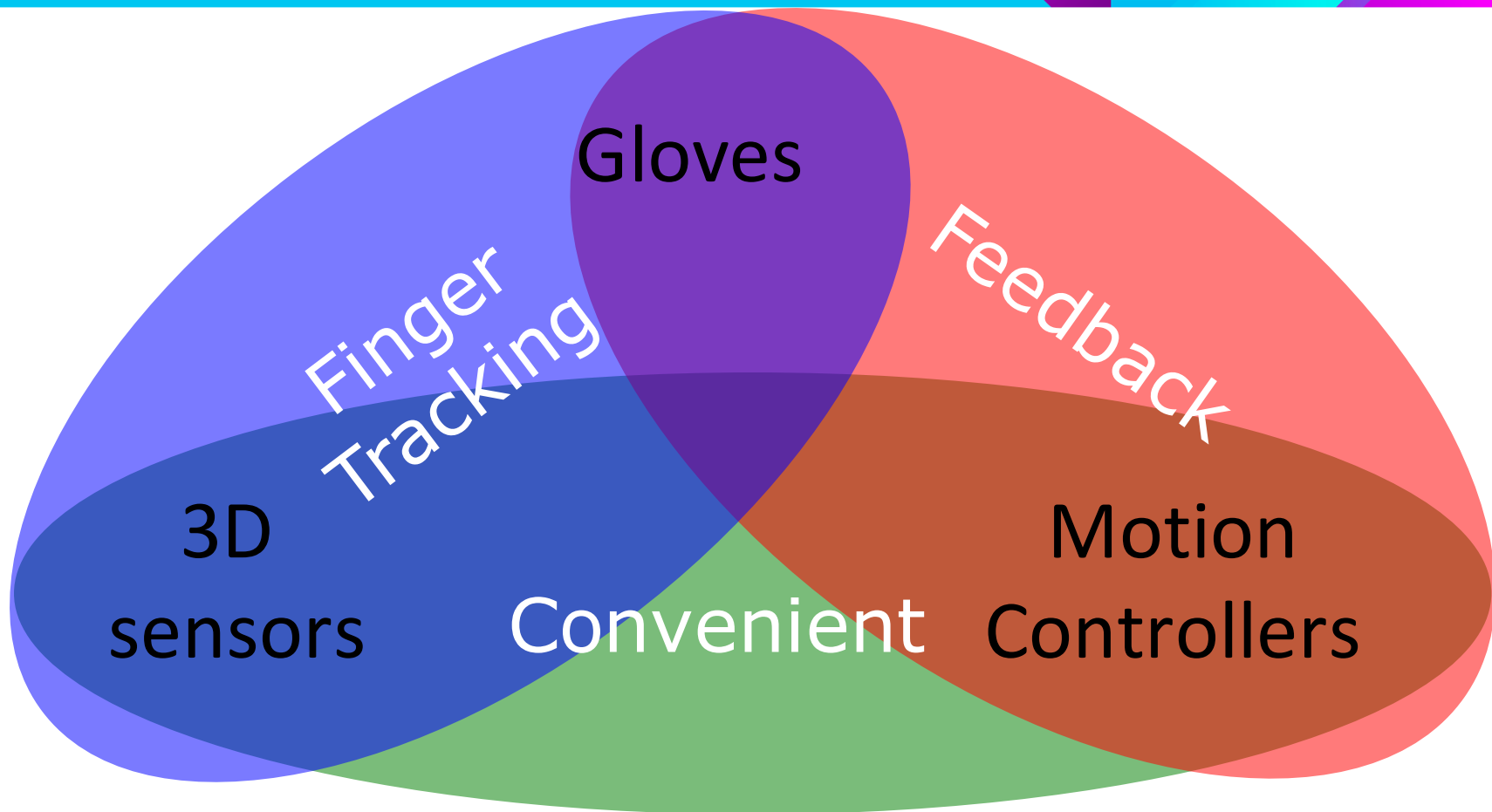
HTC Vive



Motion Controllers



Oculus Touch



Some things we learned

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2. Avoid hand personalities (use gloves)
3. Be consistent
4. Skip the arms... for now
5. Think long and hard about every object in the scene
6. Make it obvious how to interact with the object
7. Use the most natural grasp type
8. Choose controller based on the use case
9. **Use feedback**

Some things we learned

1. Avoid the uncanny valley
2. Avoid hand personalities (use gloves)
3. Be consistent
4. Skip the arms... for now
5. Think long and hard about every object in the scene
6. Make it obvious how to interact with the object
7. Use the most natural grasp type
8. Choose controller based on the use case
9. Use feedback
- 10. Some times hands and feedback gets weird...**



Tesla Suit by Tesla Studios

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7. Use the most natural grasp type
8. Choose controller based on the use case
9. Use feedback
10. Some times hands and feedback gets weird...

Hands are very interesting.

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