

Senses

What's Inside?

Define

Defined: Haptic

Defined: (Opt)ics

Defined: Haptics

Haptic Exploration

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Exploratory Procedures

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Tactile and Proprioceptive Devices

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Kinesthetic Device Challenges

Workspace vs Force

Haptic Wearables?

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Five Senses, Which is Most Important to You?

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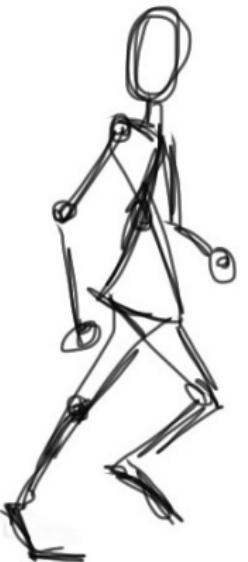
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- ▶ Hearing?
 - ▶ Sight?
 - ▶ Smell?
 - ▶ Taste?
 - ▶ Touch?
-
- ▶ Which of these seems the most valuable to you?
 - ▶ Which would you relinquish last?

Five Senses, Which is Most Important to You?

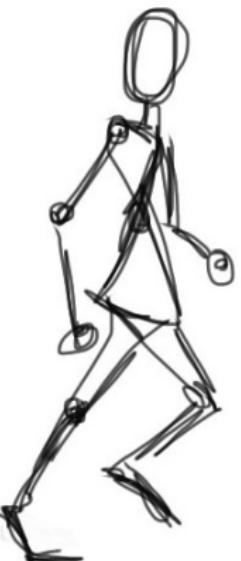
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Sight



- ▶ Centralized
- ▶ Broad
- ▶ Passive
- ▶ Cognitive



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Sight

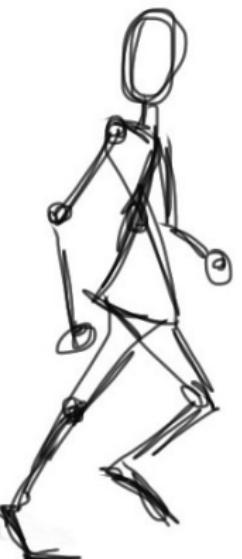


- ▶ Centralized
- ▶ Broad
- ▶ Passive
- ▶ Cognitive

Touch



- ▶ Distributed
- ▶ Narrow
- ▶ Interactive
- ▶ Fundamental



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Definition

haptic

adjective

1. of or relating to the sense of touch, in particular relating to the perception and manipulation of objects using the senses of touch and proprioception.

origin

1. late 19th century: from Greek *haptikos* ‘able to touch or grasp,’ from *haptein* ‘fasten.’

What is (Opt / Informat)ics?

Definition

optics

plural noun

1. the scientific study of sight and the behavior of light, or the properties of transmission and deflection of other forms of radiation.

Definition

in•for•mat•ics

plural noun

1. the science of processing data for storage and retrieval; informatics science

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A set of small, semi-transparent navigation icons typically used in Beamer presentations for navigating between slides and sections.

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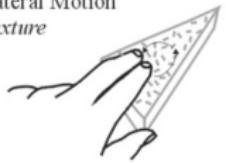
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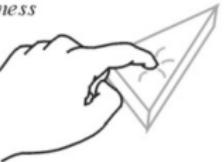
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Lateral Motion
Texture



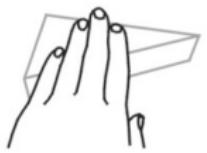
Pressure
Hardness



Enclosure
Global shape/Volume



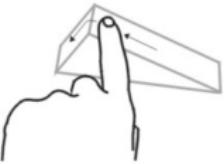
Static Contact
Temperature



Unsupported Holding
Weight



Contour Following
Shape



Types of Sensing

Cutaneous / Tactile
Stems from skin contact



Kinesthetic / Proprioceptive
Stems from body movement

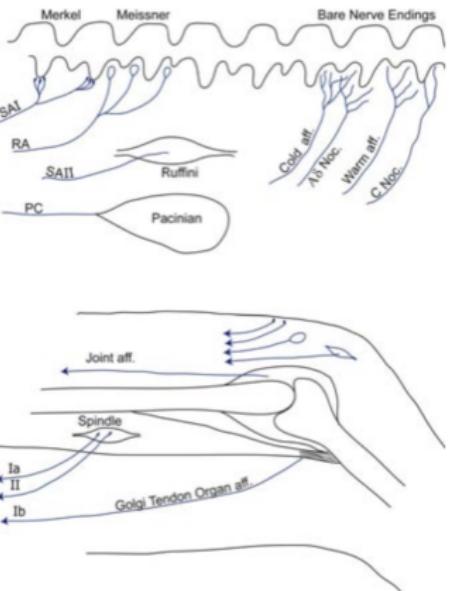


Illustration by A. M. Okamura.

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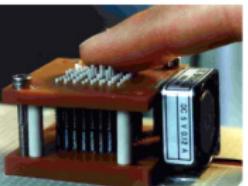
Tactile and Proprioceptive Devices

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Haptic Interfaces

Tactile Devices



Stimulate skin to create contact sensations



Hybrid Devices

Attempt to combine tactile and kinesthetic feedback



Kinesthetic Devices

Apply forces to guide or inhibit body movement

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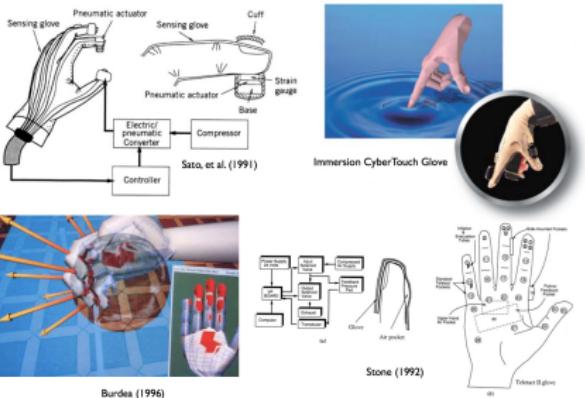
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Tactile Device Challenges



- ▶ Stimulation density needs to be high.
 - ▶ Multimodal sensations are very hard to overlay.
 - ▶ High complexity and weight diminish portability.
 - ▶ Passive touch does not feel real.
 - ▶ Tactile device design is difficult!

Senses

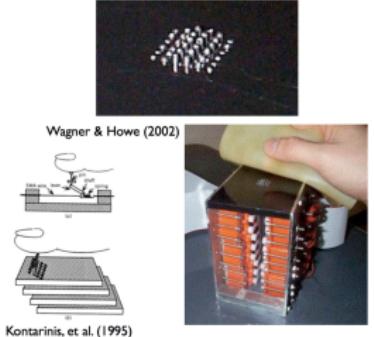
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- ▶ Competing goals of high stiffness and low mass.
- ▶ Force feedback feels soft - “Nerfworld”.
- ▶ Point based interactions are overly simple.
- ▶ High quality devices are expensive.
- ▶ Limited workspace.
- ▶ Constrained to a desk!

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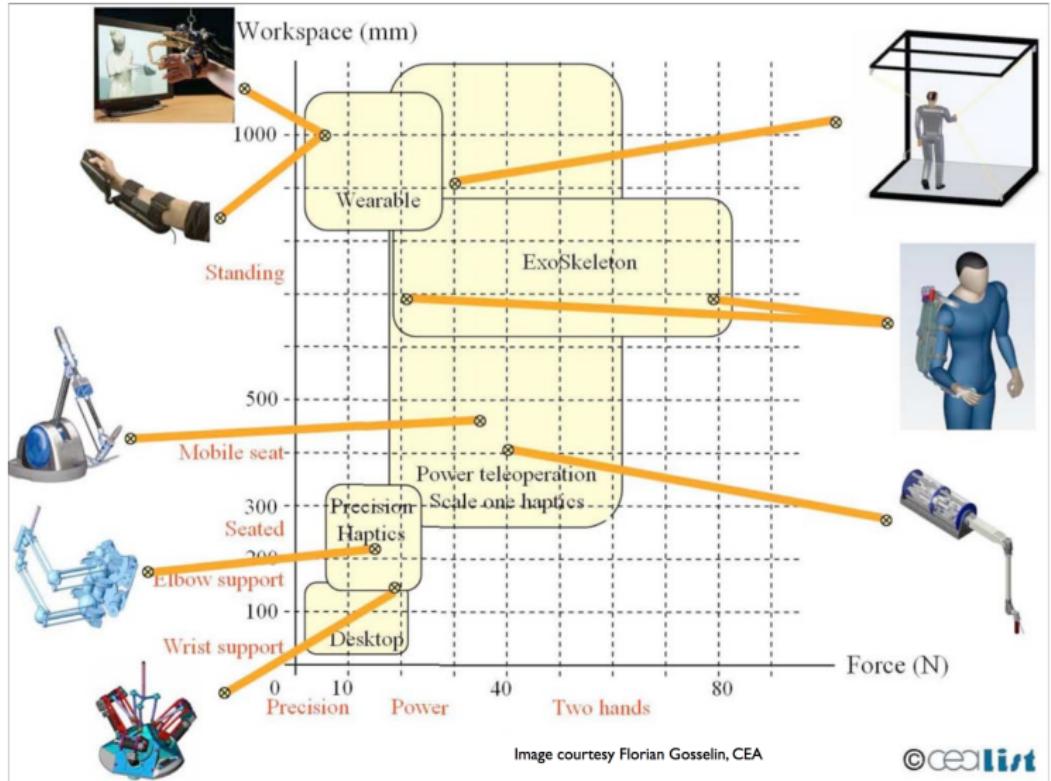
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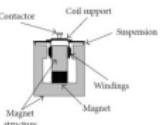
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But what can you do with haptic wearables?

- ▶ Vibration (eccentric mass motor or tactor)
- ▶ Skin stretch
- ▶ Kinesthetic force
- ▶ Inertial changes



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