

Senses

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Define

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Defined: (Opt)ics

Defined: Haptics

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Wearable Technologies and Applications (Wearable Informatics)

Winfree

Lecture 3

What's Inside?

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Five Senses, Which is Most Important to You?

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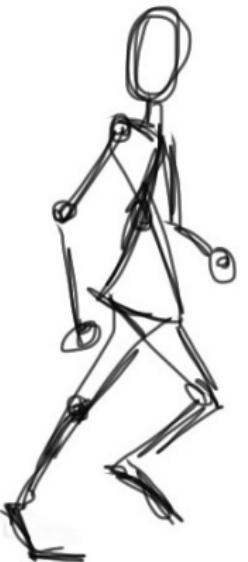
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- ▶ Hearing?
 - ▶ Sight?
 - ▶ Smell?
 - ▶ Taste?
 - ▶ Touch?
-
- ▶ Which of these seems the most valuable to you?
 - ▶ Which would you relinquish last?

Five Senses, Which is Most Important to You?

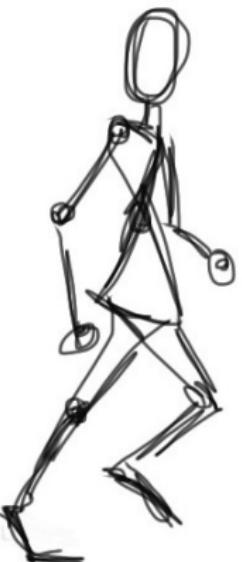
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Sight



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



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Sight

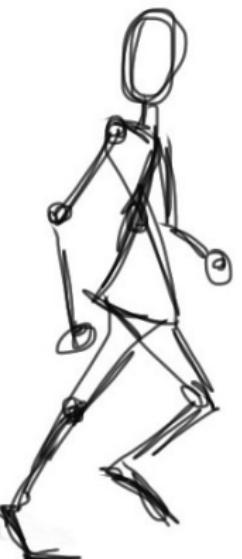


- ▶ Centralized
- ▶ Broad
- ▶ Passive
- ▶ Cognitive

Touch



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



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What is Haptics?

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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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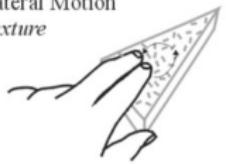
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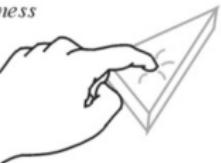
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Lateral Motion
Texture



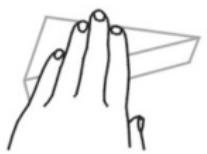
Pressure
Hardness



Enclosure
Global shape/Volume



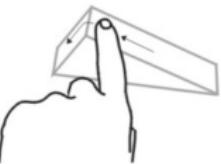
Static Contact
Temperature



Unsupported Holding
Weight



Contour Following
Shape



Types of Sensing

Cutaneous / Tactile
Stems from skin contact



Kinesthetic / Proprioceptive
Stems from body movement

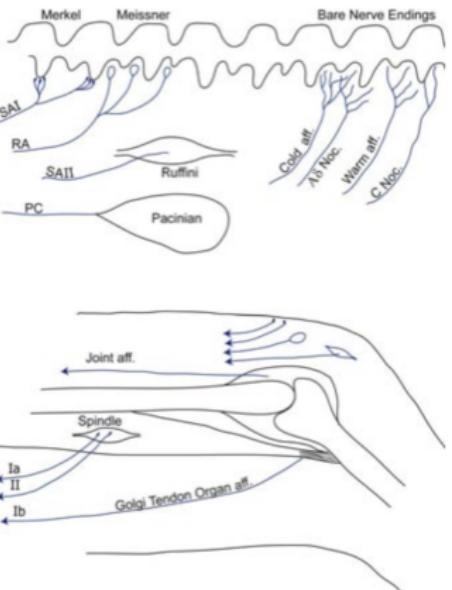


Illustration by A. M. Okamura.

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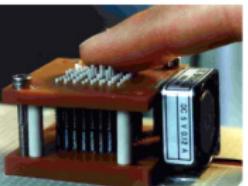
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Haptic Interfaces

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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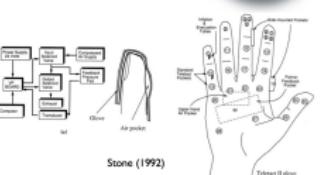
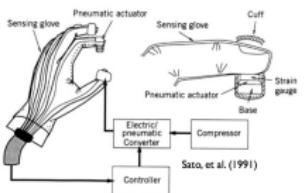
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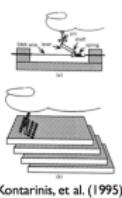
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Tactile Device Challenges



Wagner & Howe (2002)



Kontarinis, et al. (1995)

- ▶ 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!

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Kinesthetic Device Challenges

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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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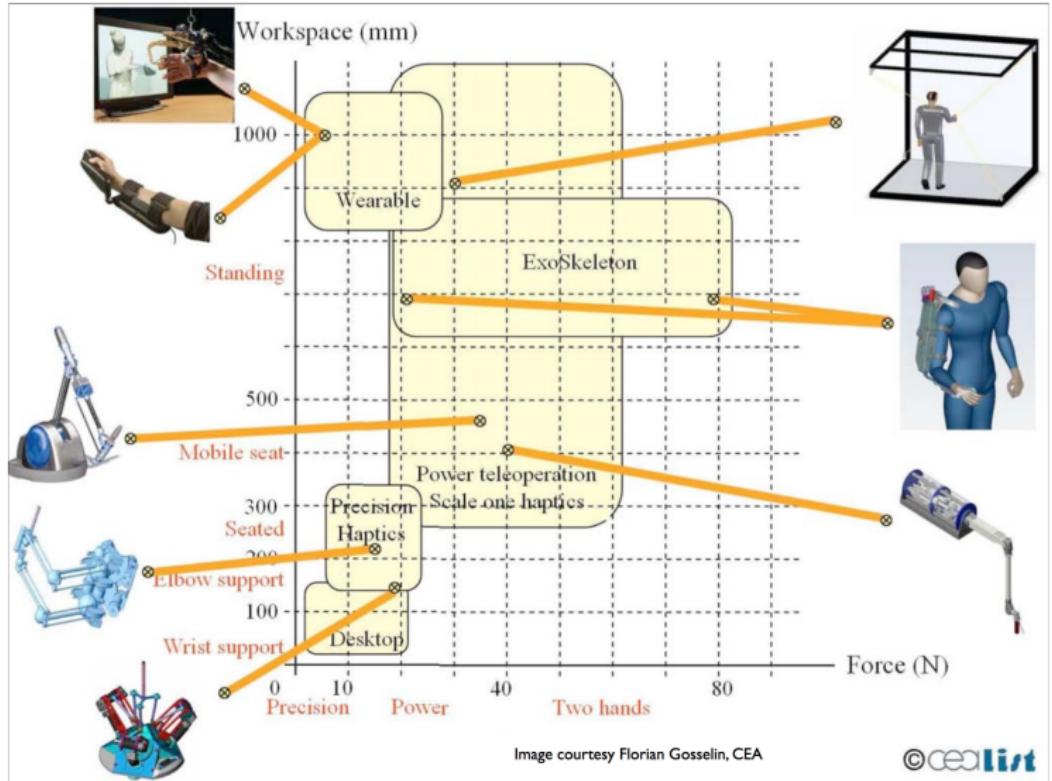
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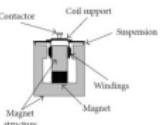
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But what can you do with haptic wearables?

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



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