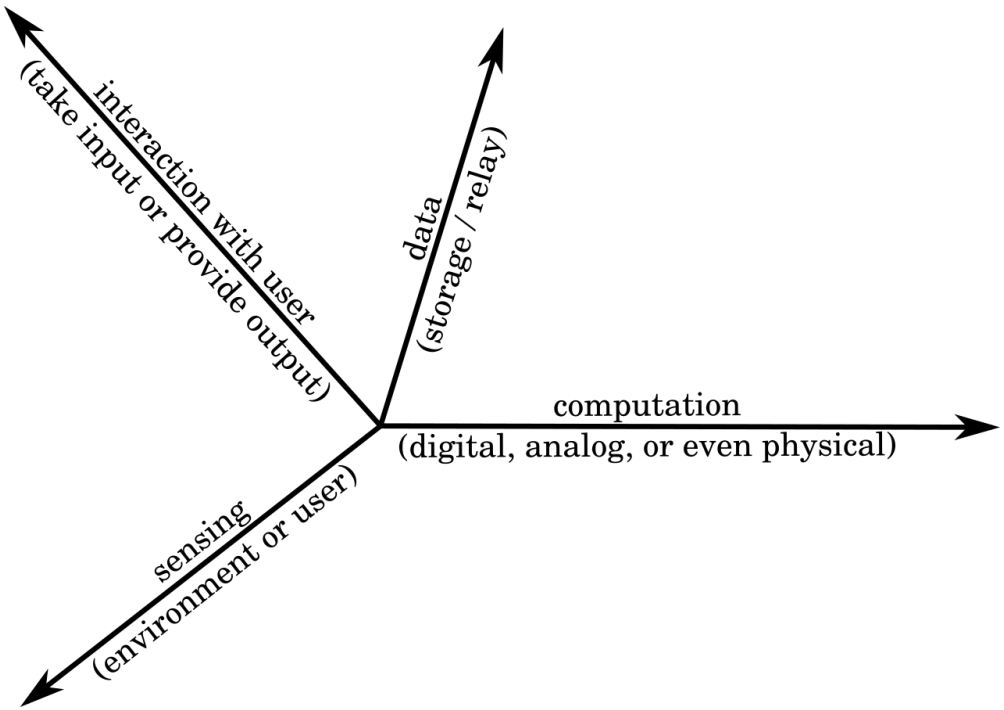
Wearable Technologies and Applications (Wearable Informatics)

Winfree

Lecture 2

Dimensions of Functionality
Axes
Early Examples
Rivet Glasses
Countess of Lovelace
Roulette
"Recent" Examples
Computing on the Wrist
Environmental Sensing
Human Sensing
More Examples
Fashion
Communication
Mobility
Implantables
Dimensioning Examples

Axes as a Framework



- Four dimensions of functionality.
- Each axis is not necessarily orthogonal to any other.

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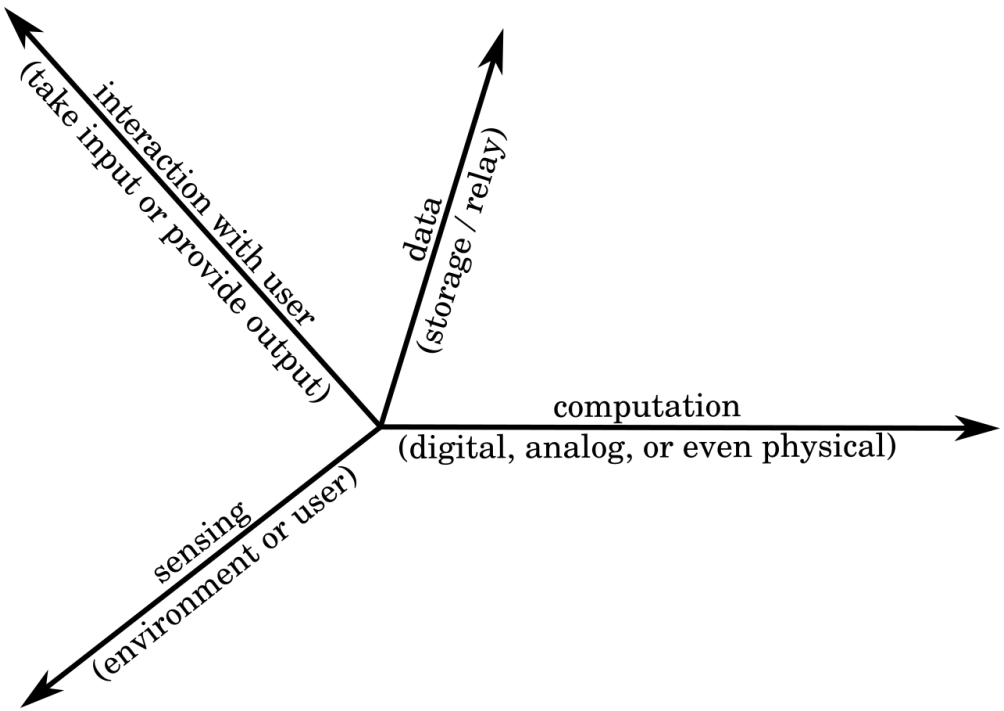
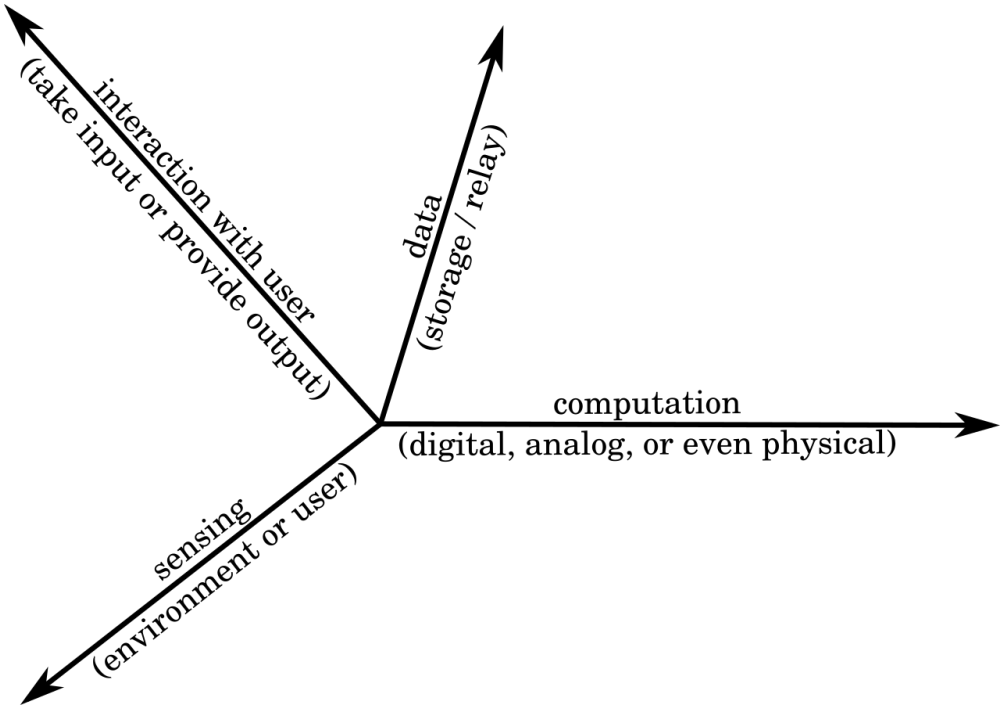
Sensing



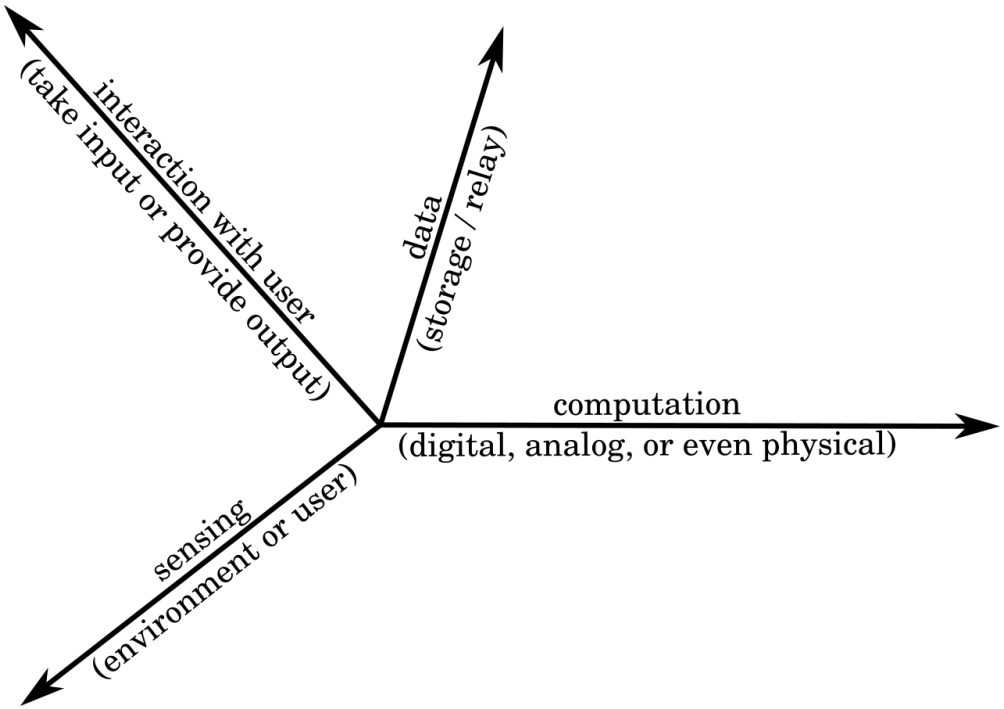
- Environmental
  - Temperature (not skin)
  - Location
  - Air quality
- Wearer (user)
  - Temperature (eg skin)
  - Heart Rate
  - Physical Activity Level

Data



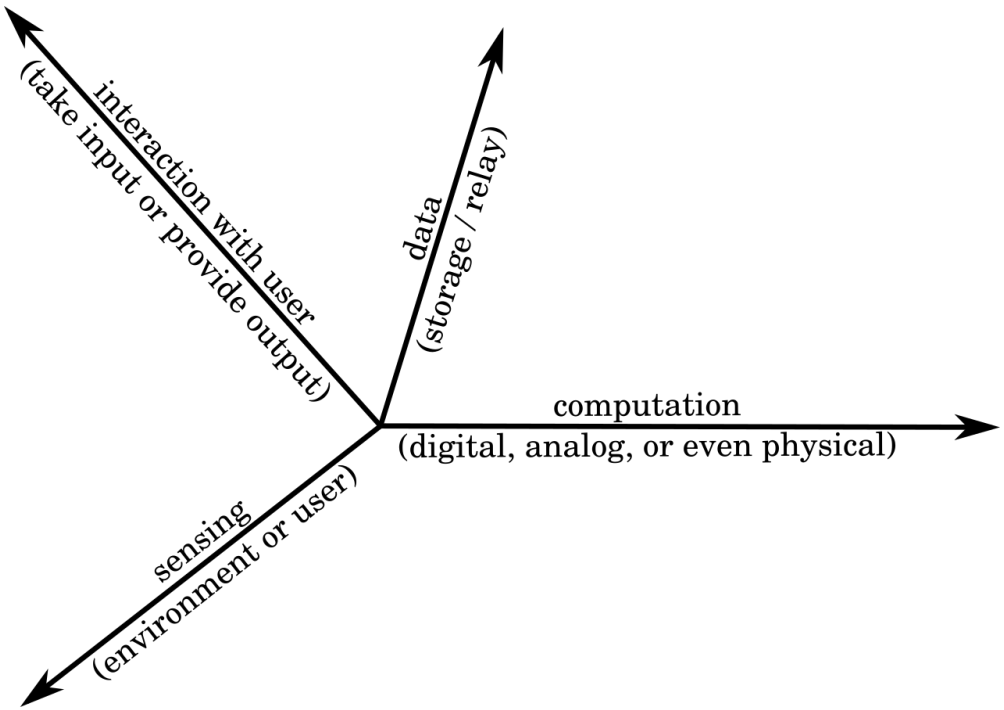
- Storage
  - Local
  - No storage - process and throw away
- Relay
  - Physical storage - SD card
  - Wired on command
  - Wireless
  - Continuous or Staged

Interaction with the Wearer (Human Comp. Interaction - HCI)



- Input
  - Direct entry
  - Motion
  - Voice Command
- Output
  - Audio
  - Haptic
  - Visual

Computation



- Mechanical
- Analog
- Digital

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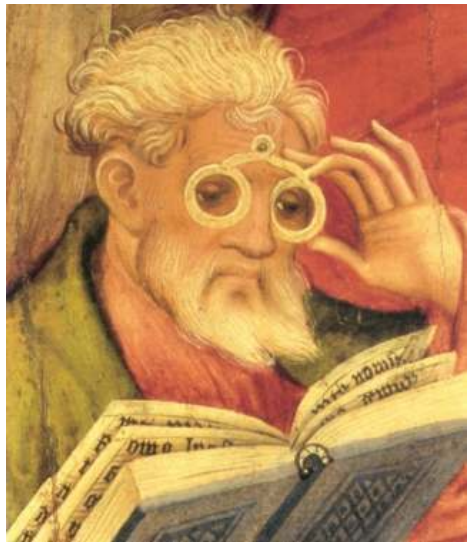
Rivet Glasses

- First clear exemplar of wearable technology.
- Corrective glasses (with a convex lens) - 13th century in Italy. Two lenses held together by a rivet; no arms to rest on the ears.
- Function - Modify information (images) through a mechanical process (the lens) for the wearer (user) - mechanical computing.[a]



[a] https://en.wikipedia.org/wiki/Glasses, https://www.medievalchronicles.com/medieval-history/medieval-inventions-list/eyeglasses/

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Countess of Lovelace

"Augusta Ada King-Noel, Countess of Lovelace (Ada Lovelace) was an English mathematician and writer, chiefly known for her work on Charles Babbage's early mechanical general-purpose computer, the Analytical Engine. Her notes on the engine include what is recognized as the first algorithm intended to be carried out by a machine. As a result, she is often regarded as the first computer programmer."

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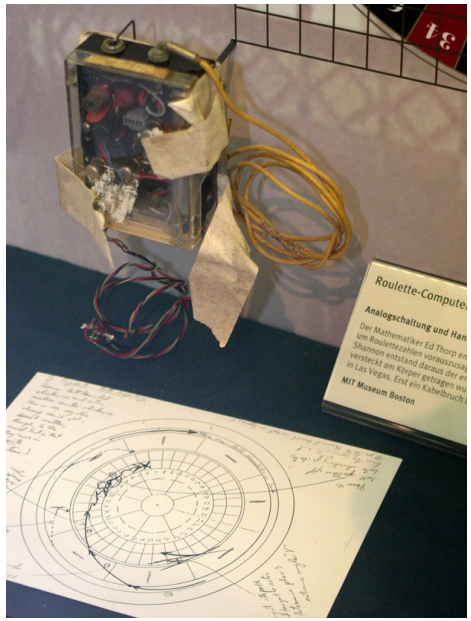
Roulette Computer

August of 1961 Edward O. Thorp and Claude Shannon, of MIT

"They worked as a team. Shannon watched the wheel, clandestinely clocking the speeds of the rotor and the ball by flipping micro switches in his shoe with his big toe. The signals coursed through wires that ran up his pant leg to a small computer strapped to his waist. The machine calculated the ball's final resting position and then transmitted this prediction wirelessly to a receiver under Thorp's shirt. Through a tiny speaker in his ear, Thorp heard one of eight distinct tones that advised him on how to bet." [a]



[a] http://spectrum.ieee.org/consumer-electronics/portable-devices/wearable-computers-will- transform-language

Computing on the Wrist

Casio CA-90 (1970s)

Seiko UC-2100 (1984?)

Casio Data Bank (1980s to current!)

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Environmental Sensing

1

[1] http://www.treehugger.com/clean-technology/environmental-sensors.html

INF632 (EE499/EE599)

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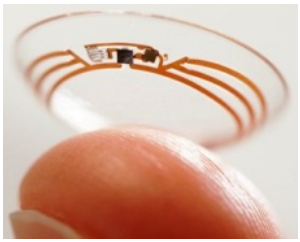
Human Sensing



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Little Boots Cyber Cinderella LED Dress

See ‘1 - Little Boots Cyber Cinderella LED Dress [HD, 1280x720p].mp4’

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Signing

See ‘2 - SignAloud Gloves that Transliterate Sign Language into Text and Speech [HD, 1280x720p].mp4’

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Orthotics and Prosthetics

See ‘3 - Can Prosthetics Outperform Real Limbs Cyborg Nation [HD, 1280x720p].mp4’

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Neural Prosthetics

See ‘4 - Amputee Makes History with APL’s Modular Prosthetic Limb [HD, 1280x720p].mp4’

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Cochlear Implants

See ‘5 - How A Cochlear Implant Works by Advanced Bionics [HD, 1280x720p].mp4’

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Cochlear Implants

See ‘6 - Kai hearing hearing her voice for the first time [Low, 480x360p].mp4’

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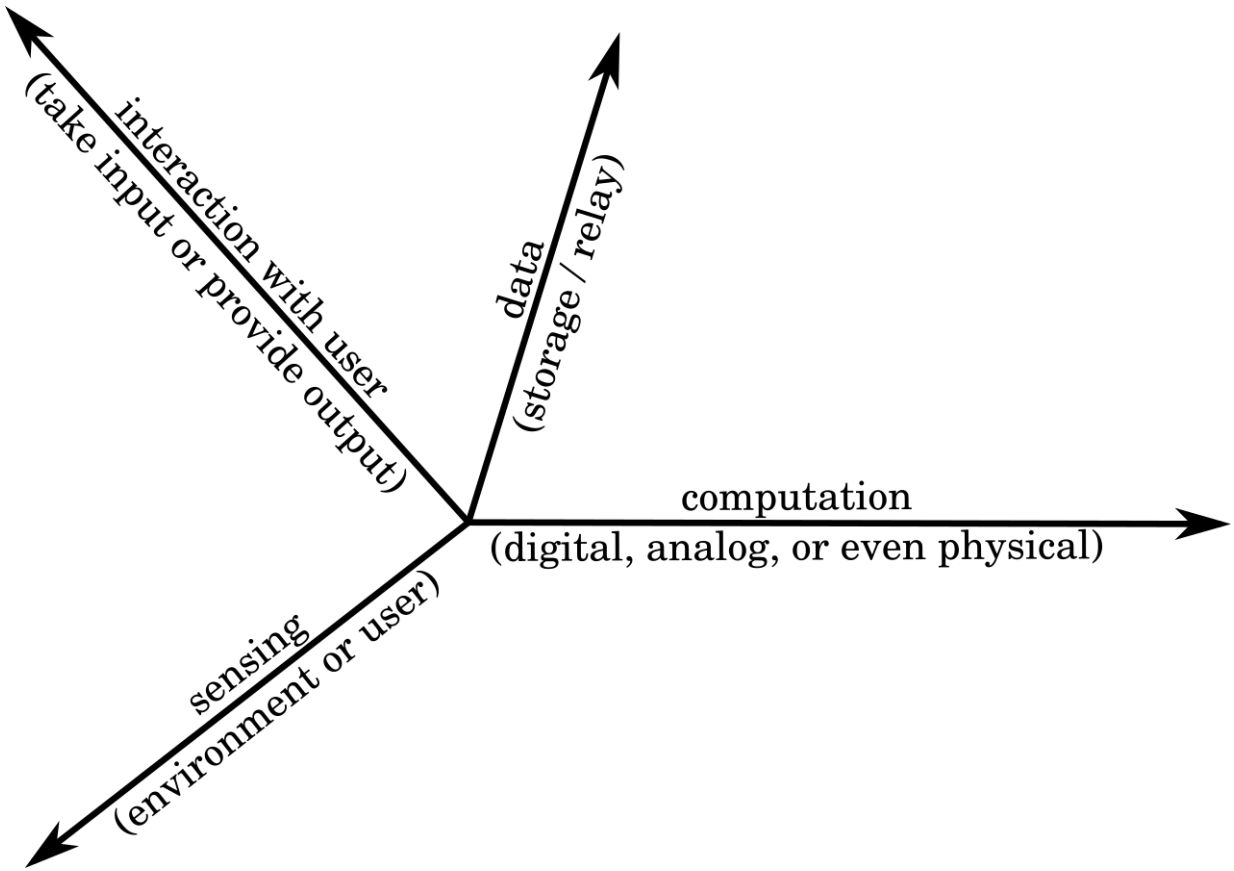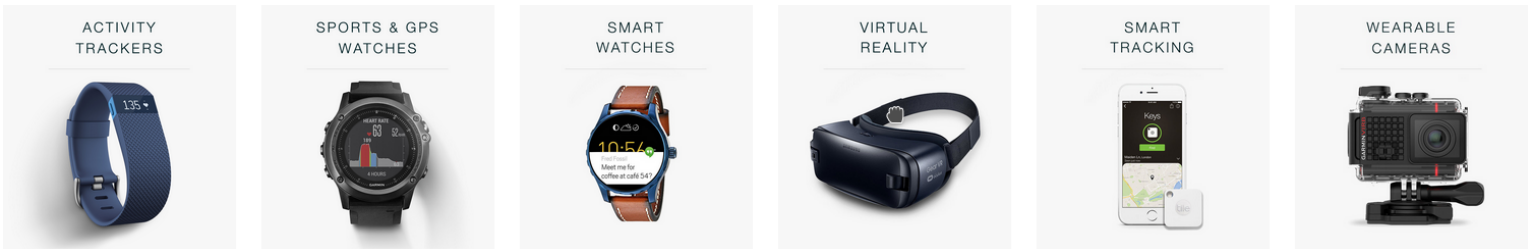
Dimensioning Examples