# Technological basics

* Two major dimensions: size and purpose
* Size: broad spectrum from ~ 1 mm to ~ 50 cm
* Purpose: general or special (with overlap)

# Big issues

# Network

Multiplexing:

* Sharing the spectrum between transmitters
* Multiple access methods:

* Time-division multiple access (TDMA)
  + Static Timeslots (not used a lot)
  + Dynamic carrier sense
    - This has a "Hidden node problem"
      * When the to nodes can receive each other but they can reach the access point

* Frequency-division multiple access (FDMA)
  + Split the stations by frequency. You split the band in sub-bands where each receiver gets a slot
  + Problem : The receiver (station) should be able to listen to more sub-band at the same time

* Code division multiple access (CDMA)
  + Spread spectrum method: all devices in an area transmit at the same time and across the same frequency range.
  + It is possible to split them by using modulation code

Wireless standards

* Bluetooth
  + Wireless personal area network
  + Connecting with your personal devices

* 1,2,3,4,5G
  + Wireless wide area network
  + 3G
    - Hybrid between old telephone network and IP-based network
  + 4G
    - LTE, only IP communication
  + 5G
    - Only IP communication
    - And includes sub-standards for further scenarios

* WIFI
  + Wireless local area network
  + Anything can transmit. Has to be very robust
  + Only2 lowest layers of ISO (Physical & Data Link)
  + Network topology: Usually star(or tree)

# Location

Classes

* Geographic (latitude, longitude)
* Topological (street name)
* Cell-based (ID of network cell)
* Mapping between classes is necessary (geocoding, reverse geocoding)
* Methods(location providers)
  + Satellites
  + WLAN cells
  + Cell towers
* Terminology:
  + High accuracy
    - Measurement is close to the actually ground truth location you're looking at
  + High precision
    - Measurement is close to each other

# I/O

Issues touch:

* No haptic feedback (unlike keyboards)
* Occlusion – hand/fingers covers part of display
* Precision - user hits multiple pixels, covers target
* No “hover” state - “Midas touch problem”
* Reachability

Issues: gestures

* gestures are any physical movement by the user to activate a specific control within the design
* Discoverability
  + How do I know which gestures are available?
  + Even more difficult for complex gestures
* “Natural” interaction
  + What's a natural gesture?
  + Strong personal & cultural preferences
* No standards
  + E.g. swipe; long-press: very different meanings for each app/OS
  + Exception: pinch-zoom
* Taxonomy
  + Pointing/”deictic”
  + Semaphoric
    - Gesticulation, sign language?
  + Pantomimic
    - Describes actions
  + Iconic
    - Conveys shapes
  + Manipulation
    - Implies physical link