

# UbiComp In The Clouds: Observations, Reflections and Experiences

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<http://www.ics.uci.edu/~djp3>



## First Wave

- Main Frame Computing
  - 1960-1970
  - Massive computers to do simple data processing
  - Few computers in the world





## Second Wave

- Desktop Computing
  - 1980-1990
  - Business applications drive usage
  - One computer per desk
  - Computers connected in intranets to a massive global network
  - All wired







## Third Wave

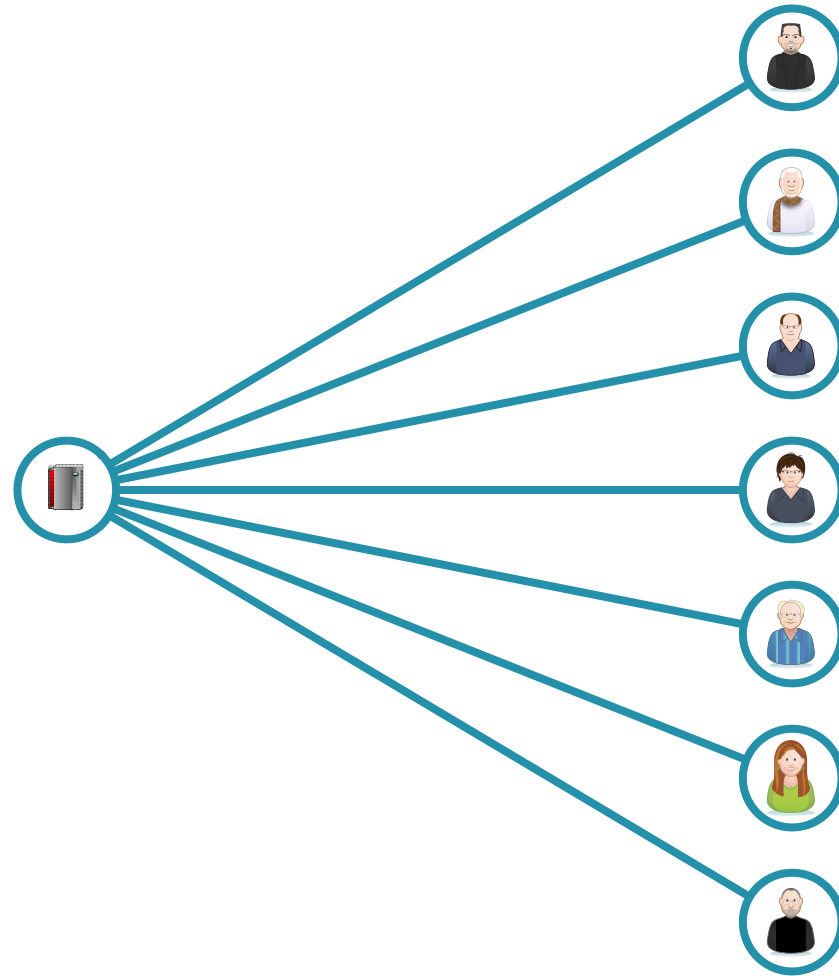
- Ubiquitous Computing
  - 2000 - present
  - Information creation, access, communication drive usage
  - Multiple computers per environment/person
  - WANs, LANs, PANs, ad-hoc networking, wireless
  - Computers disappearing





: Ubicomp is about people's relationship to computers

## First Wave



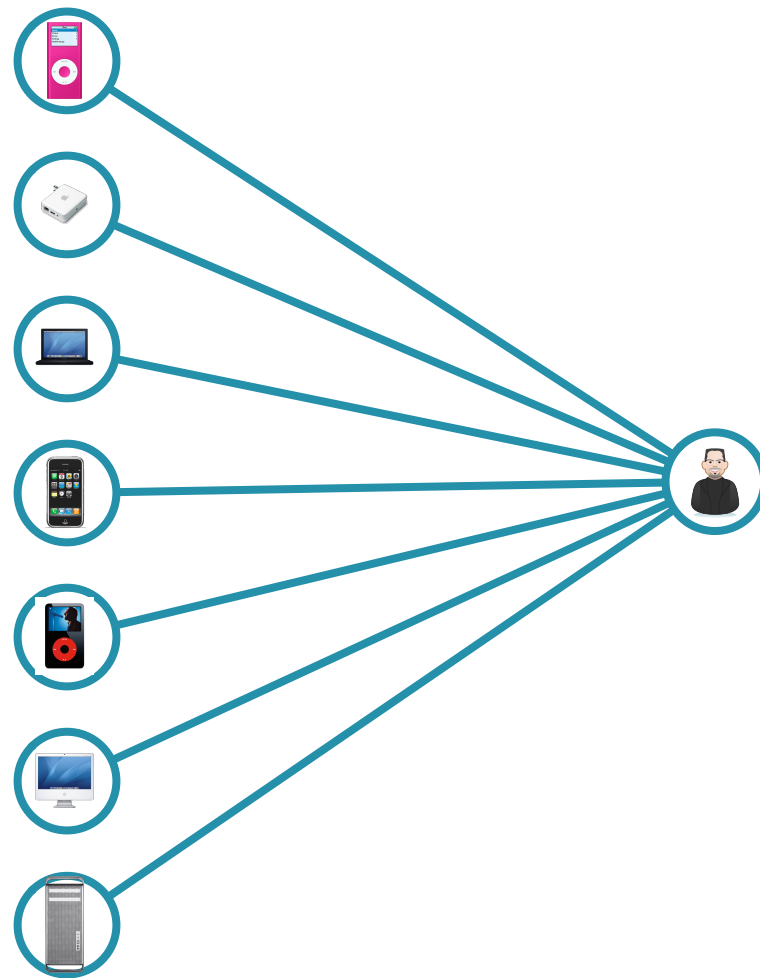
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## Second Wave



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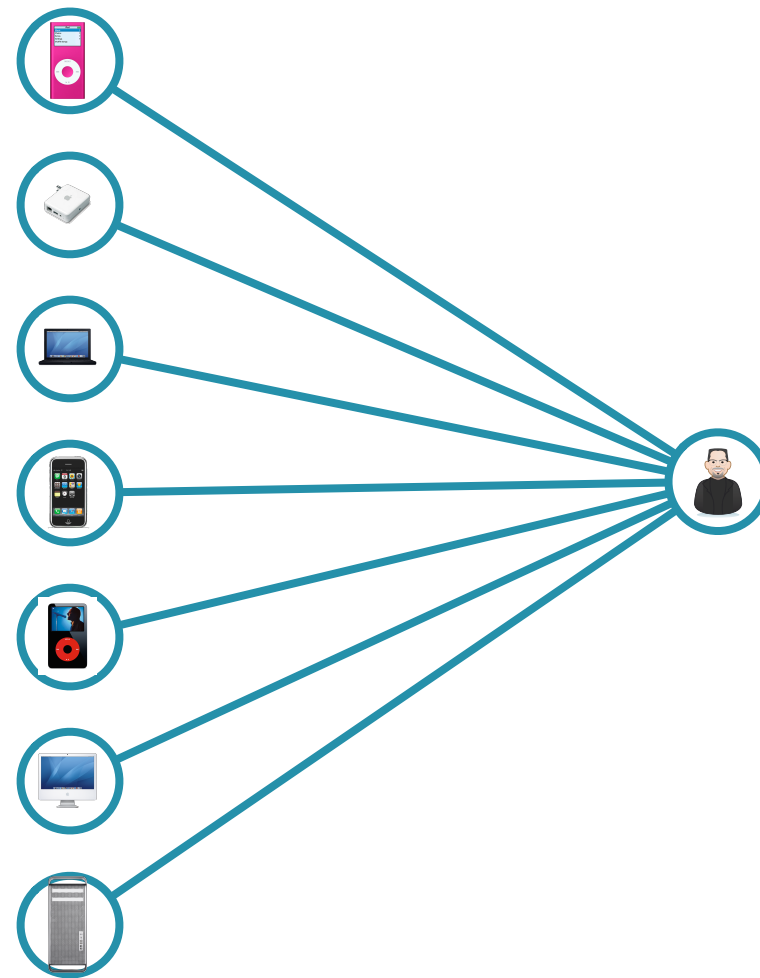
# Third Wave





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## Third Wave



How are we going to manage all of these devices?

# Ways of Thinking about UBICOMP

- Systems
- Experience
- Sensors



- Systems
  - Carried
  - Worn
  - Infrastructure





- Xerox Parc
  - ?



- IBM Research (mid 1990s)
  - “Pervasive Computing”
  - WAP based phone checkin system



- University of Tokyo (late 1980's)
  - T-Engine and ITRON
  - Notable for elevating the role of software



- Cooltown
  - Hewlett Packard
  - First Realization of the Internet of Things



- UC Berkeley
  - Optimized info pad for consuming media



- MIT Media Lab
  - Wearable Computing
  - Heads-up Displays
  - Twiddlers





- MIT Media Lab
  - Wearable Computing
  - Heads-up Displays
  - Twiddlers



- Georgia Tech
  - Aware Home
  - Classroom 2000





# Examples

- Smart Floor
  - local tracking
  - anonymous
  - no additional equipment for a person
  - poor scalability
  - costly



- Georgia Tech
  - Aware Home
  - Classroom 2000





- Olivetti Research
  - Active Badge
  - Active BAT



# Examples



- Active Badge
  - GUID broadcast by infrared
  - symbolic proximity
  - absolute positioning
  - sunlight/flourescent lighting



# Examples



## • Active Bat

- GUID ultrasonic broadcast by radio request
- infrastructure computes absolute proximity
- 9cm 95% of the time
- bad scalability, hard to deploy, maybe costly



# Ways of Thinking about UBICOMP

- MIT
  - Cricket



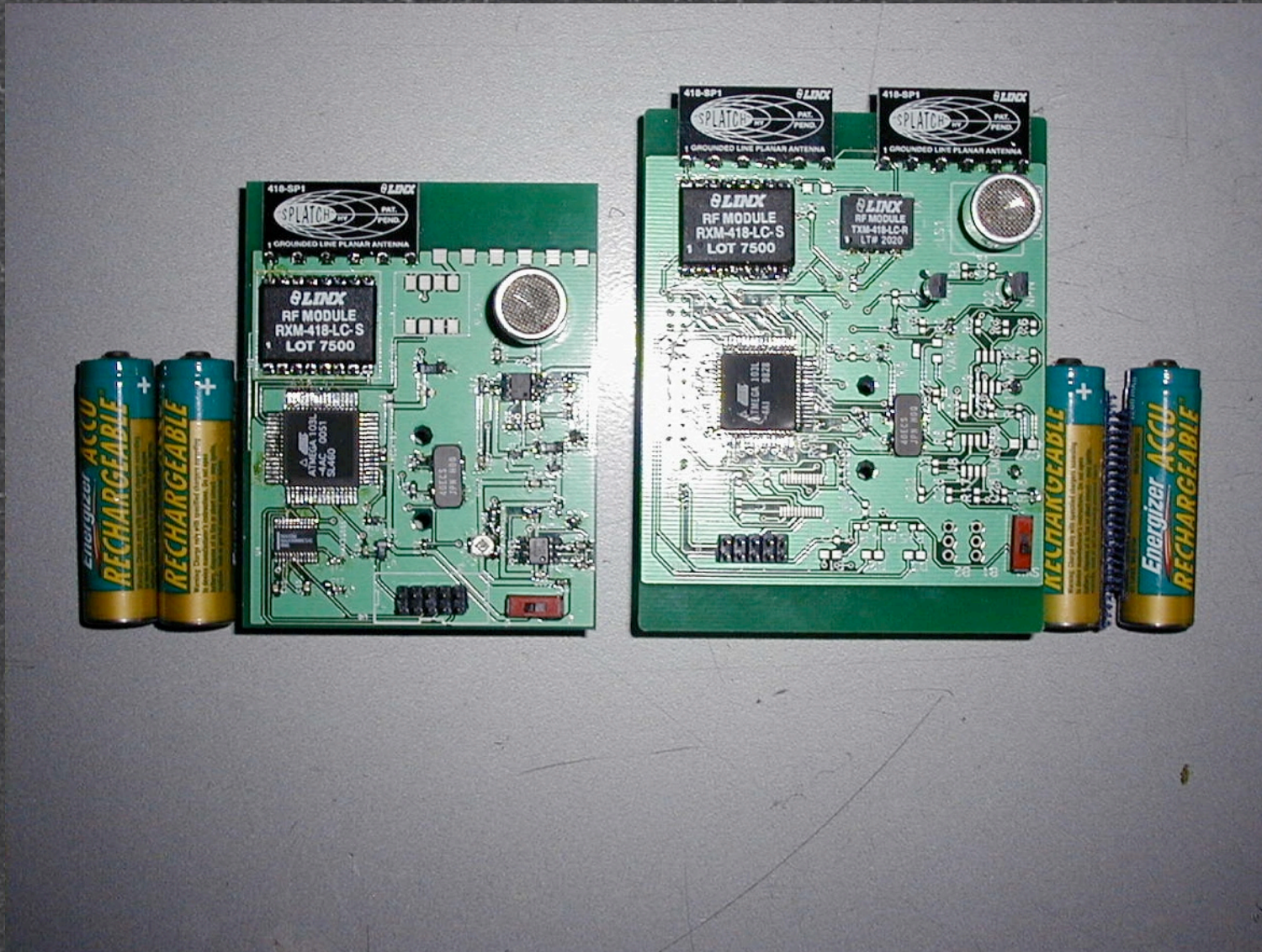


# Examples

- Cricket
  - Object based ultrasonic localization
  - radio frequency control signal
  - triangulation base on time-of-flight
  - private, decentralized scalability
  - local computation -> power drain



# Examples





- ETH Zurich
  - Smart-ITs
- Lancaster University
  - Guide System



# Ways of Thinking about UBICOMP

- MSR
  - Radar
  - EasyLiving
- Intel Research
  - PlaceLab



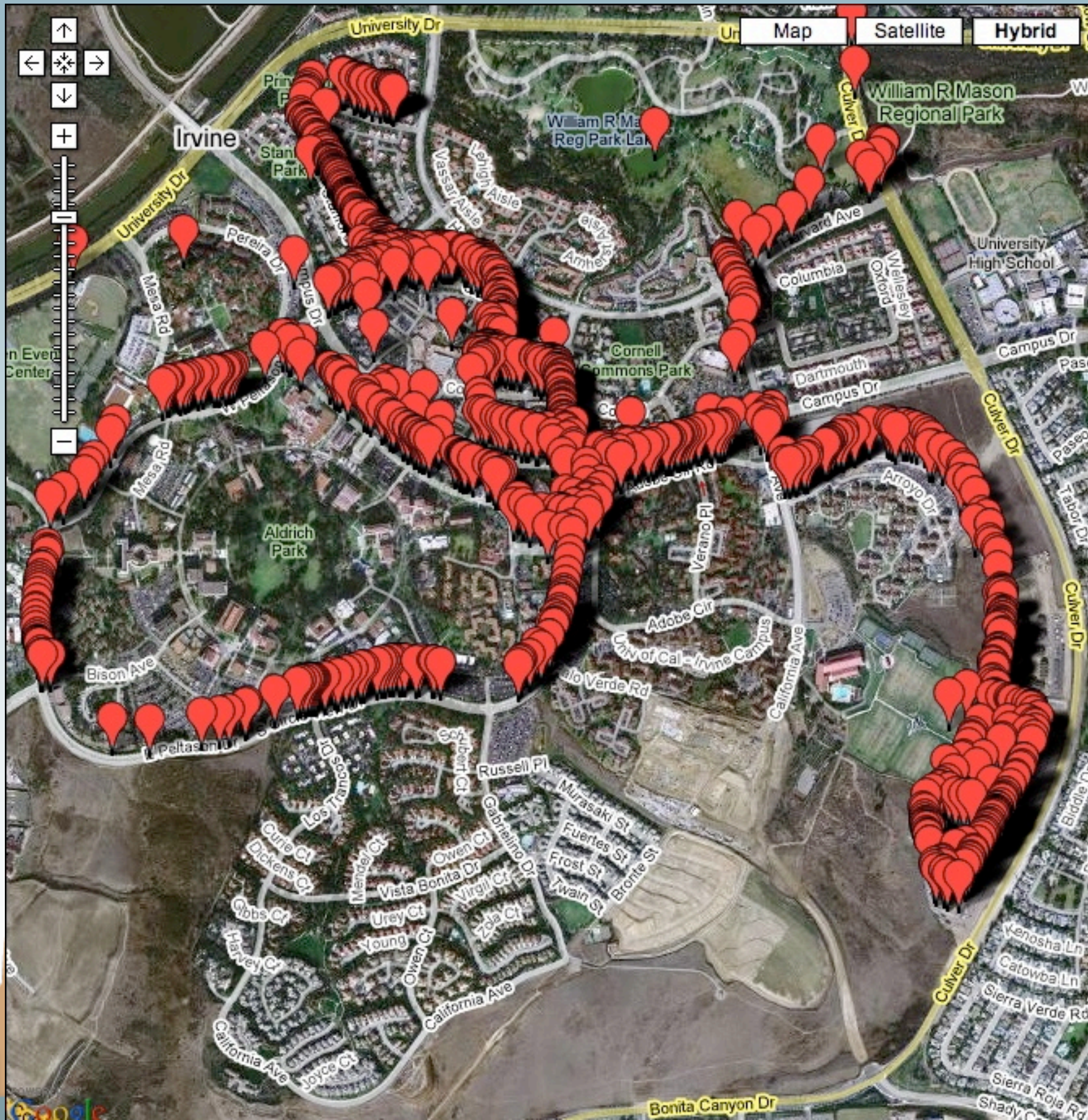


# Examples

## • RADAR

- building-wide tracking system
- 2-D Wifi based localization
- “scene analysis” through fingerprinting
- local computation -> power drain

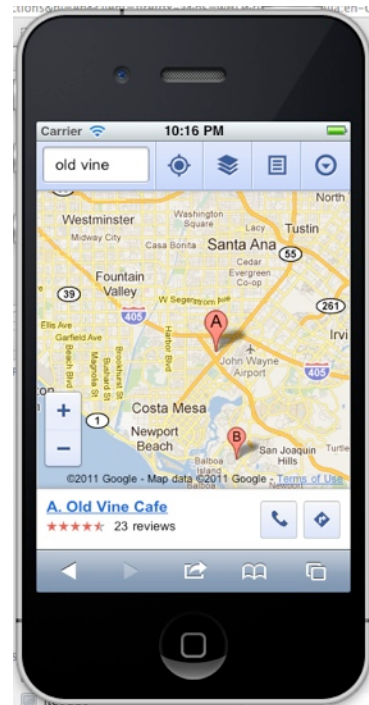




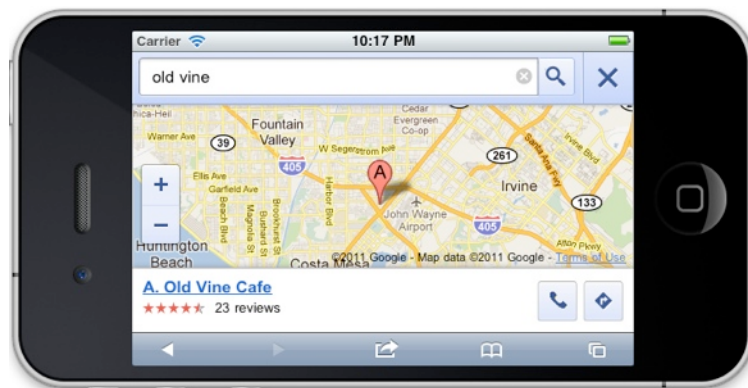


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Ubicomp — Augmented Reality — Virtual Reality



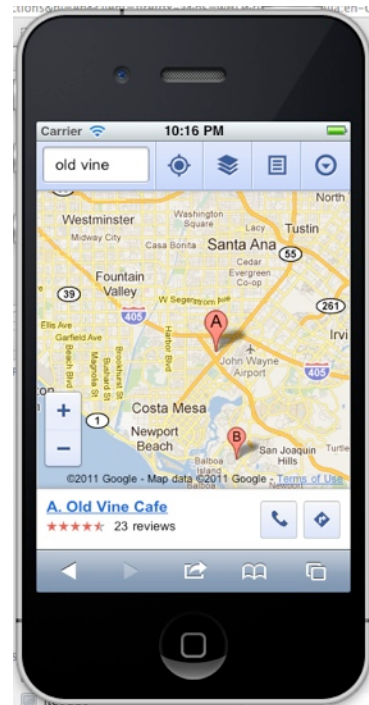
Virtual Worlds  
Mirror Worlds



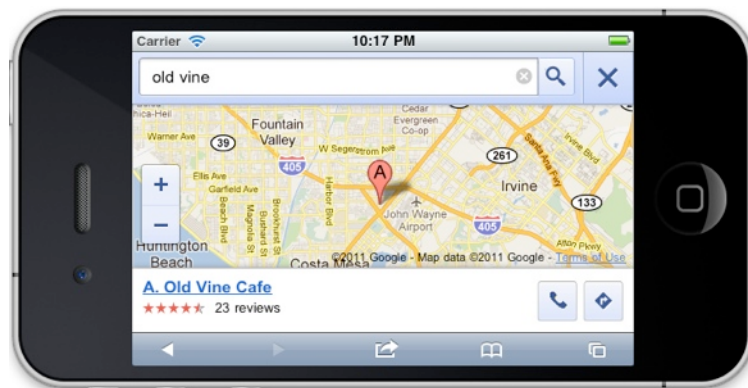


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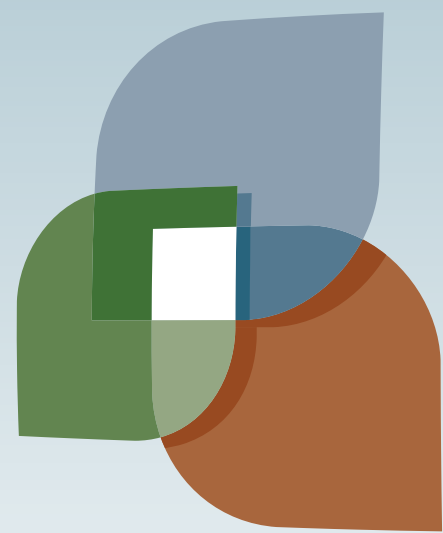
Virtual Worlds  
Mirror Worlds



ar photo, vr photo, green photo

# Ubicomp is about people's relationship to computers

- virtual reality
  - humans enter the computers world
- ubiquitous computing
  - computers enter the human's world



L U C I

