Chapter 1: Introduction (2)

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Research Challenges

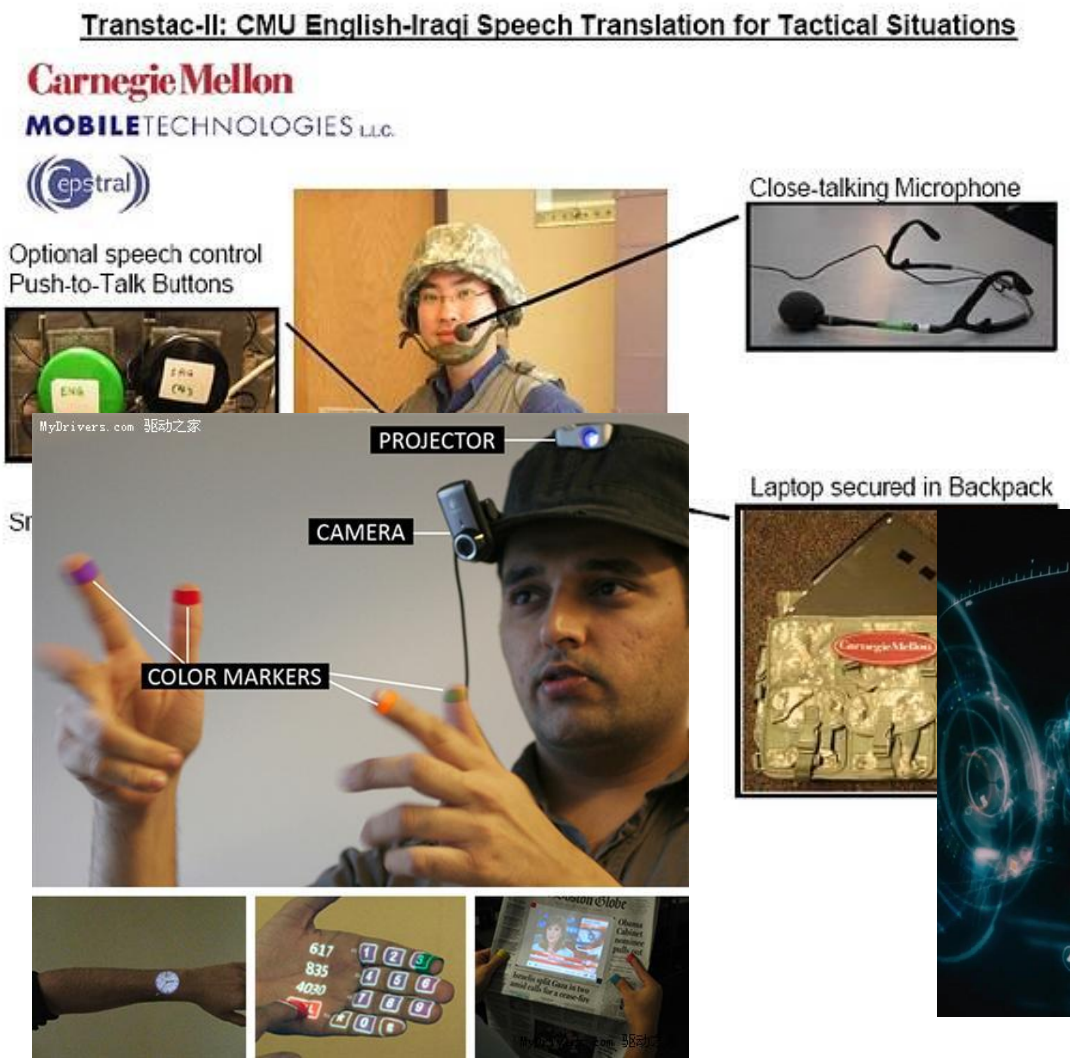
- Hardware
- Network
- HCI (Human-Computer Interaction)
- System software
  - Context/Context-awareness
  - Middleware
- Applications
  - Smart space
  - Healthcare

Hardware

- Embedded devices
- Portable devices (便携式设备)
- Mobile devices
- Wearable devices
- Planted devices
- Smart objects

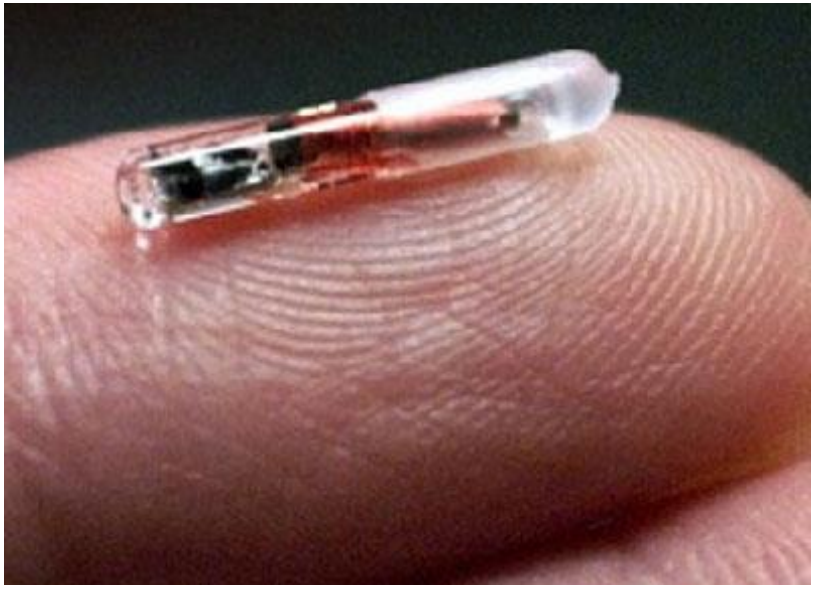
Mobile devices @ Apple

Wearable devices



http://www.ted.com/talks/pranav_mistry_the_thrilling_potential_of_sixthsense_technology?language=zh-cn#t-68907

Planted devices



Pervasive/smart objects

Smart Table

智能餐桌

唇膏地图？袖珍投影地图


泡泡网

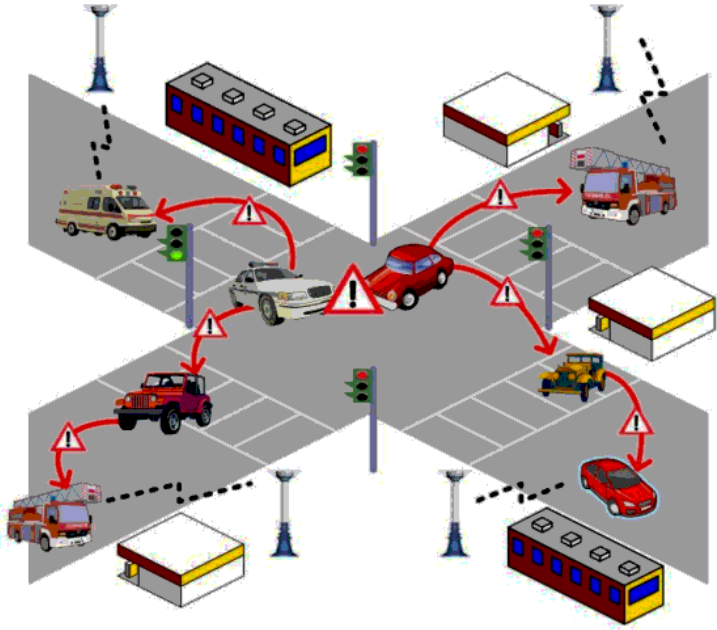

泡泡网 PCPOP.COM
Using small projector technology, it has been made to conveniently project map on desired locations (for example, on the palm of hands, wall or floor) when traveling. Also, since MAPTOR is installed with GPS it makes finding directions easy by indicating the current location on the projected map.
MAPTOR
Map + Projector
MAPTOR has great mobility since it is small enough to be worn on necks. It can ZOOM IN/OUT as well as EXPAND/REDUCE the map size through its simple button operation.
MAPTOR is an innovative product that provides conveniences to users by eliminating the inconveniences of paper map. Based on the current trend of growing number of travelers, the product is expected to create a big new market.
泡泡网 PCPOP.COM

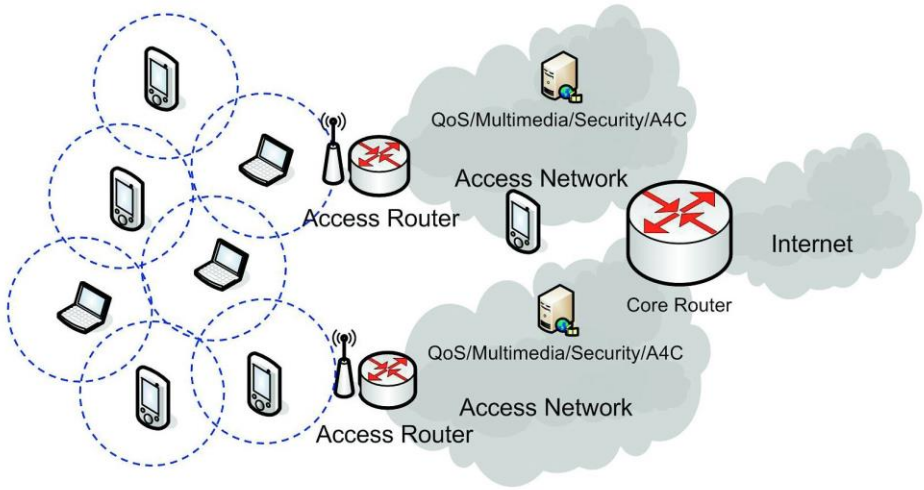
唇膏地图？袖珍投影地图

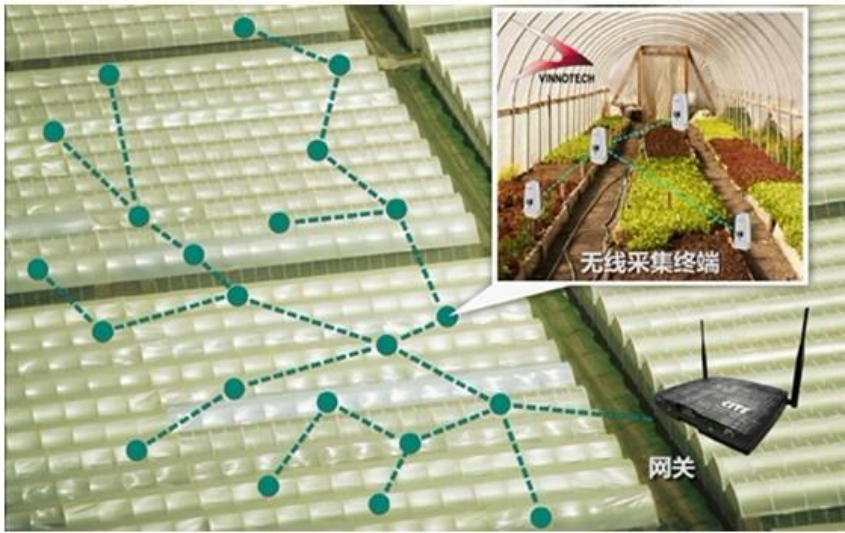

Structure & Material
Biodegradable plastic PLA(Polylactic acid) :
Biodegradable plastics have the same physical properties with general plastics, but they are decomposed by the microorganisms (bacteria, molds and algae) existing in the nature producing water, carbon dioxide and others. Generally biodegradable plastics are derived from starch or aliphatic polyester.
they have similar properties to those of existing plastics and have price competitiveness against petrochemical products.
MAPTOR does not pollute the environment as it is made from environmentally friendly biodegradable plastic PLA (Polylactic acid).
Part for the string to hang on necks / Open this part to insert batteries.
Touchpad Button
to Operate and Control MAPTOR
Head Generation Hole :
a hole to discharge the heat being generated from the projector module when projecting map
On/Off switch
Projector lens
GPS :
it is installed with GPS to indicate the current location on the map.
FRONT
BACK
Bluetooth:
when downloading map, it can be downloaded through Bluetooth without any cable.
ON

2. Network

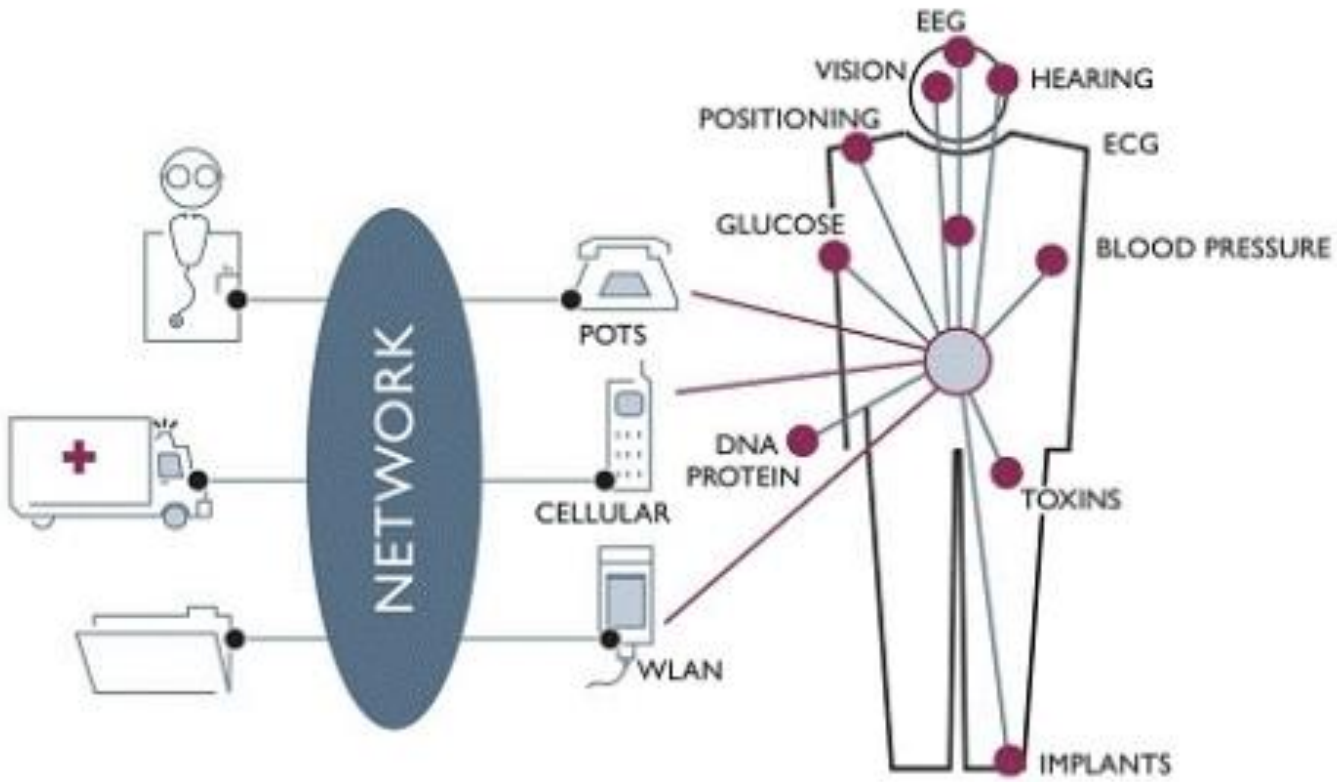
- Wireless network
- Mobile network
- Bluetooth network
- Personal area network (PAN)
- Body area network (BAN)
- Ad hoc network
- Sensor network
- Hybrid network





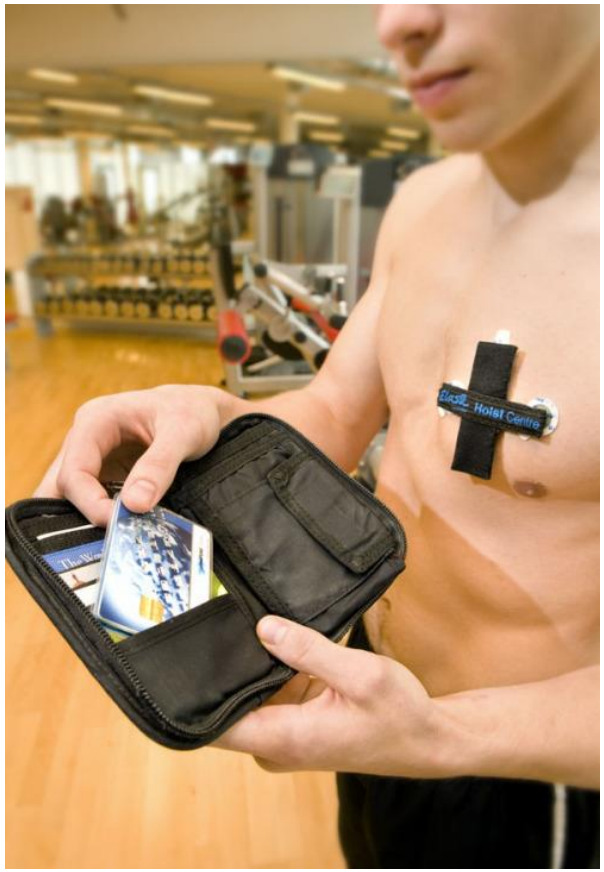


Body Area Network



The technology vision for the year 2020: people will be carrying their personal body-area network and be connected with service providers regarding medical, sports and entertainment functions.

Body Area Network

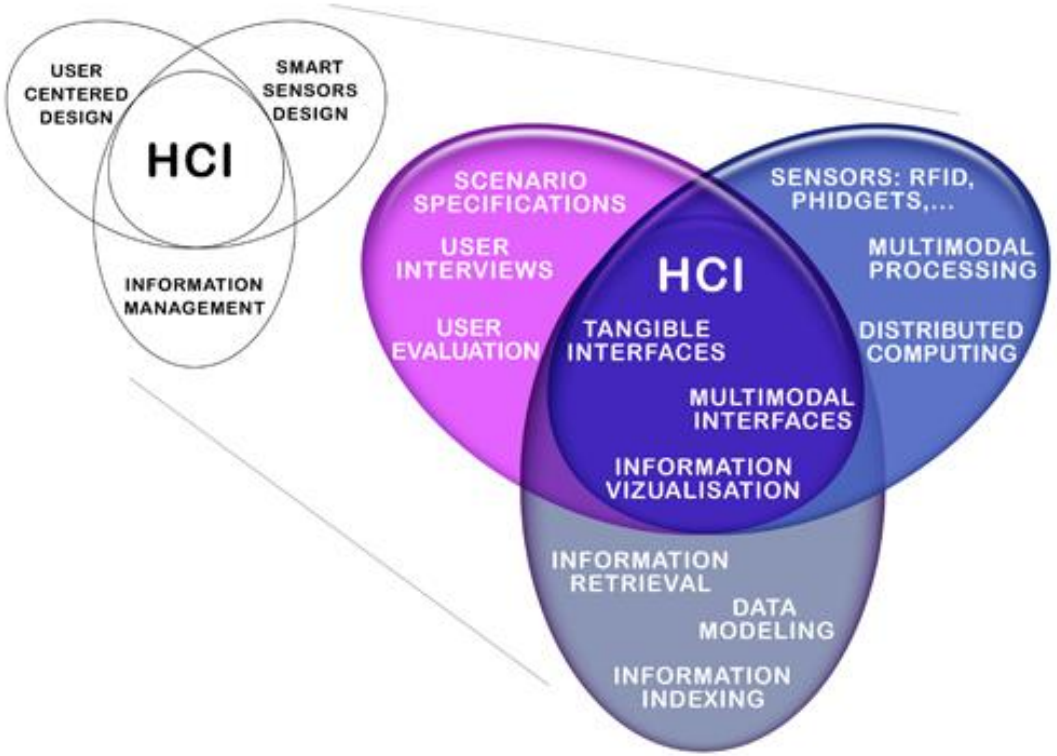


Wireless, flexible and stretchable ECG (心电图仪) patch for comfortable heart monitoring.
http://www.imec.be/ScientificReport/SR2007/html/1384156.html

3. HCI

- Multimodal HCI: 多通道
  - Visual (GUI)
  - Voice
  - Gesture
  - Touch
- Context aware HCI
  - Personalized HCI
- Tangible user interface

  A **tangible user interface (TUI)** is a user interface in which a person interacts with digital information through the physical environment.



Tangible interface

4. System software

- **Adaptation**
  - Adapt up to human
    - Adapt to user preference, user model
    - Personalized system
  - Adapt down to hardware and lower systems
    - Adapt to heterogeneous hardware, network, protocol
- **Architecture**
  - Component-based arch.
  - Agent-based arch.
  - Service-based arch.(SOA)

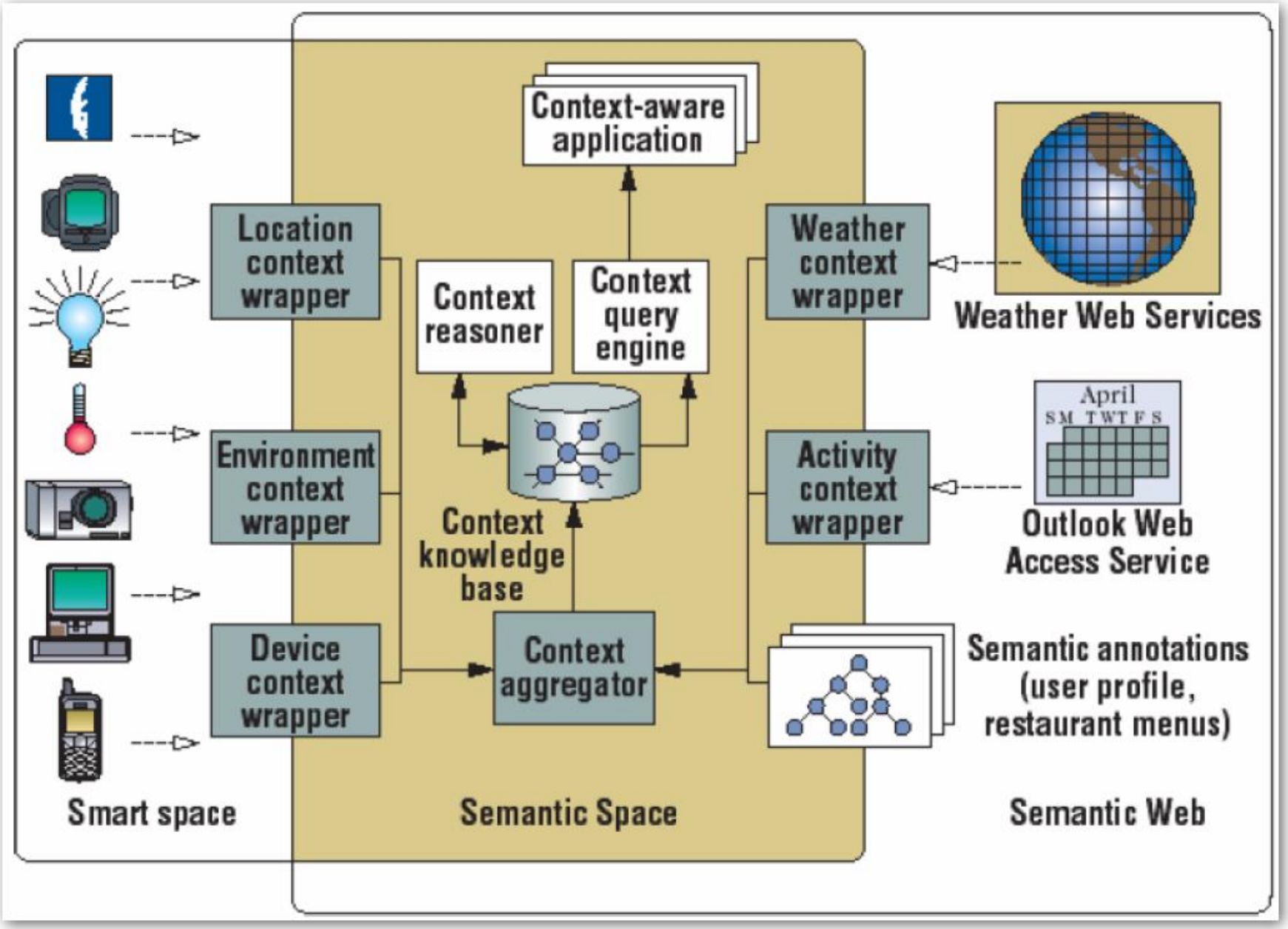
Context/Context-awareness

- Context Capture
- Context Representation
  - Key-value, object-oriented, logic-based, relation, ontology
  - Extendable, hierarchy, multi-modal, heterogeneous devices
- Context Fusion
- Context Inference/learning
- Context Query
- Context Delivery
- Context Storage

- User-awareness/Personalization, location-based service (LBS)

Middleware

- Device management
- Communication management
- Context management
- Application management


Context-aware application
Location context wrapper
Context reasoner
Context query engine
Weather context wrapper
Weather Web Services
Environment context wrapper
Context knowledge base
Activity context wrapper
April
SM TWT F S
Outlook Web Access Service
Device context wrapper
Context aggregator
Semantic annotations (user profile, restaurant menus)
Smart space
Semantic Space
Semantic Web

6. Applications

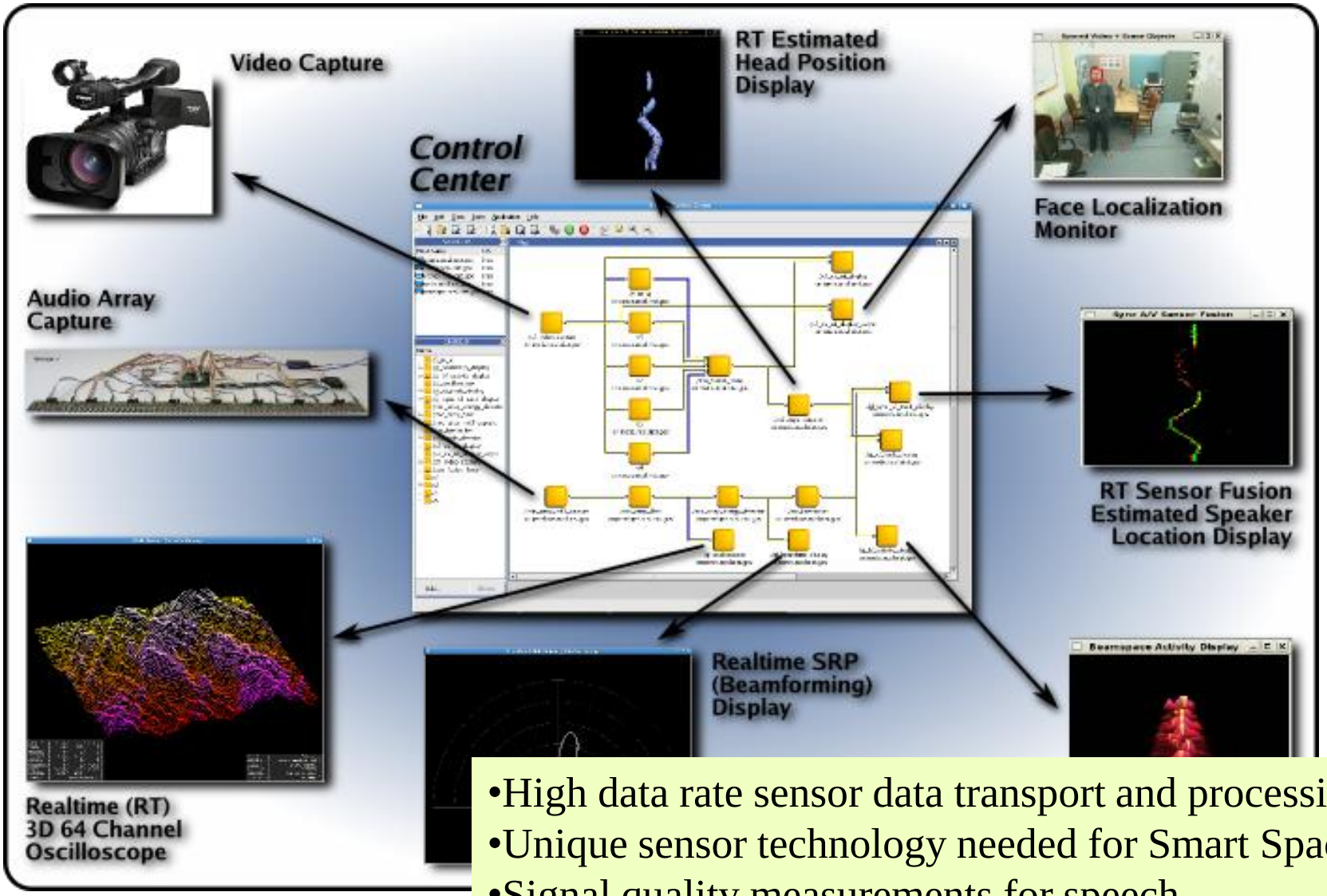
- **Smart Space**
- **Healthcare**
- **Environment monitoring**
- **Military**
- **……**
- **E-Learning**
- **ITS**
- **Sport**
- **Museum**

Smart space

- Networking
- Smart objects
- Localization
- Human behavior understanding
- Human identification
- Interaction analysis
- Speech recognition and natural language processing

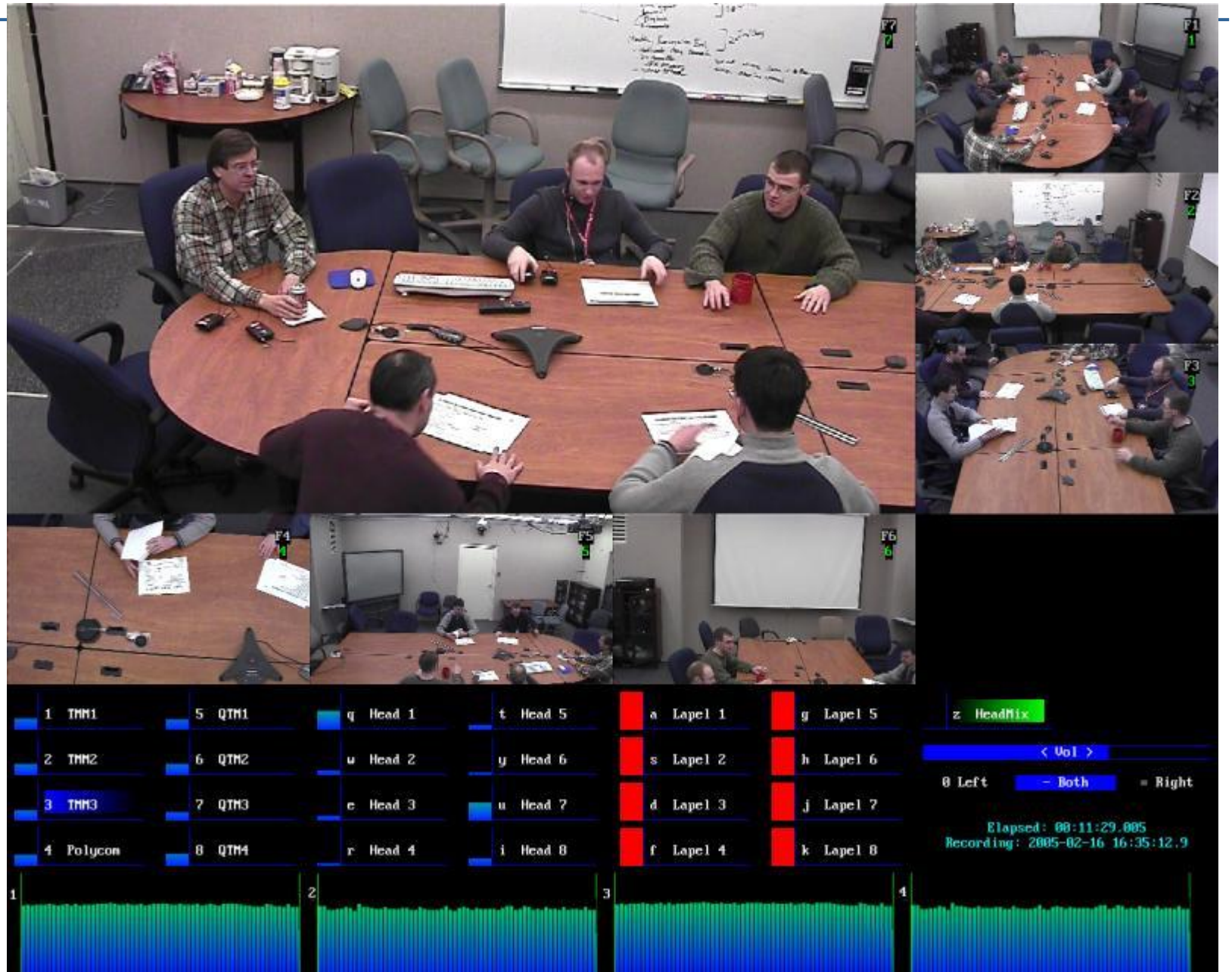
NIST SmartSpace Project

http://www.nist.gov/smartspace/



- High data rate sensor data transport and processing;
- Unique sensor technology needed for Smart Spaces;
- Signal quality measurements for speech

NIST SmartSpace Project



The Aware Home @ Georgia Tech

Figure 4: Memory Mirror

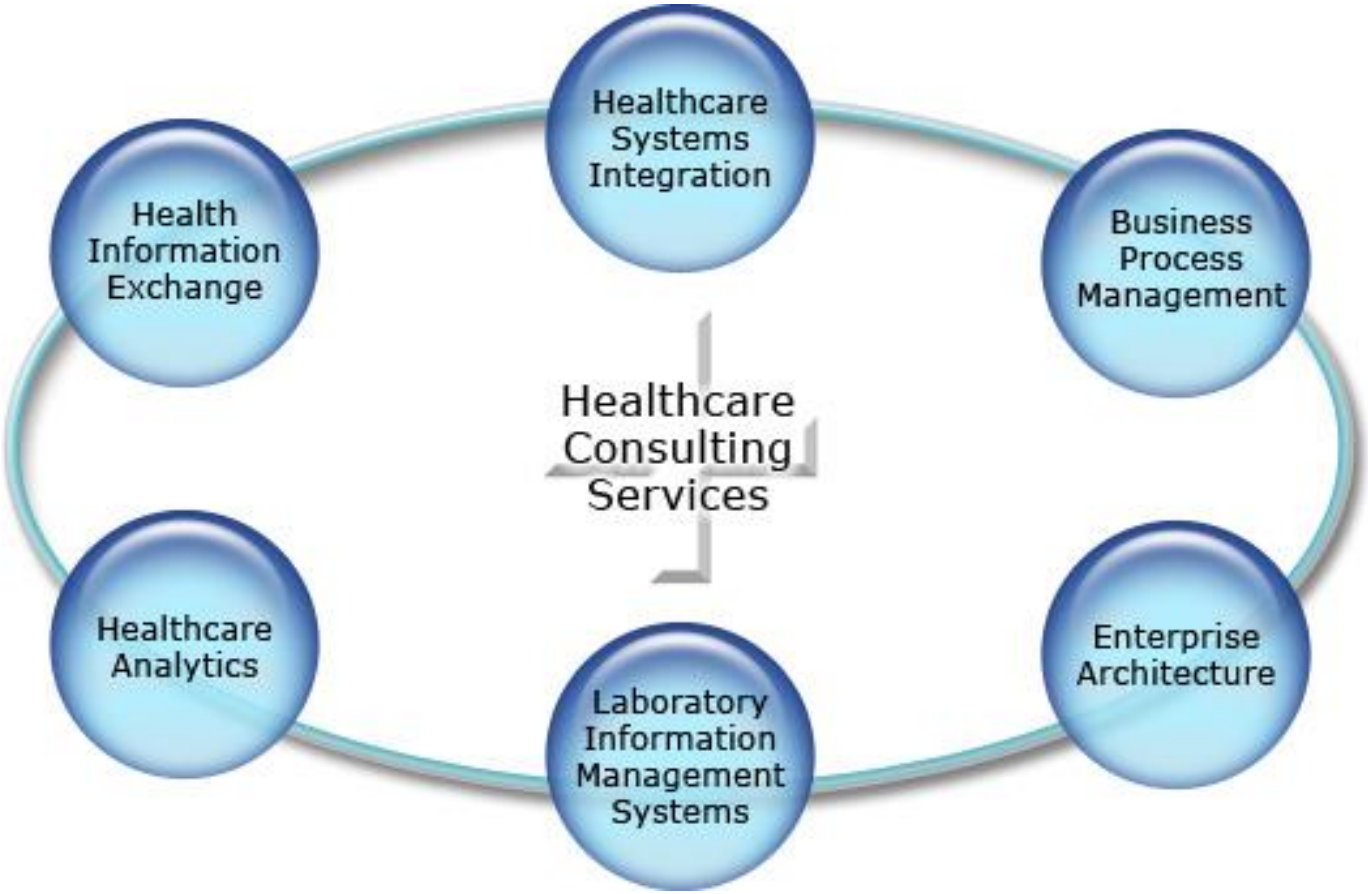
(a)

(b)

(c)

Figure 3: *The RF ID room location system in the Aware Home. (a) The RF ID antenna are hidden under doormats, as shown, or under carpets within the home. (b) A view of the hand-crafted RF ID antenna. (c) A floorplan indicating positioning of antenna/mats throughout one floor of the Aware Home*

Healthcare

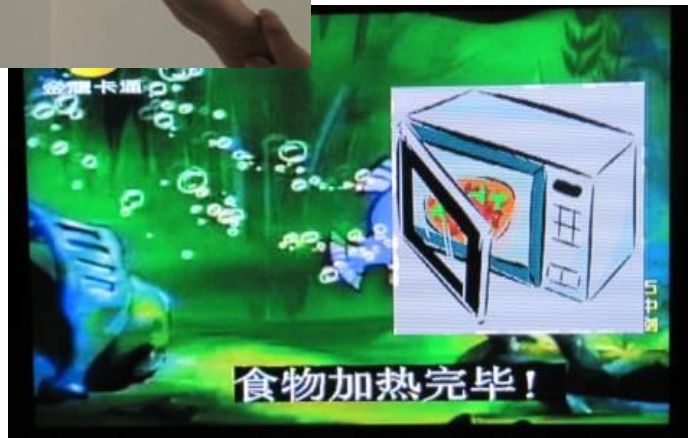

Healthcare Systems Integration
Health Information Exchange
Business Process Management
Healthcare Consulting Services
Healthcare Analytics
Enterprise Architecture
Laboratory Information Management Systems

Your vital signs, on camera @ MIT 2010.10.4

MIT Media Lab student Daniel McDuff, who collaborated on the pulse-monitoring system, demonstrates a version of the device built into a mirror that displays his pulse rate in real-time at the bottom.

Healthcare@NWPU

Healthcare@NWPU



End of Chapter 1

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