Smart Wearable Devices

Presented by
Kate Grant
Nine Tiles
What are Smart Wearable Devices?

• The IoT has the potential to connect billions and billions of “things” to the Internet by 2020, ranging from bracelets to cars.
• Breakthroughs in the cost of sensors, processing power and bandwidth to connect devices are enabling ubiquitous connections already.
• In 2014 Goldman Sachs highlighted five key verticals of adoption: Connected Wearable Devices, Connected Cars, Connected Homes, Connected Cities, and the Industrial Internet.
• Early simple wearable products like fitness trackers and activity monitors are already gaining traction. More than 300 such devices were on the market at the end of 2015, 40% are fitness trackers, 40% lifestyle/computing, 10% healthcare adoption.
• New Smart Wearable Devices being launched everyday.
Conventional devices and Wearable Smart devices
Definitions in IEC SG10
(SMB Strategic Group on Smart Wearable Devices)

• **Wearable Smart Devices:**
  • electronic devices and components intended to be located near, on or in an organism that have intelligent functionality and/or may be a part of an intelligent system via connectivity

• **Near-body electronics**
  • electronic devices and components intended to be located near an organism where it does not contact the external surface of the organism directly

• **On-body electronics**
  • electronic devices and components intended to be located on an organism where it contacts the external surface of the organism directly

• **In-body electronics**
  • electronic devices and components intended to be located internal to an organism

• **Electronic Textiles**
  • fabrics or textile-based electronic devices and components
Terminology in Exploration on MIoTW in on ISO/IEC JTC 1 SC29 WG11 MPEG Wearables

- **Wearer**: any living organism that is sensed by a Wearable.
- **Wearable**: any thing that senses the Wearer; it may have control, communication, storage and actuation capabilities, and sense the Wearer environment.
- **Mwearable**: a Wearable having at least one of media communication or storage capabilities.
- **User**: any living organism, physical object or software interacting with and/or acted by a Wearable; it may also interact with the Processing unit through devices and interfaces out of the scope of MPEG Wearable. In some applications, the Wearer is also the User.
- **Processing Unit**: a unit or a set of units, some of which can reside in a local client and/or in a remote server that intelligently processes the information received from and provides the results to the Wearable and/or the Wearer.
Conceptual Model for Wearable MPEG
On-body electronics: A searching system for people with cognitive impairment

Aim: To find patients in early stage with secure data management system
1. Secure personal information system
2. Registration of patient and quick information delivery of lost patient
3. GPS and oscillator worn by patient
   – GPS in shoes because lost patient at least wears shoes

- GPS, Oscillator
- GPS information
- Data management
- Wear
- Information
- Data input
- People with cognitive impairment
- Family or Care manager
- Welfare division
- Volunteers
On-body electronics: Wearable Position and Sensing Example Healthcare Device: Silmee™ Bar type - Sleep state analysis application

Pulse wave sensor, temperature sensor and 3 dimensional accelerator inside package

Bluetooth connection to tablet display

ECG (Electrocardiogram) electrodes

https://www.toshiba.co.jp/about/press/2014_07/pr_j0902.htm
On-body electronics: Smart Glasses and their input devices
In-body electronics: Return of missing cat – the one and only Leo Grant
Human body communication (HBC) is a technique for transmitting signals between apparatus connected to a human body by using the human body having conductivity as a communication channel.

JTC1 SC6 has a NWIP on HBC to support 6 Mbps data transfer rate using Frequency Selective Digital Transmission (FSDT) over galvanic coupling in 8~16MHz frequency band for transmission of images from inside the body.
Convergence of apparel and electronics value chains --- Smart Clothes

Fabric manufacturer -> Manufacturer -> Retail

Typical Users
- Sportsmen
- Cyclists, Runners etc
- Caregivers
- First Responders
- Military

Electronic ink

Electronic ink printer

Gartner (Nov 2014) – “smart clothing
Tractica (March 2015) – worldwide revenue from smart clothing will exceed $600 million by 2020

Clothes will outsell phones
Smart Clothes can monitor body functions eg:
- Heart Rate
- Breathing Rate
- Muscle Fatigue
- Movement and Form
- Sweat

Pictures © 2016 Dupont, Dr M Burrows presentation to Raleigh Wearables Workshop March 2016
Wearable applications in clothing

Sports and Fitness
(institutional sports, individual sports, active lifecycle)
- Bio Feedback
- Performance Tracking
- Performance Enhancement
- Coaching and Development
- Injury Prevention, Detection and Recovery

First Responders, Medical and Military
- Preventative; Early Detection
- Rehabilitation; Self Monitoring
- FR/EMT; Safety and Prevention
- Military; Safety, Performance, Communication

Lifestyle
- Personal Enhancement
- Hands Free Multi Tasking
- Alternative Safe Commuting
- Entertainment; Music, Film and Gaming Industry
- Travel/Hospitality
- Education and Child Development

Photos from Ortiz Industry’s presentation to Raleigh Wearables Workshop March 2016
E-wearables – textiles – see Raleigh workshop proceedings

• Worldwide market for smart fabrics - $2.25b with an annual growth rate of 18%

• US market for smart fabrics - $1.016b with annual growth rate of 27%

• Market Segmentation
  • 27% for Transportation
  • 21% for Military
  • 20% for Industrial Commercial Uses
  • 17% for Sports and Fitness

• Electronics in clothing has great potential and various major companies are exploring the field eg Levi, Nike, Ultimo, Underarmor, Adidas etc