E-health applications based on Wearable 3D body motion tracking

MEPTEC 2013
Content

- Consumer electronics trends and markets
- Body motion technology maturing for CE market
- E-health professional applications
Smartphone adoption rate fast:
- 8 yrs to 10% and 3 yrs to 40% penetration
- Tablets penetrate even faster!
- 1 B smartphones in H2 2012
- 10 B mobiles in 2016 for 7,3 B people

Those who moved quickly and competently to embrace the consumerization of the smartphone market are today's market leaders.

Smartphones & tablets combined with wearable body accessories will revolutionize E-health
1st generation wearable sensors rapidly growing

Exploding health care costs and ageing population requires technology health solutions

- Conscious & always connected young generation desires to create, play and share their own sport movements, movies and games resulting in new markets

- Next Gen wearable sensor accessories using smartphone and tablet as platform will enable home care, rapidly and revolutionize E-health
• Estimated Market size 2023
  • 700 mio body motion “suits”
  • 3.500 mio combo sensors

• Assumptions:
  • Average 5 combo sensors (acc, gyro, mag) per body motion
  • Adoption rate similar to smartphone adoption rate at 40 %
    adoption in 10 years in USA.
  • Total global mobile phone market in 2012: 1750 mio units
    market of which > 350 mio smartphones in 2012.
  • Smartphone market share increases versus feature phone.
Xsens: 3D motion tracking innovation

Sensor Fusion Software

- gyro
- accel
- mag
- baro
- UWB RF
- GNSS
- Product supply
- IP Licensing
• Consumer electronics
  • Adoption rates, trends and markets

• Body motion technology maturing for CE market
  • Critical product requirements, status and innovative components

• E-health professional applications
  • Today’s market: Clinical example
  • Today’s market: Physiotherapist example
  • Tomorrow’s market: Physiotherapist consumer example
Critical product requirements

• Critical requirements
  • Low power consumption sensors and processors.
  • Standard radio technologies: low power data transmission (BLE).
  • Low-cost
  • High performance
  • Developers: easy to use, sophisticated APIs for wearable sensors to enable 3D body motion tracking.
Convergence of technology & Maturing of key spec’s

- Power consumption: >8 hours
- Rendering @ mobile dev
- Wireless & Real-time
- Easy to use
- Highly accurate
- Capture jumps, running
• Consumer electronics
  • Adoption rates, trends and markets

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Today’s professional market

Example: upper and lower limb gait analysis

- Today’s limitations:
  - optoelectronics technologies confined to fixed space
  - clinical motion analysis in every day environment not possible

Solution:

- Wearable 3D body motion gait analysis

Market:

- Applications include upper limb impairment, spasticity, gait analysis
- Immediate opportunity is the professional market: (orthopedic, hospitals, pharma) > 100,000
- Future opportunity is usage by individual clients
Example: tools for back pain

- Back pain experienced by > 500,000,000 individuals
- Currently initial tools for > 500,000 physiotherapist
Tomorrow’s consumer market
Use case: back pain treatment

- Application: back-pain treatment
  - Professional -> Physiotherapist supported market: > 500,000 physiotherapist in USA/EU
  - Consumer -> Market size 500,000,000 for e-health @ home
IMMS improves spasticity assessment in children with cerebral palsy

Wireless measurement of scapular dyskinesis with IMMS

Sensor positions and simplified skeletal model

Advanced Diagnosis and Assessment of Tremor
Accelerometry-based prediction of Center of Pressure and Center of Mass during motor tasks

A novel wearable measurement system for ambulatory assessment of joint loading in the occupational setting

Interactive Sonification of Human Movements for Stroke Rehabilitation
Wearable Sensors

Future Applications for 3D body motion
Wearable Sensors
Future Applications for 3D body motion
Thank you
Xsens Quick facts:

- Offices in Enschede, The Netherlands, & Los Angeles,
- 60+ employees
- 8 figure sales and profitable
- Founded in 2000
• Applications: Health and fitness
  • Biomechanics, sports science, rehab, ergonomics

• Single trackers to full-body motion measurement
• 500+ universities worldwide
Xsens: Product supply

Applications: Character animation
- Visual effects, previsualization
- Film, commercials, video games
- Live entertainment
- Training, simulation

- Full-body inertial motion capture
- 500+ studios worldwide
• Application: Stabilization and control
  • Antenna, platform and camera systems
  • Underwater, ground and aerial vehicles
  • Robotics, handheld devices and more

• 30,000+ units delivered since 2000
  • 20,000+ from mid 2010 onwards
• Industrial grade MEMS based Attitude Heading Reference Systems