User interface & acceptance

Mathias Funk (CO), Loe Feijs, Wei Chen
Department of Industrial Design, Eindhoven University of Technology

User interfaces

Mathias Funk, Department of Industrial Design, Eindhoven University of Technology, for CATRENE workshop "Smart System for Healthcare and Wellness" in Brussels on Feb 4, 2014

New interface paradigms and modalities

- Combinations of modalities

- Multi-modal interaction (e.g. speech with gestures)

- New technologies: Leap motion or Google Glass

Human cognition is limited!

- Interaction via the layer or the modality that feels most natural in the moment

- Needs robust interaction, dealing better with ambiguous multi-layered input

- Expertise in different dialects of interaction expected in the future

- Bio signals can help mediate and facilitate more natural interaction, e.g. by recognizing the current state of the user

- Expert interfaces can already now make more and more use of multi-modality

Simulation and Games

- The human body becomes more and more part of games

- Games become more casual and embedded in everyday life

- Self-tracking becomes playful - unconscious or not

- Sensors capture very realistic image of reality

- Games or simulations blur the boundary between reality and simulated world
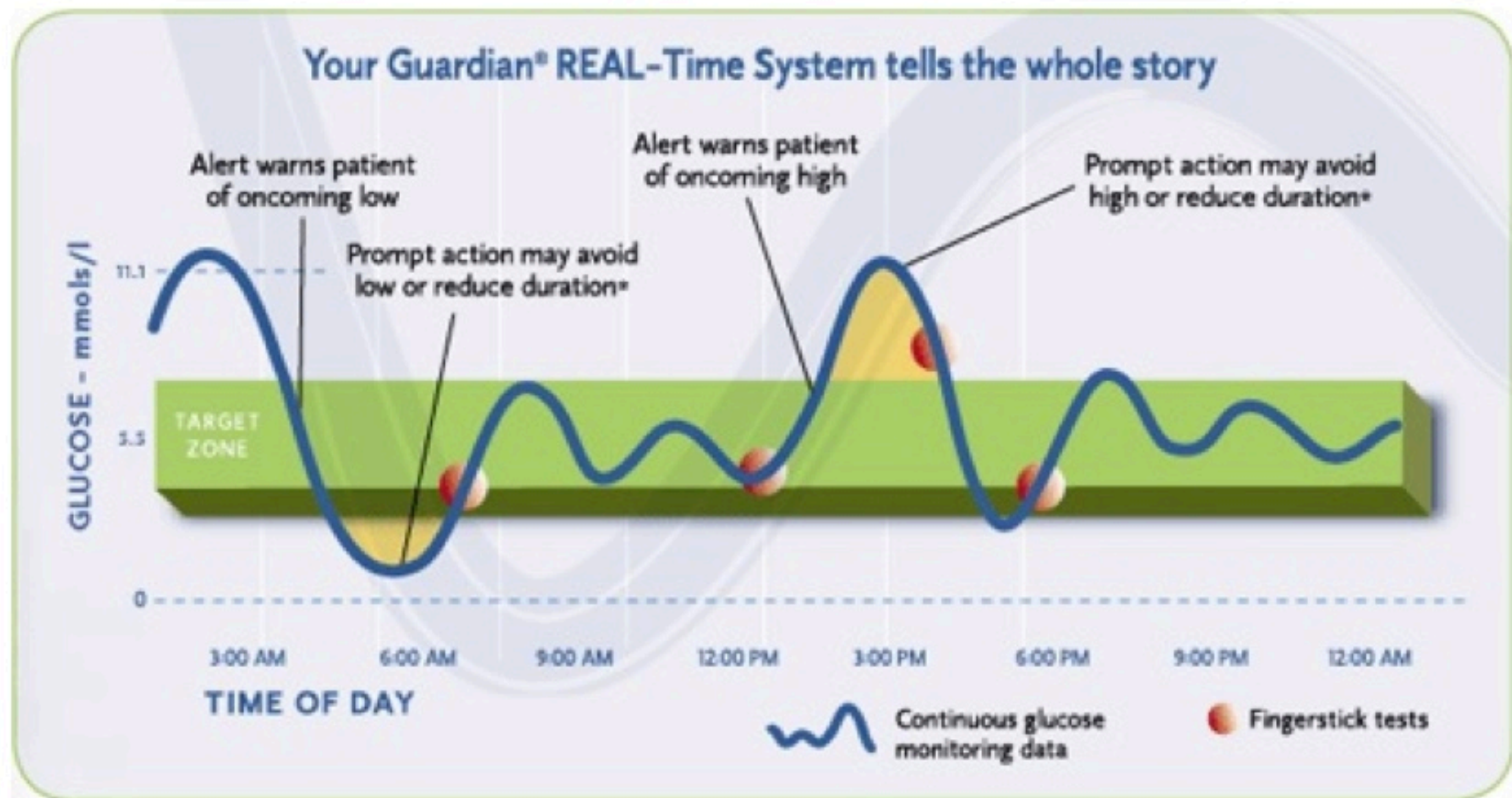
Lifestyle and wearables

- Self-tracking becomes lifestyle

- Sensor data can be visualized via the clothing and other wearables

- Visualization may also blend art and design

- Privacy issues might be emphasized

Connectivity and Remote Action

- User interfaces prompt human intervention when needed

Connectivity and Remote Action

- 100ms response time is perceived as "instant" response

- Network connectivity can be bad at times: needs to be handled when interfacing with the user

- Fast and critical interventions are not possible without connectivity!

- Now mostly dedicated devices, smart phones can function as hubs in the future, phone manufacturers are preparing for that already

We have been looking at end-users so far...

Professional Stakeholders

- Expertise to diagnose, to detect patterns, and to interpret the data

- Can deal with more data, with more details and with more complex mappings

- Sometimes understand the algorithms that lead to the representation of data

- Different context of use, remote interaction with the user and/via their data

- Dedicated interfaces or even devices for accessing and manipulating data

Existing Developments (example)

wearable unobtrusive continuous monitoring system realized by body sensor networks (BSN) and wireless communication

Existing developments (example)

feedback system for body worn wireless sensors for wireless emotion monitoring, photo frame UI fits the working environment

User acceptance

User Diversity

- End-users

  - generate data, consume an *executive summary* of their data

  - End-users are diverse, e.g. quantified self / teenager / elderly

  - Different reasons to accept: possibilities and fascination / lifestyle benefits / safety and convenience, respectively

  - Privacy - *and often irrational decision making*

User Diversity

- Professional users – Healthcare professionals

    - distant close observer role ("drone operator of healthcare")

    - new possibilities as business reality ("normal")

    - rational decision making: striving for better care

    - uncanny valley: feeling more and more disconnected from the people, alienation
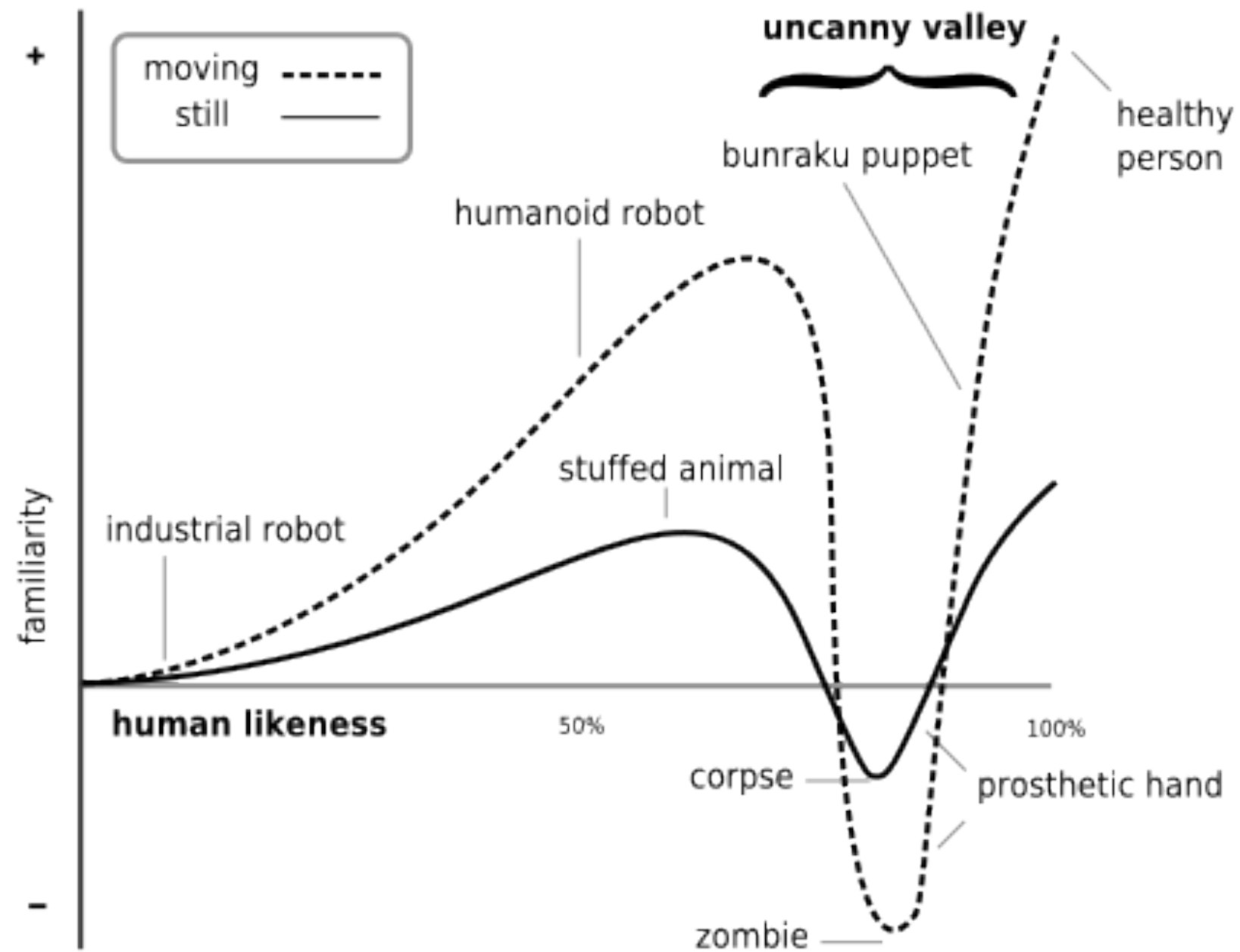
User Diversity

- Professional users – Organizations

  - better understanding of the end-user, deeper insights: opportunities

    - better, closer, more tailored services

    - connecting metrics to billing and payments

    - predictability and controlling

  - more rational decision making

Accuracy and Measurability

- A user's experienced reality will be more dominated by systems and networked intelligence – perceivable or not

- Users expect and require more and more aspects of reality measured and quantized – and the data readily available for comparison, competition and (self-) improvement

Accuracy and Measurability

- Trust

  - Reference and normative components (what is considered high or low)

  - Understanding of probabilities, mappings

- Accessibility of metrics

  - How accurate does information have to be? (granularity and presentation)

  - What is the affordance of raw numbers? ("parseability" and meaning)

Privacy and Big Data

Aggregation is happening at a large scale, with benefits

vs.

Health and Wellbeing is personal and contextually rich

- Privacy breaches can be disastrous

    - Scenario: patient data leaked to employer, patient fired

- User-centered privacy:

1. should someone know certain information

2. if ok, how to make sure they know the *right* information

Privacy and Big Data

- Large-scale databases of human health conditions

  - Storing is cheap, removal is more costly (efforts, control, ...)

  - Contextual information is captured as a side-effect

  - (Future) data joins are unpredictable

- Interpretation of such data

  - Algorithms are usually not open, how can users accept their results?

  - Automated decision making is even more difficult to accept then

Connectivity and Real-Time Data

- Connectivity is not yet very good (esp. outside urban areas), but will be better in the future, features need connectivity to be acceptable for users

- Response time is an issue for this domain, bandwidth not so much

  - life-critical: "stroke pattern detected, consult expert advice immediately"

  - casual: "you have run for 23mins and burned 340kcal, have an ice-cream now"

- Relevance and meaning strongly relate to timeliness!

Conclusions

- Healthcare and Wellness is just another application area, but with special requirements

- New technology available later than mass market to conservative domain of Healthcare/Wellness

- *Decelerated* timeline allows for better decisions:

  - What is really necessary?

  - How can risks be mitigated?

  - How can migration to new technology happen?

Images and photos in this slide set from:

__ http://www.cinemablography.org/minority-report.html
__ http://www.techspot.com/review/702-leap-motion/
__ http://www.themobilityresource.com/wearable-technology-and-how-it-affects-people-with-disabilities/
__ http://www.medtronic-diabetes-me.com/Guardian-REAL-Time.html
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___ Sibrecht Bouwstra, Wei Chen, Loe Feijs, Sidarto Bambang Oetomo, "Smart jacket design for neonatal monitoring with wearable sensors", in Proceedings of Body Sensor Networks (BSN),
2009, Berkeley, USA, pp. 162 - 167.

___ Kimmy Ansems, Wei Chen, Lindsay Brown, "Smart Photo Frame for Arousal Feedback - Wearable sensors and intelligent healthy work environment", in proceedings of workshop on Smart Offices and Other Workplaces of the 7th International Conference on Intelligent Environments - IE'11, Nottingham, United Kingdom, July 2011, pp. 685-696.