Pannel on Information and Signal Processing

Theme: Trends on Body Networks

Topic: Cognitive and Human-friendly Devices

Moderator : Pr. Wilfried Uhring – University of Strasbourg and CNRS, France

Pannel List :

Viktor Sydoruk, IBG-2: Plant Sciences, Forschungszentrum Jülich GmbH, Germany

Michal Placek, Wroclaw University of Science and Technology, Poland

Peter Edge, Ara Institute of Canterbury, New Zealand

Lial Khaluf, Heinz Nixdorf Institute, Germany

Lisa Ehrlinger, Johannes Kepler University Linz and Software Competence Center - Hagenberg, Austria

June 23 2019 – Athens, Greece

Introduction

- Topics:
  - software and hardware for wearable/implementable devices
  - cognitive components, such as bracelets,
  - special cameras, sensors, cognitive lenses/glaces and related issues
  - cognitive computing vs restricted storage and computing capabilities
  - cognitive interfaces
  - ... :) mind-driven future

Actually, panels are open bidirectional discussions, for mass-participation... a mix of commonsense and scientific details

Wilfried Uhring
Icube, University of Strasbourg and CNRS

Introduction

What is a Cognitive and Human-friendly Devices?

Wilfried Uhring
Icube, University of Strasbourg and CNRS

Introduction

C3-PO

- Protocol droid

fluent in over six million forms of communication.

Including the binary language of moisture vaporators

Wilfried Uhring
Icube, University of Strasbourg and CNRS

Introduction

Autonomous car

Wilfried Uhring
Icube, University of Strasbourg and CNRS

Introduction

Human friendly robots: Baymax

Wilfried Uhring
Icube, University of Strasbourg and CNRS

Introduction

- **Viktor Sydoruk**
  - "How non-invasive sensors can improve plant investigations"
    "Network of non-invasive sensors to monitor plant development“
- **Michal Placek**
  - "It is possible to pull out small changes from videos by special amplification algorithms. This approach can be used, e.g., to retrieve sound from vibrating objects or to measure human pulse”
- **Peter Edge**
  - "I would briefly present on the state/trend of on body IoT, communications (fitness, health monitoring). Standards in communications and security around the inclusion of personal health data made available on home networks and ultimately cloud (Public or Private?)."
- **Lial Khaluf**
  - "organic real-time operating systems: I will present an algorithm, which can provide real-time applications with self-adaptability behavior. The goal is to have highly dynamic real-time applications. Adaptation can take place online. System reactions must not be pre defined offline. It can be added online.
- **Lisa Ehrlinger**
  - "I would like to highlight the importance and potential of semantics and data quality for cognitive computing, especially with respect to the restricted storage and computing capabilities in wearable devices. "

Wilfried Uhring
Icube, University of Strasbourg and CNRS

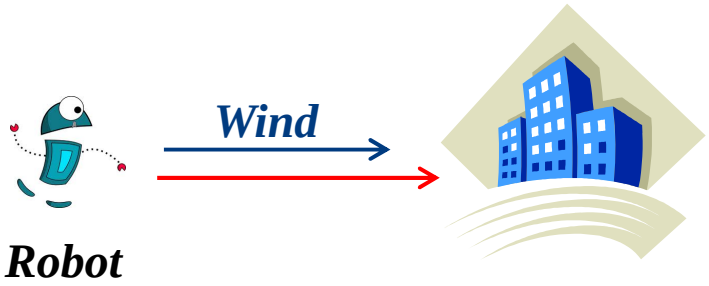
Panelist

Organic Programming of Dynamic Real-Time Applications

Lial Khaluf
Franz Rammig

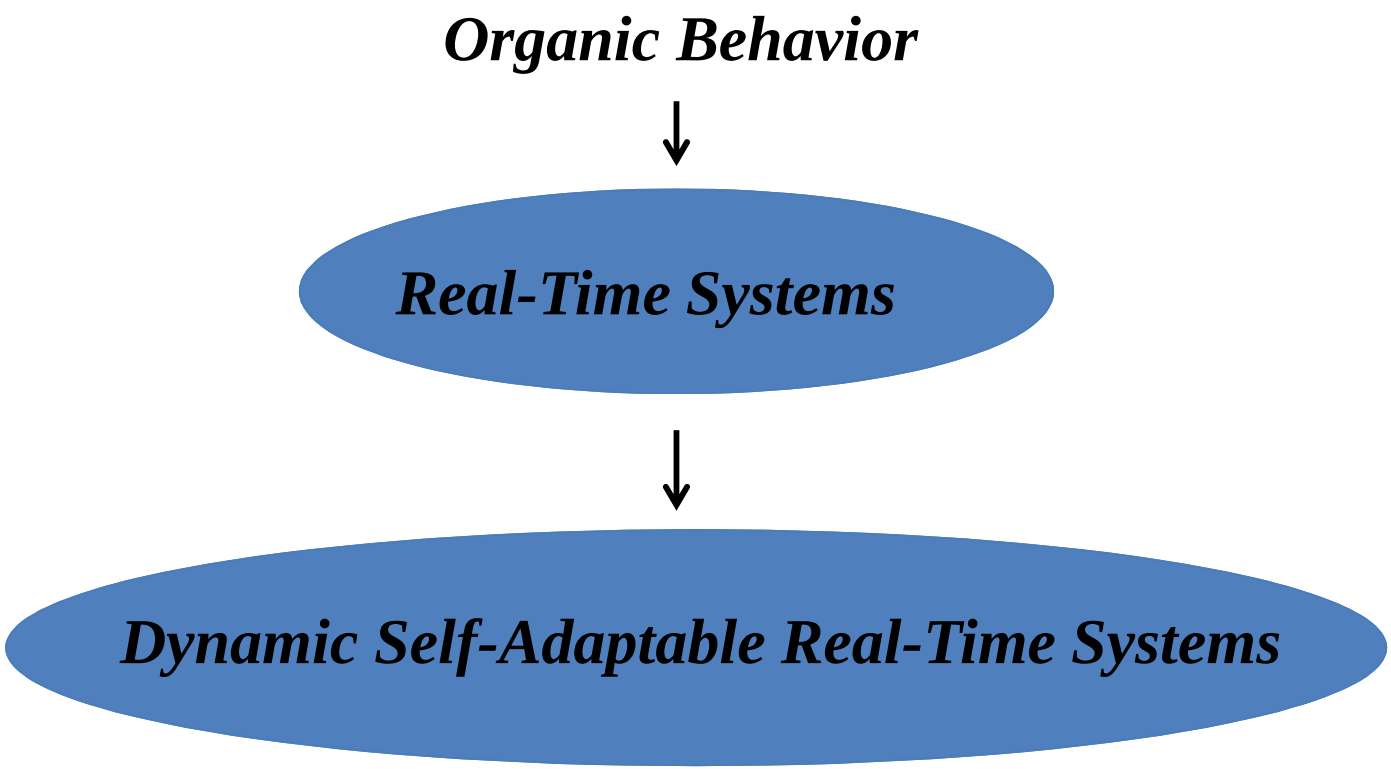
Motivation

Objects in our Real World



Robot in a Rescue System

Motivation


Organic Behavior
Real-Time Systems
Dynamic Self-Adaptable Real-Time Systems

Scenario

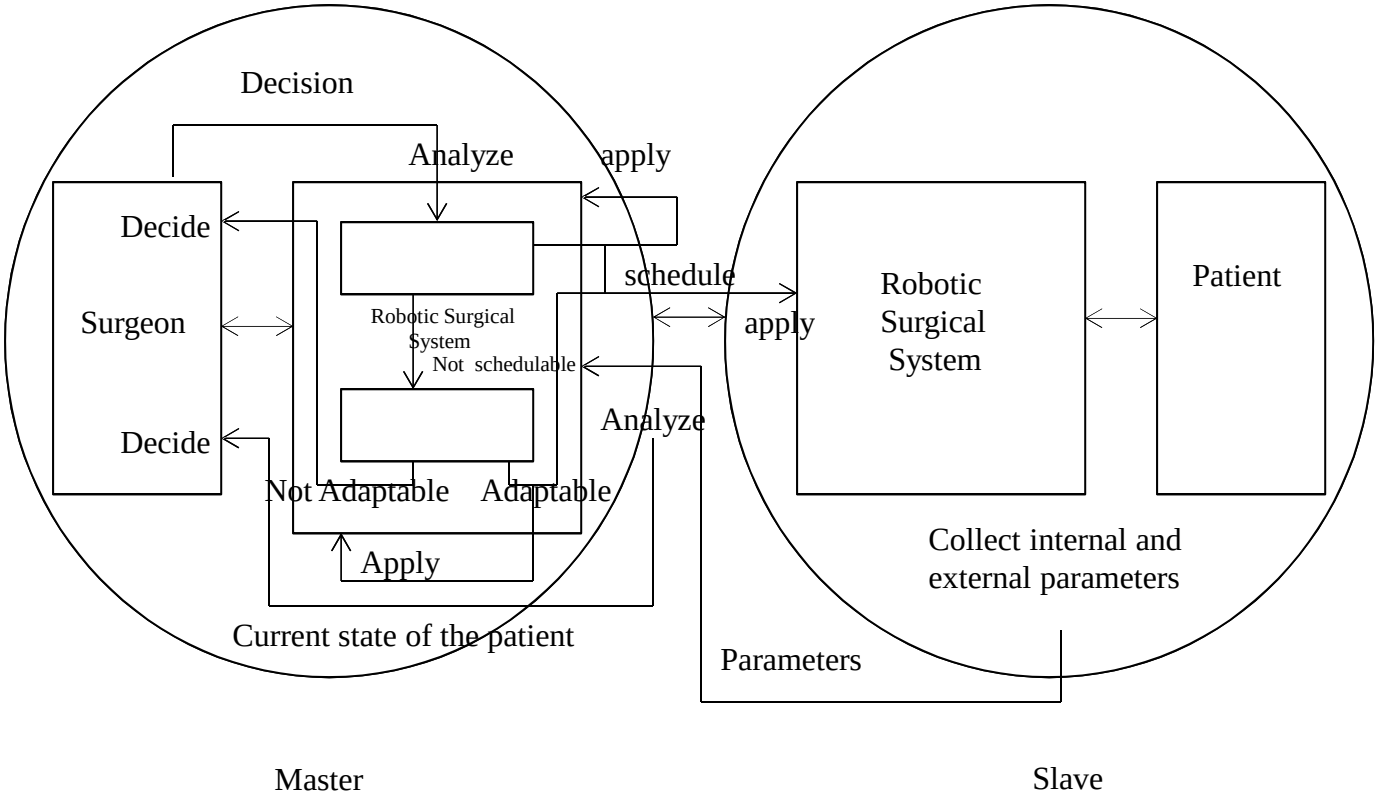
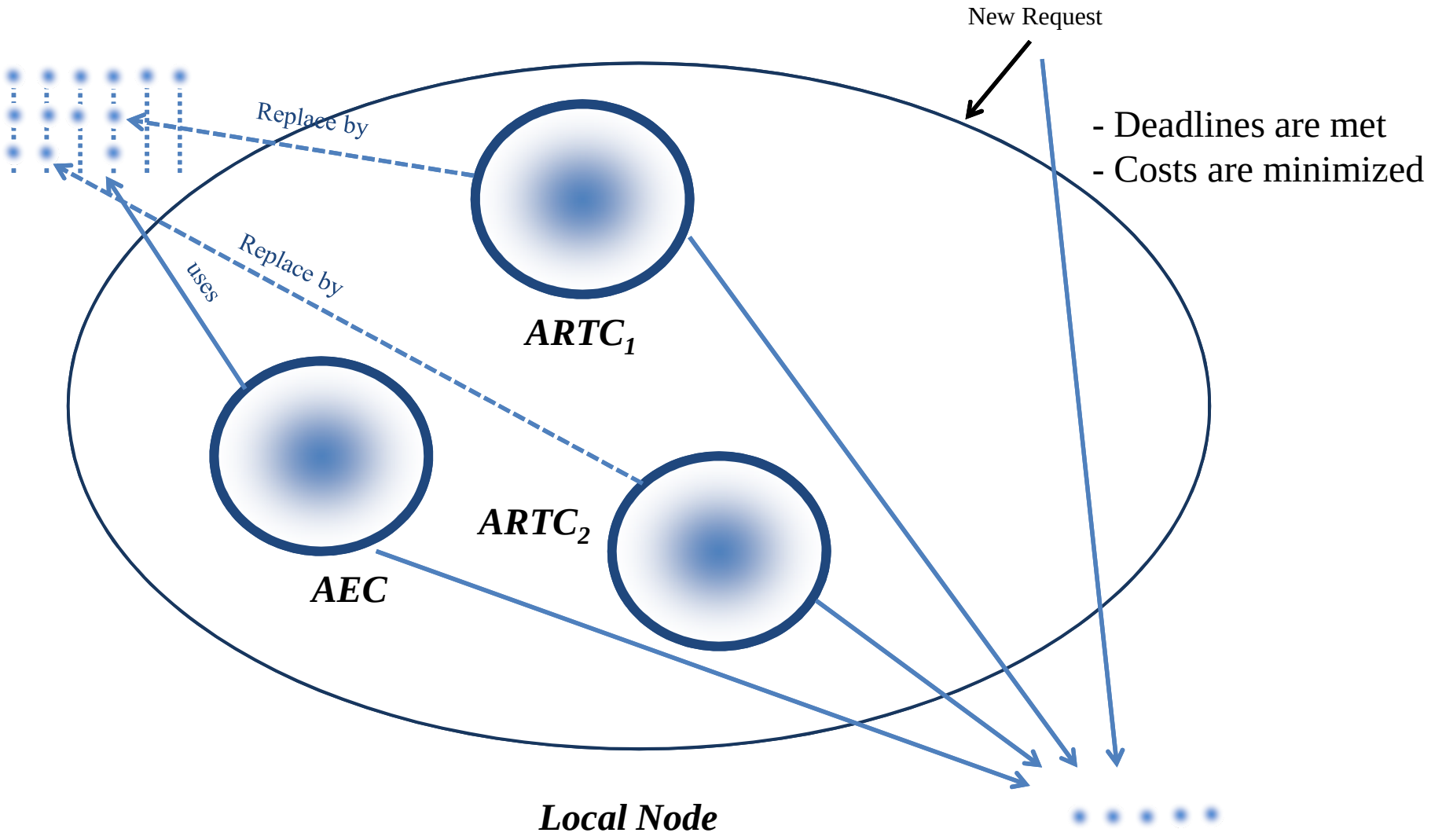


Figure 3: Self-Adaptable System of robotic surgery

Our Approach



- Deadlines are met
- Costs are minimized

Future Trends

- Distribute the central algorithm that is run by the Engine-cell on several nodes.

- In case of a distributed algorithm, how can we obtain fault tolerance?

- How to deal with the boundedness of the algorithm in case of a non- deterministic network.

- Having controlling cells other than the Engine-cell.

- Applying different genetic algorithms or solve the knapsack problem in a different way.

- Discuss task communication, or interrelated tasks.

Improving Data Quality with **Knowledge Graphs** for Cognitive Computing

Panel: Cognitive and Human-friendly Body Network Devices

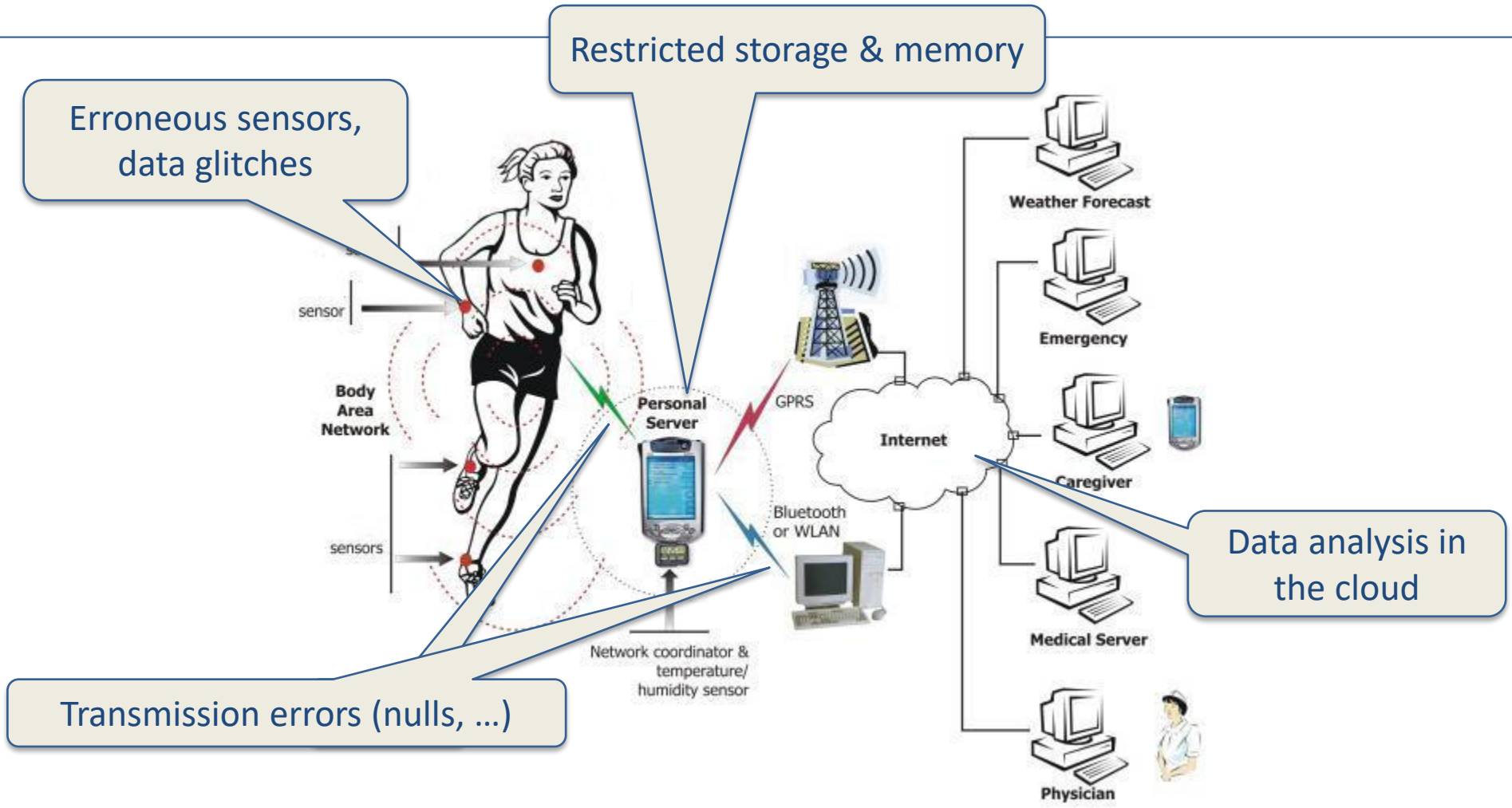
Lisa Ehrlinger
Johannes Kepler University Linz, Austria
Software Competence Center Hagenberg, Austria

lisa.ehrlinger@jku.at
http://faw.jku.at

scch software competence center hagenberg

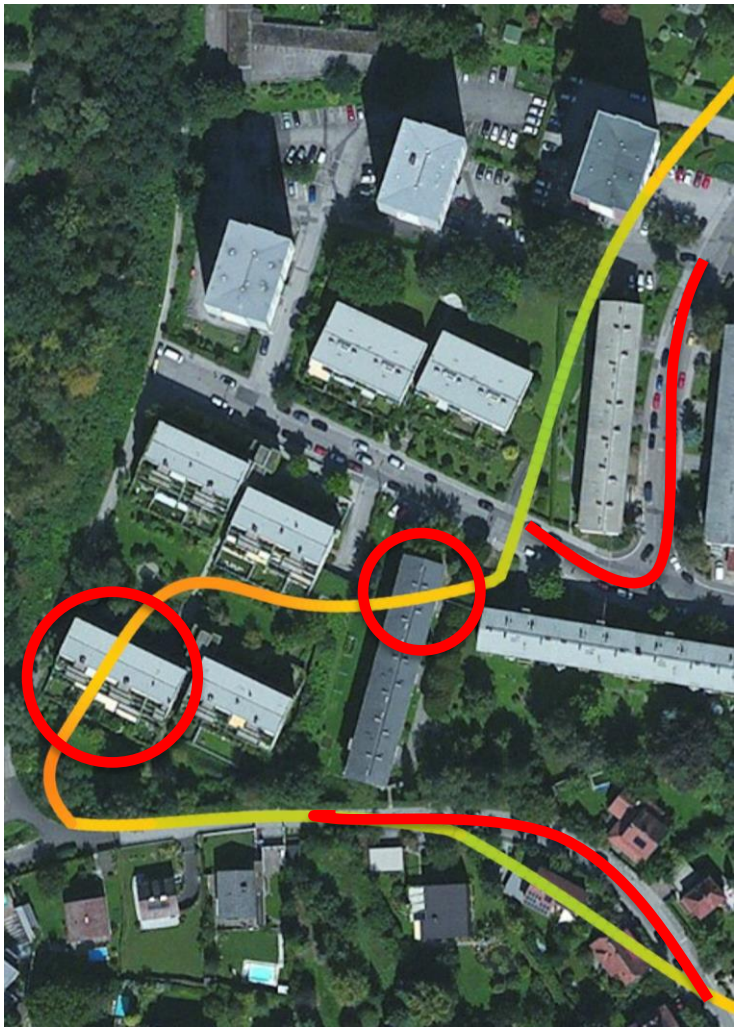
JKU JOHANNES KEPLER UNIVERSITY LINZ

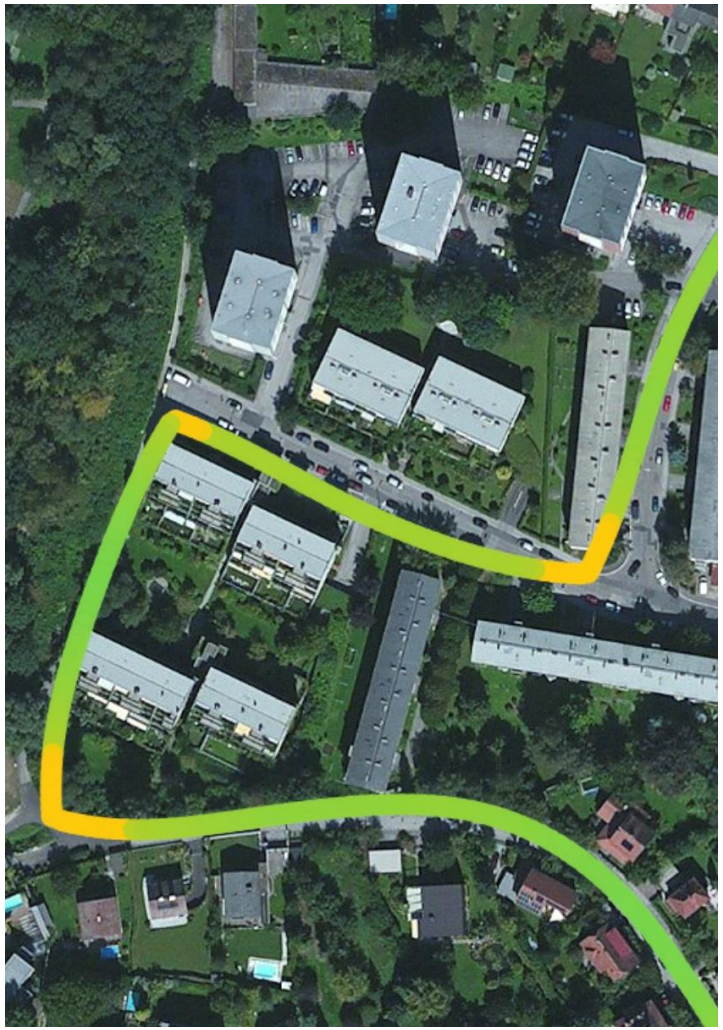
Data Processing in Body Sensor Networks



Wikipedia contributors. (2019, February 20). Body area network. In Wikipedia, The Free Encyclopedia. Retrieved 08:31, May 29, 2019, from https://de.wikipedia.org/w/index.php?title=Body_Area_Network&oldid=186859702

DQ Issue 1: GPS Interpolation Error



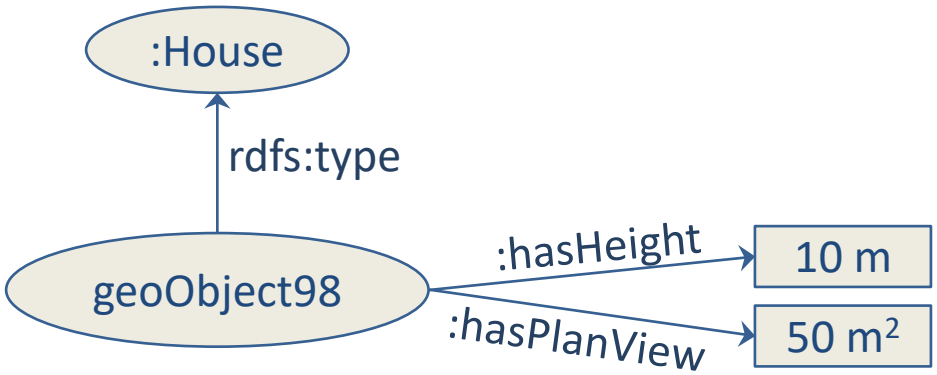


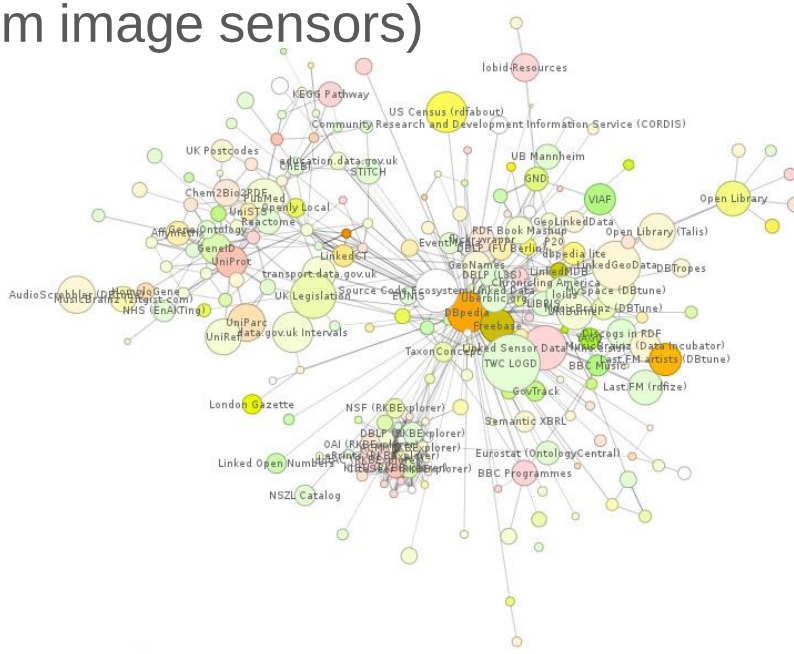
DQ Issue 2: Electrocardiogram

- Detect atrial fibrillation (AFib)
- Ensure reliable data analytics through **continuous data quality measurement**

The Power of Knowledge Graphs

- Enrich sensor data with machine-readable semantic information
  - to increase human-friendliness
  - to increase data quality
  - to reduce computing power (e.g., from image sensors)
  - to increase prediction accuracy





Panel on Information and Signal Processing

Color and Motion Magnification

Presented by: Michał M. Placek

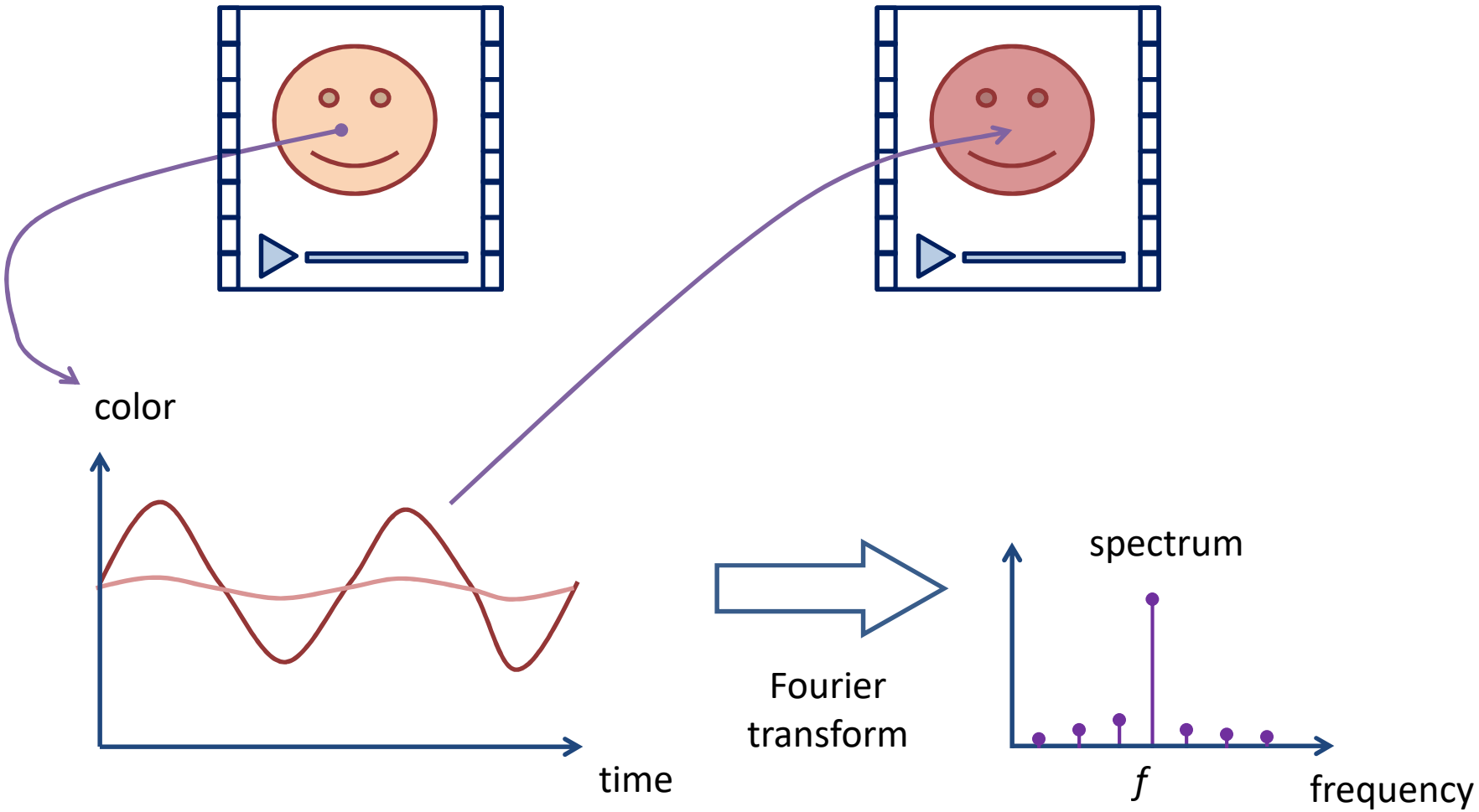
Wrocław University of Science and Technology

BSPG WROCŁAW

InfoSys 2019 June 2019, Athens, Greece

IARIA

Color Magnification



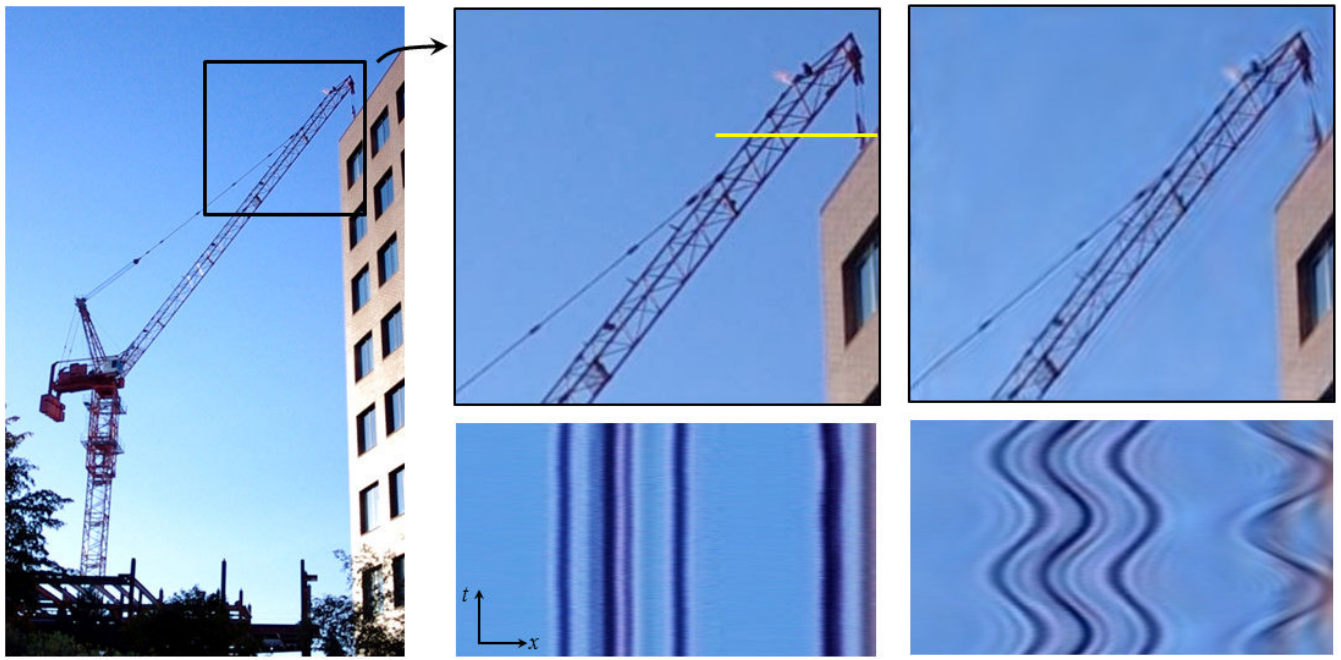
Color Magnification

(a) Input

(b) Magnified

Source: http://people.csail.mit.edu/mrub/vidmag/

Motion Magnification



Source: http://people.csail.mit.edu/mrub/vidmag/

On Body IoT Communications (wearables)

Specification, Security and Privacy

Specifications

Technology	Range	Frequency	Security
Bluetooth	1–100 metres	2.4 GHz	56-128 bit key
ANT	30 metres	2.4 GHz	AES-128 and 64-bit key
ANT +	Optimised for sports equipment	2.4 GHz	AES-128 and 64-bit key

Medical applications for wireless communication include:

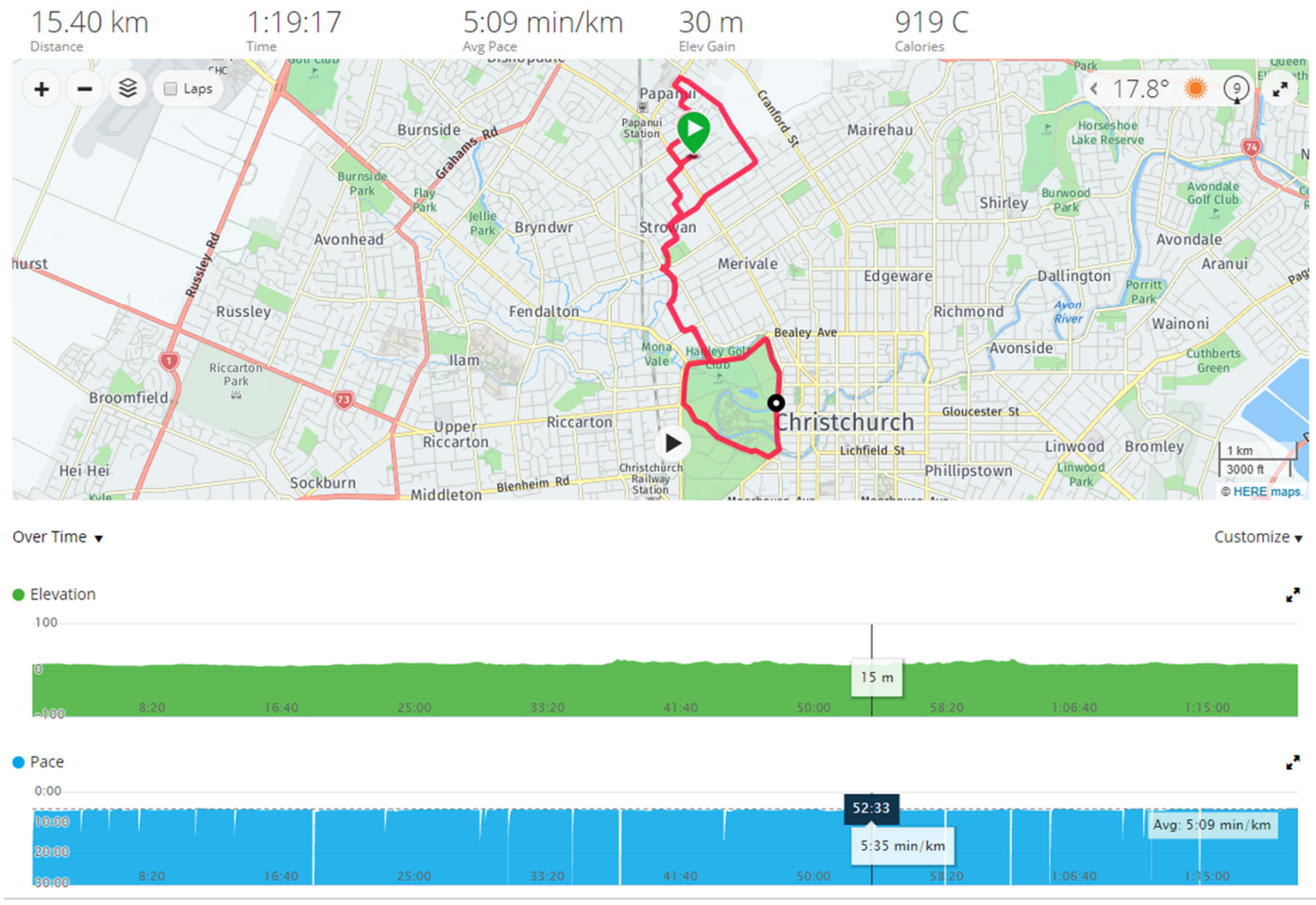
- Surface to surface (Bluetooth)
- Surface to implant (RF)
- Implant to remote location (WiMax)

Body Area Network (BAN) communications

Adaptable Network Topology (ANT) +

Bluetooth

Garmin Data



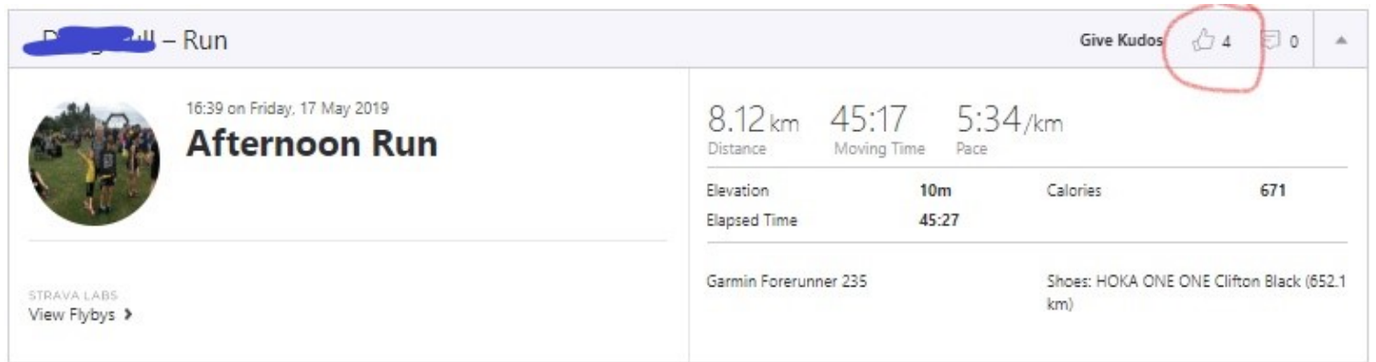
[Garmin Activities]

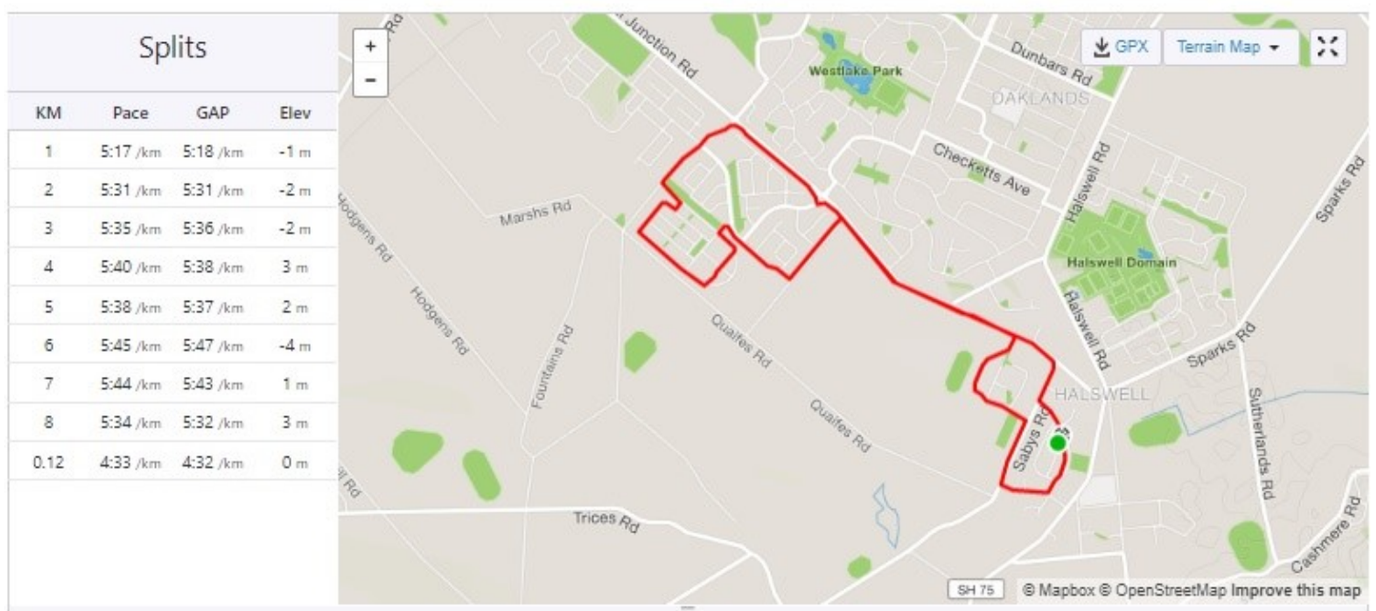
Strava Data

Data made available publicly create security issues for individuals

Start and end points are clearly visible to all that view the data

Routes are visible along with start and finish times



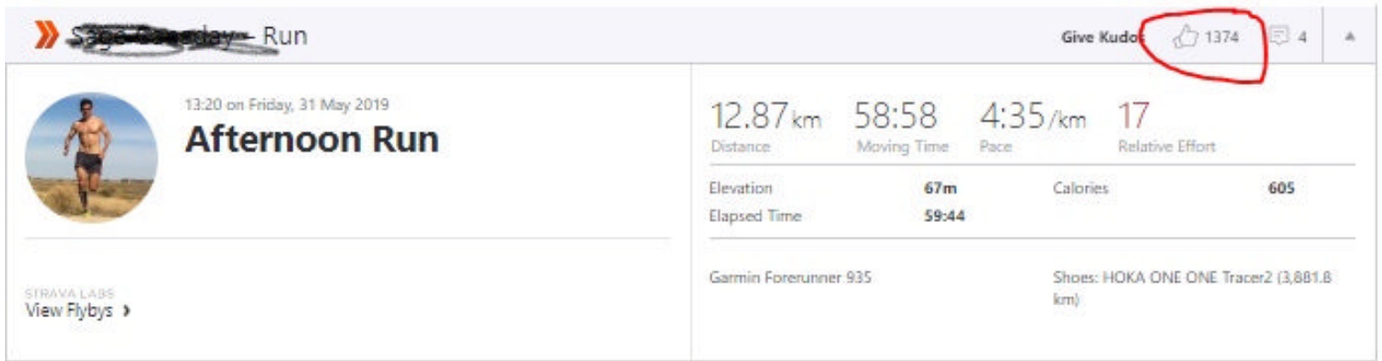


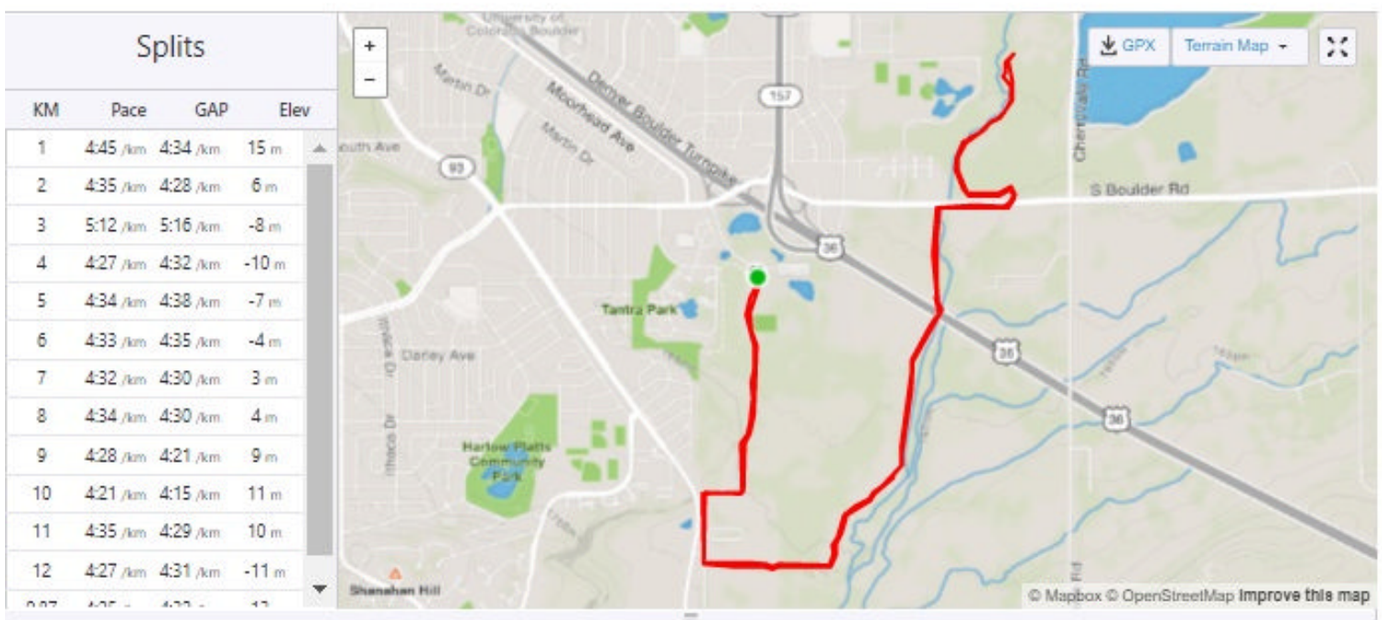
Strava Data (contd)

This user has 1300 followers

This is also valued data for health and insurance companies

A high marketing value





Conclusion

- Many health and fitness applications available
- Data can be freely available and used by marketing
- Users often don’t check to see whether data is being sent to the cloud
- Some data is protected, some is highly visible and others are held by the owner of the application. User denied access

HOW NON-INVASIVE SENSORS CAN IMPROVE PLANT INVESTIGATIONS

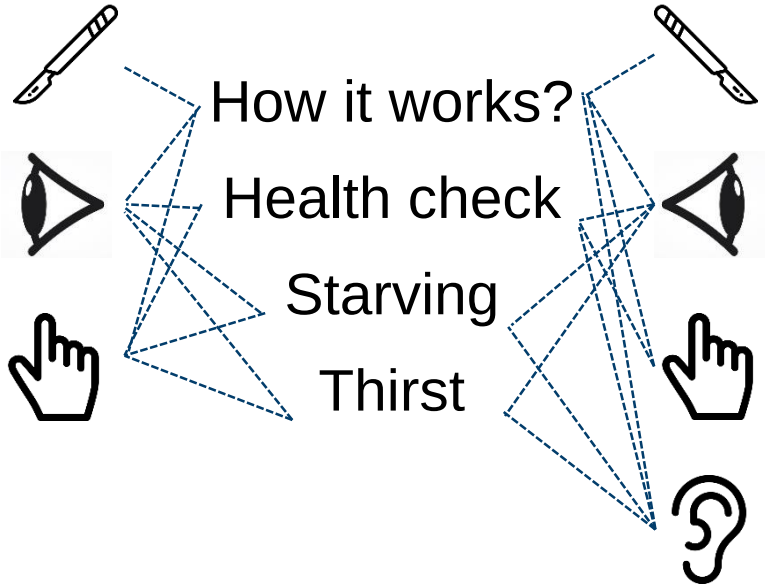
NETWORK OF NON-INVASIVE SENSORS TO MONITOR PLANT DEVELOPMENT

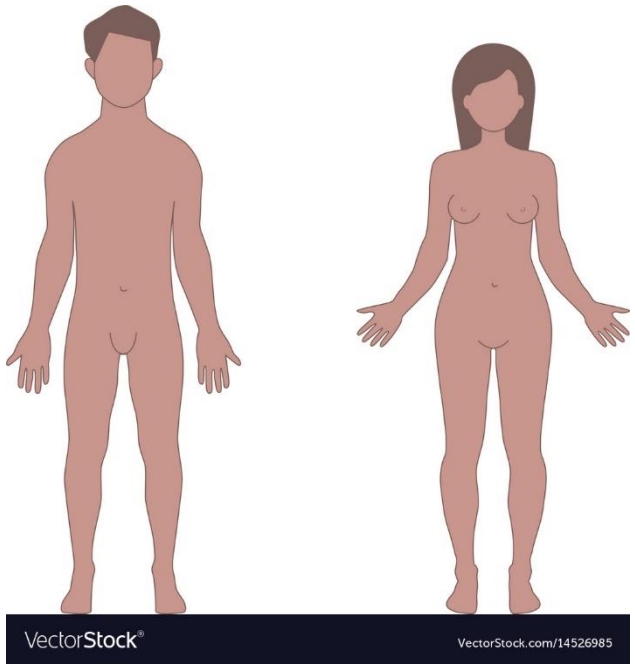
JUNE 4, 2019 I SYDORUK

HOW NON-INVASIVE SENSORS CAN IMPROVE PLANT INVESTIGATIONS

Research in the past

taken from *questgarden.com*





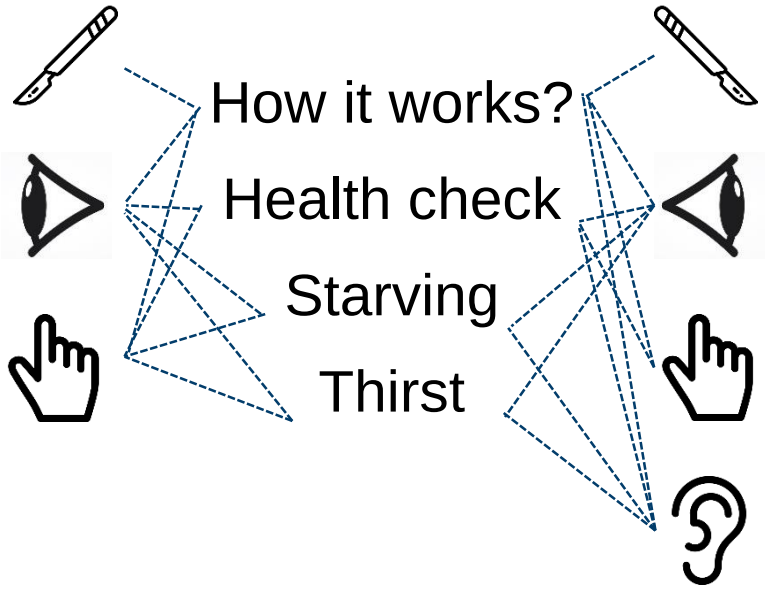
Results: yes/no + impression about the level

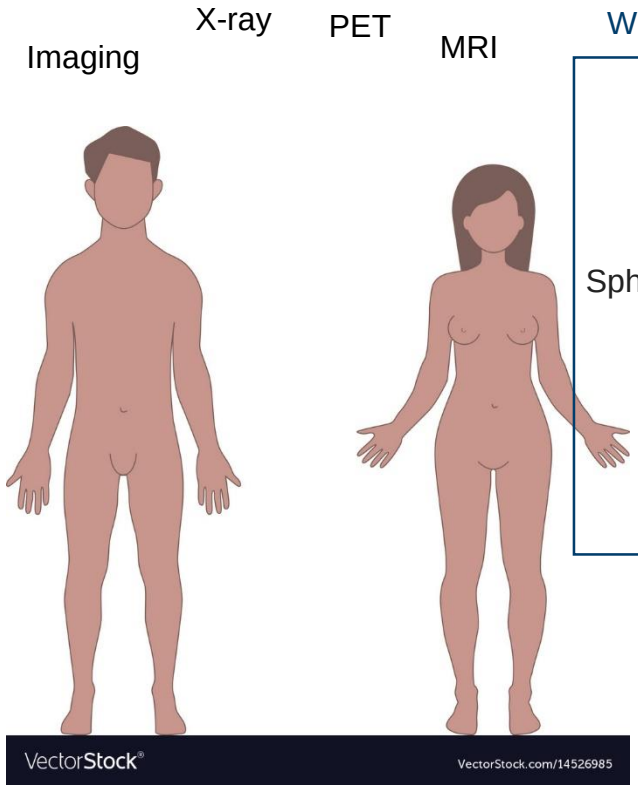
HOW NON-INVASIVE SENSORS CAN IMPROVE PLANT INVESTIGATIONS

Research now

PET
X-ray
Imaging
MRI
Hyperspectral imaging
IR tomography
MW/RF imaging
Simulations
etc.

taken from *questgarden.com*





Wearable devices

- ECG
- Oximeter
- Sphygmomanometer
- Pulsometer
- Glucose meter

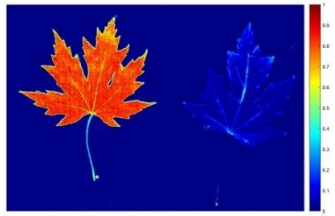
etc.

Results: yes/no + **precise level** (in many cases)

NETWORK OF NON-INVASIVE SENSORS TO MONITOR PLANT DEVELOPMENT

Institute for Bio- and Geosciences, IBG-2: Plant Sciences, Forschungszentrum Jülich GmbH, Germany

Hyperspectral imaging

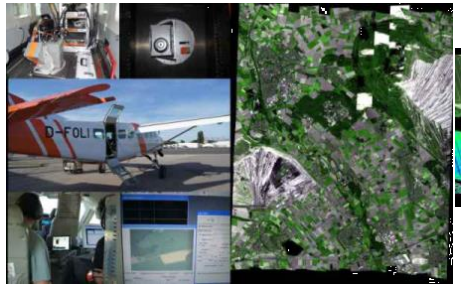


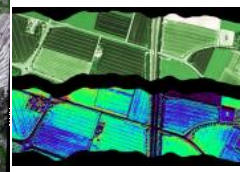
Portable MRI

phenoSeeder

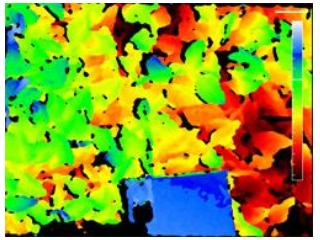
questgarden.com

Imaging



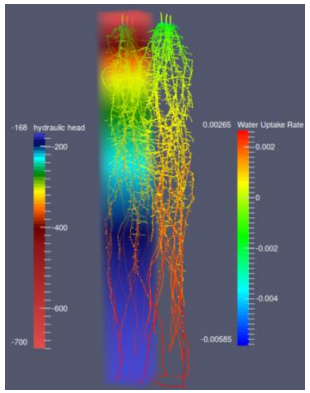


High-performance airborne imaging spectrometer

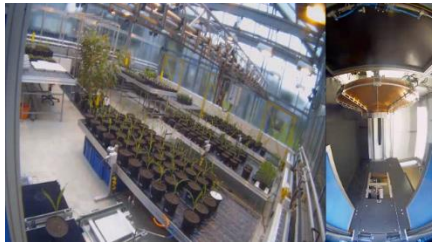


Stereo cameras

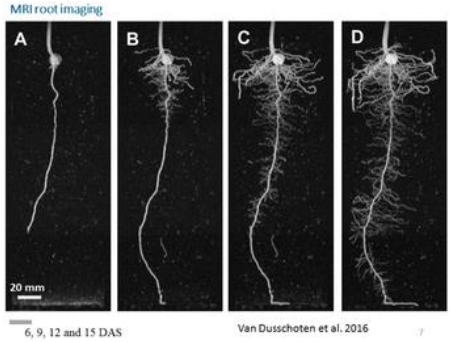
Simulations



MW/RF imaging



MRI



PET