SPECTACLES

Demonstrator Planning Workshop

Application Scenarios

27.2.2008

Universität Linz, Institut für Pervasive Computing
Altenberger Straße 69, A-4040 Linz
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Agenda

10:00 Start

10:15 SPECTACLES Demonstration Scenarios – Overview
- Example Scenes
- Technical Background (SW/HW components)

12:30 Lunch

13:30 Technical Realisation – Demonstrator integration tasks
- Next steps & timeline

15:00 End

SPECTACLES Application Scenarios

Scenarios demonstrate

flexibility

modularity

adaptiveness

of SPECTACLES platform

Goal:Document solutions for different

	Mobil klein autonom	location-/gps	Vital sensors	Info retrieval	Head gestures	Sensor comms		Camera/ optical sensor	Rocket science factor	Cool factor	who
						In	out				
Sports training feedback	!	-	!	!	-	+	+	-	2-3		Bw
*Mountain bike navi	!	-	!	!	-	+	+	-	2-3		Pa, so
*Medical – endoscopy / chirurgy	?	-	-	?	-	?	-	-	4		Bem
*Emergency - fire brigade	!!!	!	!	!	?	+	+	-	4		?
pedestrian Gps – tourism	!	!	-	+	!	+	+	-	1-2	8	Pa, so
Phone integration	!	-	-	+	!	-	-	-	1-2		Cl
Dietary companion	!	-	-	+	-	-	-	+	2		Ms

Spectacles Project Documentation Video
Scenes Overview

Scenarios

Scenario: Mobile Phone Interface

Handling a mobile phone by gestures

Problem:

Our protagonist (P) is tired of looking at his/her mobile phone when it is ringing because first of all she/he must search it and press a button to accept the call. There is a similar problem if P gets a SMS. She/he often has to search the mobile phone and open the SMS for reading in untimely situations.

Scenario:

Our protagonist (P) has fully packed hands and is waiting for a tramway. She/he hears her/his mobile phone ringing. The Spectacles Micro Display shows the caller‘s picture and name. P shacks her/his head to ignore the call. The phone rings once more. Now P nods to accept the call. The phone beeps and a SMS appear on the Micro Display. P scrolls to the next SMS page by turning the head to the right side and scrolls back by turning the head to the left side.

Scenario: Tourism GPS

Tourist guide with additional infos

Problem:

A tourist needs a guide through Vienna, but doesn‘t want to use a map. She/he wants to have additional information about buildings, pubs and other attractions.

Scenario:

The Spectacle Micro Display is integrated into the sun glasses of a tourist and marks her/his position on a map as compass rose. Now the tourist is guided through the Vienna downtown. On occasion the display advises him/her of the nearby buildings, pubs and other attractions.

Scenario: Mountain Biking Information System

GPS Mountain bike guide with altitude profile and vital functions

Problem:

A mountain biker (M) wants to follow his friend's mountain bike trail by GPS and make a virtual competition. He downloads the trail to his mobile device. The routing tool of his mobile device guides him to the trail. During biking he must always stop to take a look to his mobile device.

Scenario:

A mountain biker (M) downloads his friend‘s last used mountain bike trail to his mobile device and leave his home with his bike.

The Spectacles Micro Display shows M where his friend‘s trail starts by marking the route on a map. A compass rose indicates M‘s current position. M starts his tour at the same position as his friend.

During biking the display shows M's heart rate and the time till sunset. In between M switches to another view which displays the altitude profile. This view also indicates the results of M's friend.

Scenario: Diatary Companion

Support for product choice by nutrition comparing

Problem:

A consumer (C) stands in front of a supermarket rack and compares the nutrition information on the package of two cereal products. This procedure is very time consuming and there is no feedback about the personal daily requirement of nutrients.

Scenario:

A consumer (C) entries a supermarket. C wears glasses with an integrated Spectacles Micro Display.

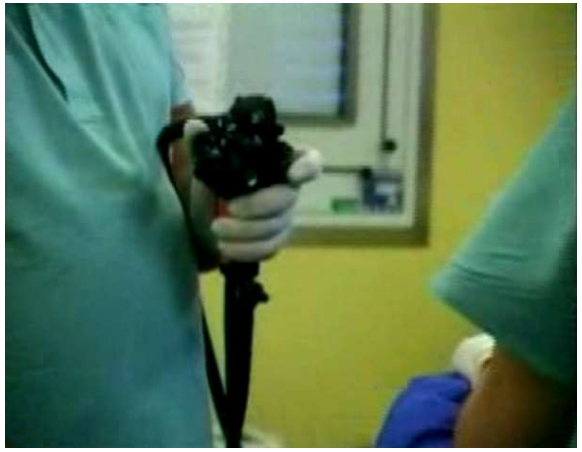
C stops in front of a meat cabinet and looks to steak. The Micro Display shows kCal, fat, carbs and proteins of this steak. Green, yellow or red indicate if the nutrition value is too high for C.

C goes on, stops in front of bread rack and looks to a special bread. The Micro Display indicates the nutrient levels of this bread. C takes one and goes on.

Now C stops at the cereals rack and compares the nutrition values of fruit loops and cornflakes by using his/her Spectacles. C takes a pack of cornflakes and goes to the checkout counter.

Scenario: Endoscopy (Gastroscopy)

Displaying vital functions during endoscopies



Problem:

A surgeon makes an gastroscopy at a patient. A nurse monitors the patient‘s vital functions and forward it to the surgeon on inquiry. At the same time the vital functions are played back as acoustic signals.

vital functions:

- heart rate
- arterial oxygen saturation

Scenario:

During a gastroscopy a surgeon (S) wears protection goggles which have integrated the Spectacles Micro Display. It indicates heart rate and oxygen saturation as number and symbol. In addition a vertical bar also indicates the actual oxygen saturation. The bar and the values are colored from green to red as indication of the gravity of situation.

Scenario: Sport Coaching Oarsmanship

Visual support for oarsman teams

Problem:

An oarsman (O) has to train for a oarsman competition. He is sitting on a rower during his vital functions are presented via a projection in front of him. Everybody can see this private information and O can only train alone but not with his team.

O trains with his oarsmen team. The vital function are now displayed via a PDA-Display, which can't be seen by O. The coach beats time via a megaphone.

Scenario:

O sits on the rower with Spectacles. The vital functions are shown on the Spectacles Micro Display. O's team-mate comes in and talks to him. He can't see O's vital functions.

O's team is training. Each oarsman wears Spectacles and can watch the own vital functions but also the rowing beat and the performance of the team.

Spectacles Demo Scenarios
Technical Analysis

Scenarios

Scenario 1: SPECTACLES for Pedestrian GPS - Tourism

Joe User is visiting Vienna as a tourist. Without being an obvious stereotypical tourist he

- wants to be informed of special buildings and facts.
- wants to be guided through the city.
- does not want to waste time running in circles and getting lost in the city

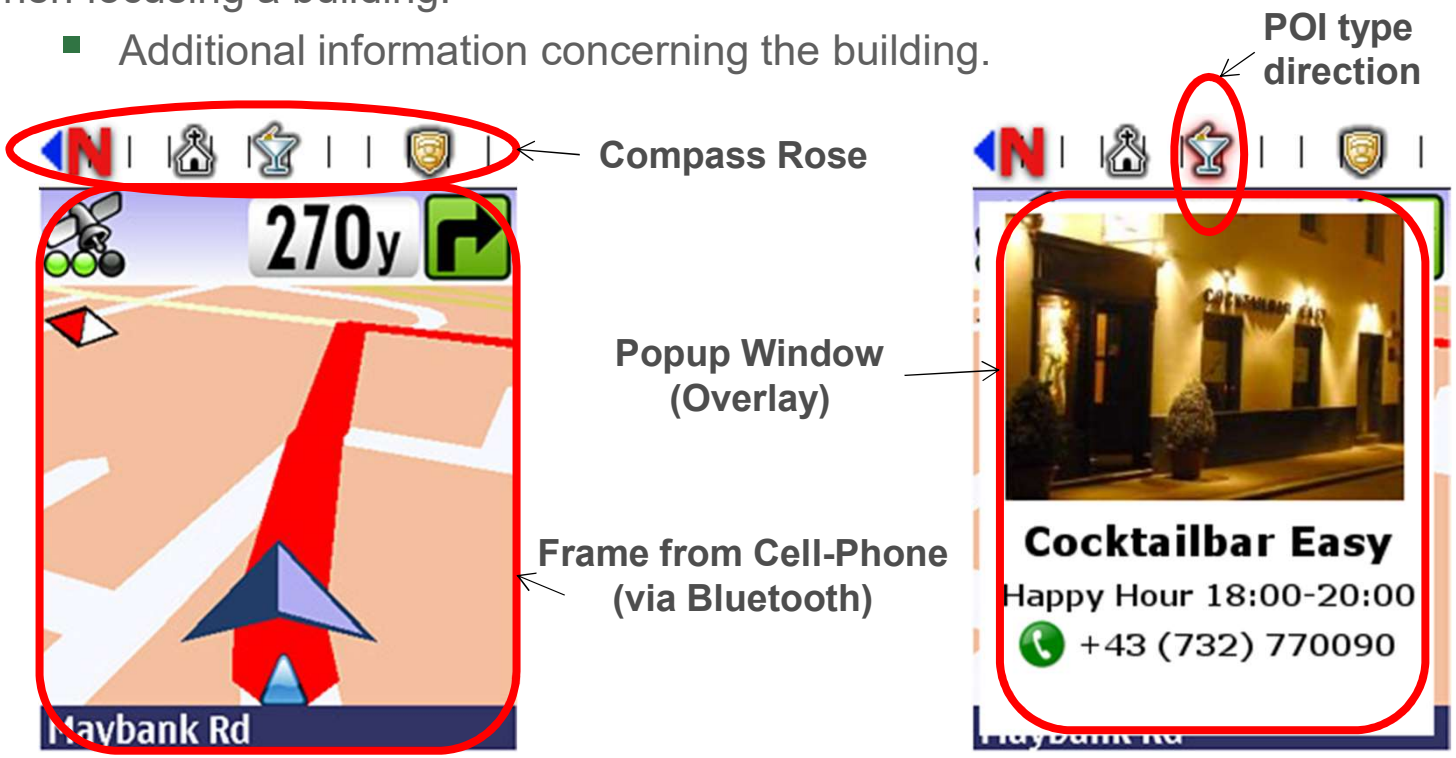
Scenario 1: Tourism GPS

While touring around without focusing a building:

- Map with route being shown.
- Top row shows Points-of-Interest (POI).

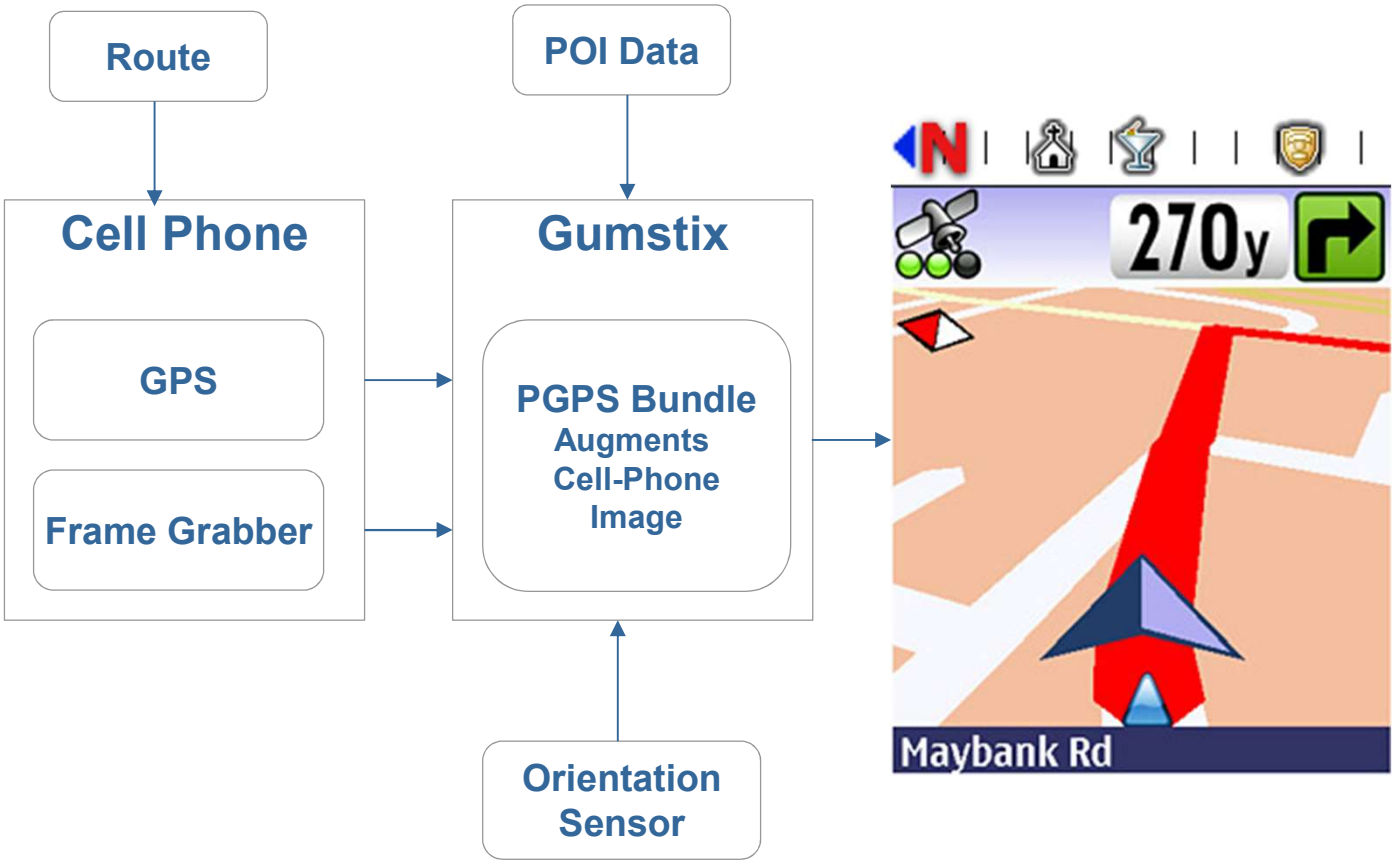
When focusing a building:

- Additional information concerning the building.



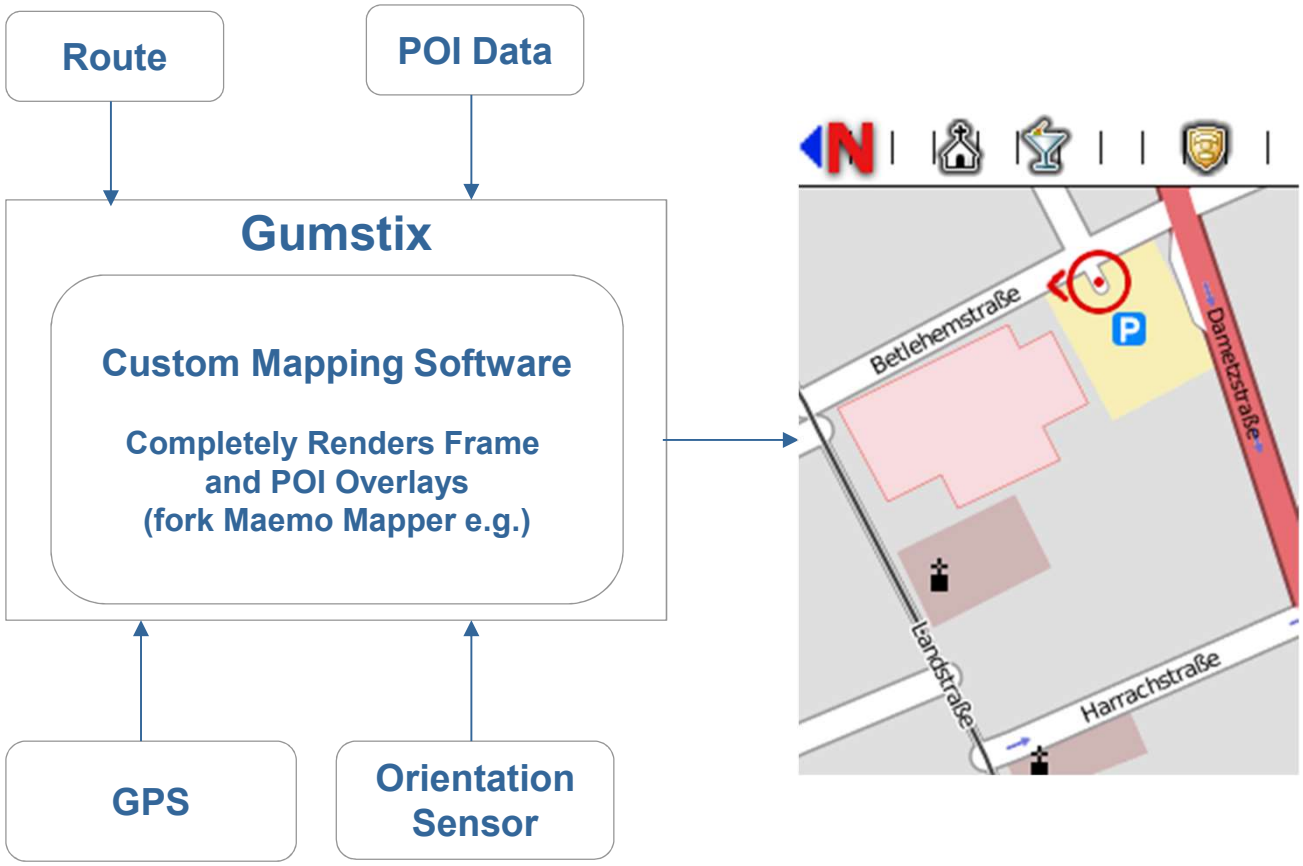
Scenario 1: Tourism GPS

System Architecture (frame grabber + cell phone)



Scenario 1: Tourism GPS

System Architecture (standalone gumstix)

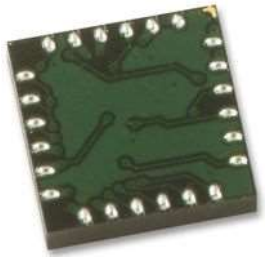


Scenario 1: Tourism GPS

Technical Requirements

Variant 1 (Cell Phone + Frame Grabber)

- GPS Positioning System (if not built into cell phone)
  - EM-408 GPS Module $64.95 (sparkfun, without external atenna)
- Orientation Sensor
  - E.g.: HMC6352 HONEYWELL S&C COMPASS-ON-A-CHIP
    - 2 Axis, 6,8 x 6,8 x 1,5 mm, typ.: 2mA@3V (max 10mA@3V), ~ 90 € (farnell)
- Suitable Mobile Phone
  - E.g. Nokia N95, (~600 €, without sim-lock)



Steps to be taken:

- Setup FrameGrabbing on CellPhone (updates to framegrabber?)
- Setup GPS location notification via Symbian LBS API (possible while running GPS app?)
- Write gumstix app that
  - Receives frame from phone
  - Evaluates GPS information and traces direction ray
  - Renders „Compass Rose“ + POI Data + user interaction

Scenario 1: Tourism GPS

Technical Requirements

Variant 2 (Standalone App on Gumstix)

- GPS Positioning System
  - EM-408 GPS Module $64.95 (sparkfun, without external atenna)
  - U-blox5 17x12mm
- Orientation Sensor
  - E.g.: HMC6352 HONEYWELL S&C COMPASS-ON-A-CHIP
    - 2 Axis, 6,8 x 6,8 x 1,5 mm, typ.: 2mA@3V (max 10mA@3V), ~ 90 € (farnell)

Steps to be taken:

- Modify existing Mapping Application to run on gumstix
  - Existing apps: Maemo Mapper, Navit, RoadMap, other?
- Add „Compass Rose“ to Application
- Implement Waypoint routing
- Define and implement ways to load maps

Maemo Mapper
on gumstix

Scenario 2: MBIS Mountain Biking Information System

After his trip to Vienna, Joe User decides to take a Mountain Bike trip. Before he left he received a hint about a good trail. He

- wants to follow his friends trail.
- wants to have an overview of his heart-rate and condition.
- wants to race against his friends track-time.
- wants to receive routing information when feeling lost.
- wants to know when he will approximately reach the top.
- wants to know how much time he has left until the sun goes down.

Scenario 2: MBIS GUI Concept

Default View

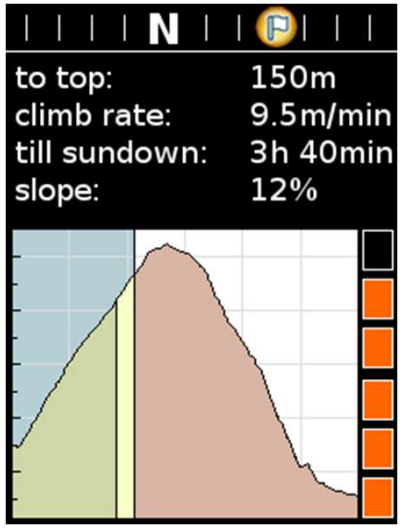
- Height Profile of the trail (current position, opponent position)
- Top row indicates direction to next waypoint
- Heart Rate Information on the right of the height profile (adjusted to user)

Detail View

- Map of surrounding area

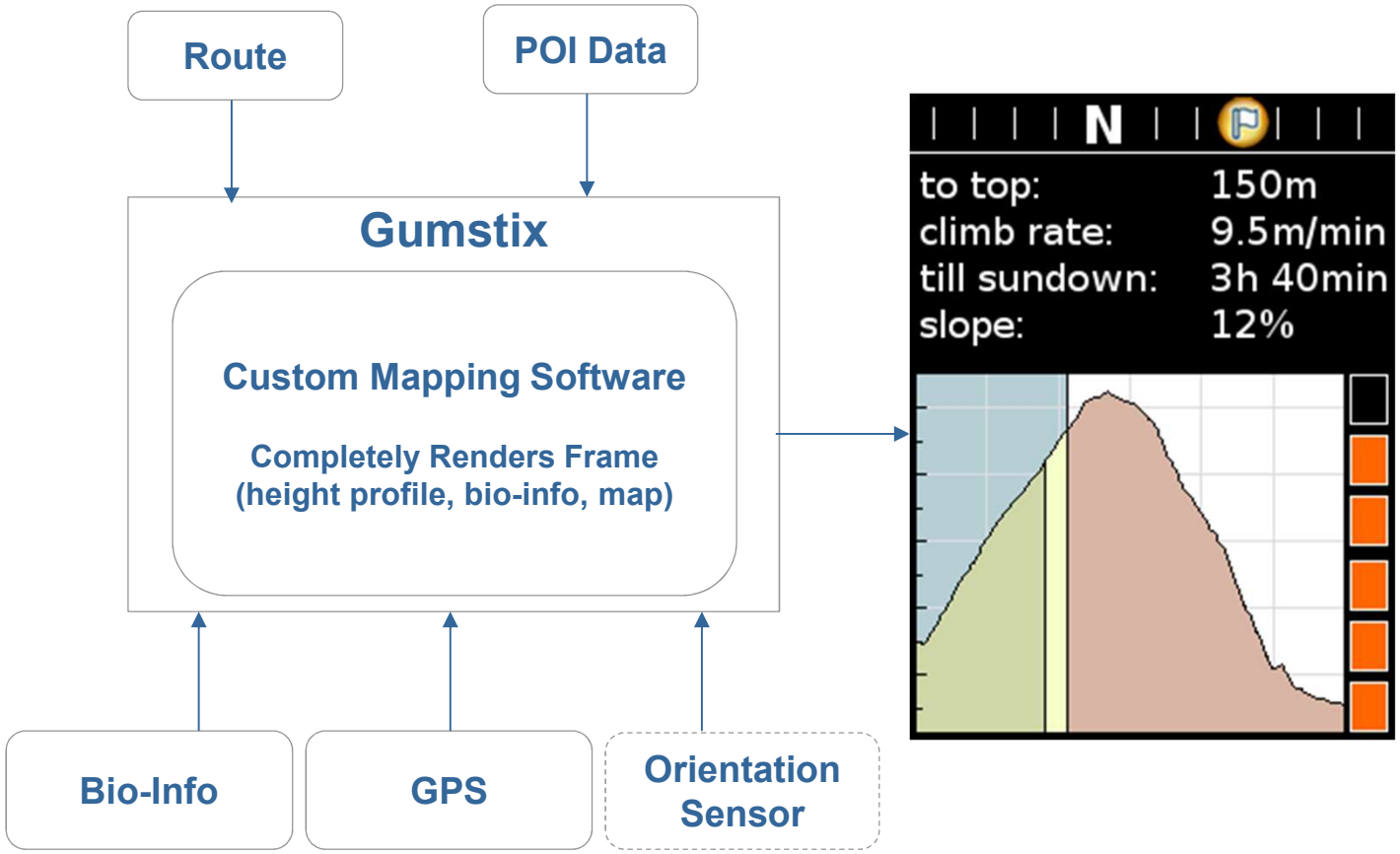
Map Overview

- Map of full trail area



Scenario 2: MBIS System Architecture

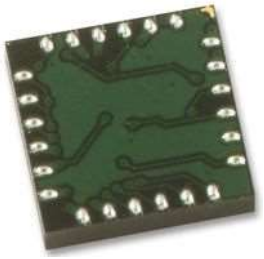
System Architecture



Scenario 2: MBIS Hardware Components

Technical Requirements

- GPS Positioning System
  - EM-408 GPS Module $64.95 (sparkfun, without external atenna)
- Orientation Sensor (nice to have)
  - E.g.: HMC6352 HONEYWELL S&C COMPASS-ON-A-CHIP
    - 2 Axis, 6,8 x 6,8 x 1,5 mm, typ.: 2mA@3V (max 10mA@3V), ~ 90 € (farnell)
- Mapping application runs directly on Spectacles Board
  - Via custom mapping application
- Routing
  - Following predefined Waypoint Path
  - Direction to a POI (line-of-sight, nice to have)
- Bio-Sensors
  - Forward Technologies B600, 249 €



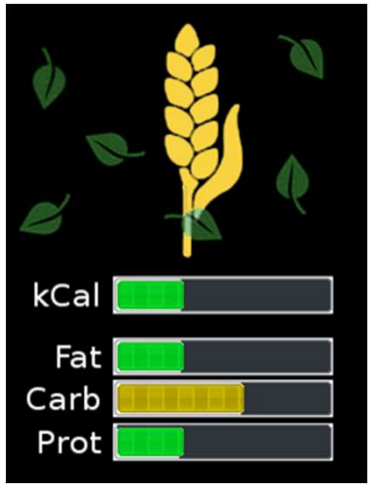
Steps to be taken:

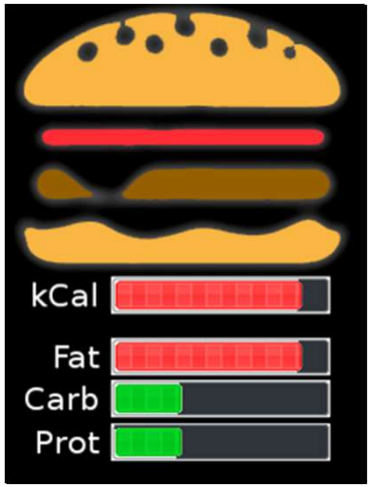
- Write Application
  - Compass Rose (reuse parts from pedestrian GPS)
  - Heart Rate Sensor
  - 3 Views (Height Profile, Detail and Overview Map)
  - Content Pipeline for GPS tours

Scenario 3: Dietary Companion - Use case

Scenario and GUI-Mockup

- User in the supermarket takes a product and scans the barcode with his / her glasses
- Histogram visualizes nutrition information for 100g of the product in relation to the recommended daily intake.
- A symbol for the food category (junk food, vegetables, milk products, pasta,..) and an approximation for the healthiness (vitamins, mineral nutritients, wholefood product,..) in form of green leaves is displayed





Scenario 3: Dietary Companion - Video Shots

Video:

- Client is standing in front of the cereal shelf and takes a package of cereals
- He initializes the barcodescan and gets a histogram
- The histogram shows that these cereals are rich in calories
- The client takes another pack of cereals, scans the barcode, looks at the histogram, repeats the same procedure for a third product
- After looking at the three histograms he decides to buy i.e. the healthiest one

Scenario 3: Dietary Companion - Requirements

Requirements & Hardware

- Barcodescanner
  - External solution with laser / camera or
  - Camera in combination with barcode extraction software
- Triggering the scan
  - Proximity sensor / button included in glasses or
    (Button integrated in a glove)
- Database with product information or
  (Web information extractor)
- Userprofile (Recommended daily intake of calories, fat,..)
- Visualization

Scenario 3: Dietary Companion - Hardware

Barcodescanner:

- Symbol SE950 / SE955
  - 1D-Barcode decoding up to a distance of 1m
  - 11.55 x 21.6 x 15.5 mm, 8.0 g, 3.3 V, 86 – 114 mA
  - SE955 5V: 140€; SE955 3.3V: 213€
    available at barcodedeus.de (Warning: 5V Version ist slightly bigger!)

- Symbol CSE600
  - 1D-Barcode decoding
  - 7.25 x 19.75 x 9.66 mm, 1.0 g, 3.0 V

- Camera and Barcode decoding via software
  - ZXing: 1D/2D barcode reader library (Apache Licence 2.0, Java)
  - supports decoding of QR Code, EAN-8/13, Code 39, Code 128, UPC-A/E

Triggering the scan:

- Micro push-button on glasses
  - KSS221GLFS 5.5 x 3.5 x 1.6 mm

- QTouch proximity sensors
- Head gesture (Head left)

Alternative: Integrate in glove

Scenario 3: Dietary Companion - Data Sources

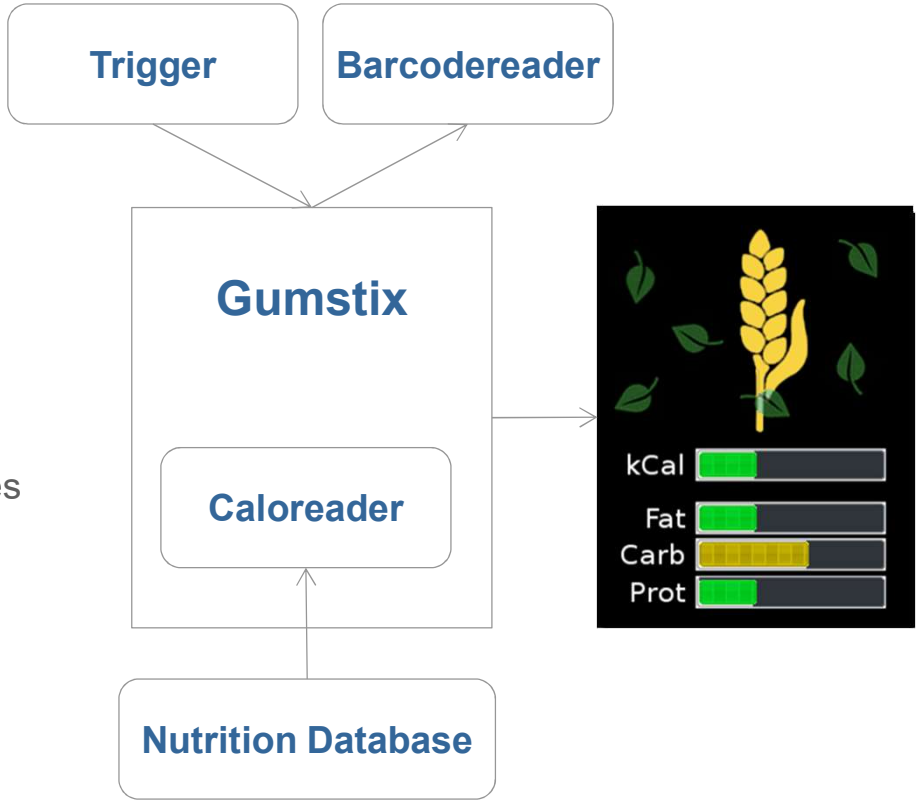
EAN - Web & Database

- Web portals:
  - fddb.info – Search for EAN or product name:
    calorific value, calories, fats, carbohydrates, proteins, fibres, alcohol
  - gepir.org – Information about company & product name via EAN
  - wikifood.lu – Ingredients and predicates like vegan, without nuts,..
  - upcdatabase.com – no austrian food available
- fddb.info in combinatino with gepir.org could resolve the barcode of only 4/14 articles to nutrition information, a database must be provided by us
- Database with product information contains:
  - EAN, calorific value (kCal), fats (g), carbohydrates (g), proteins (g), health-rating (1-5), product category (vegetables, fruits, meat, milk products, pasta, pastries)

Scenario 3: Dietary Companion - Architecture

System Architecture (Caloreader)

- Trigger the barcodereader
- Read barcode
- Lookup for nutritent information
  - Local cache
  - (Optional) web access
- Render nutrient factors
  - Relies on available image libraries
  - Includes stock icons



Scenario 4: Cell phone Interface

What:

- Interaction without the use of hands.

Why:

- Interaction in packed Space
- Both hands are free
- Information Hiding:
  - Security
  - Acceptance

Tokyo U-Bahn zur Rushhour

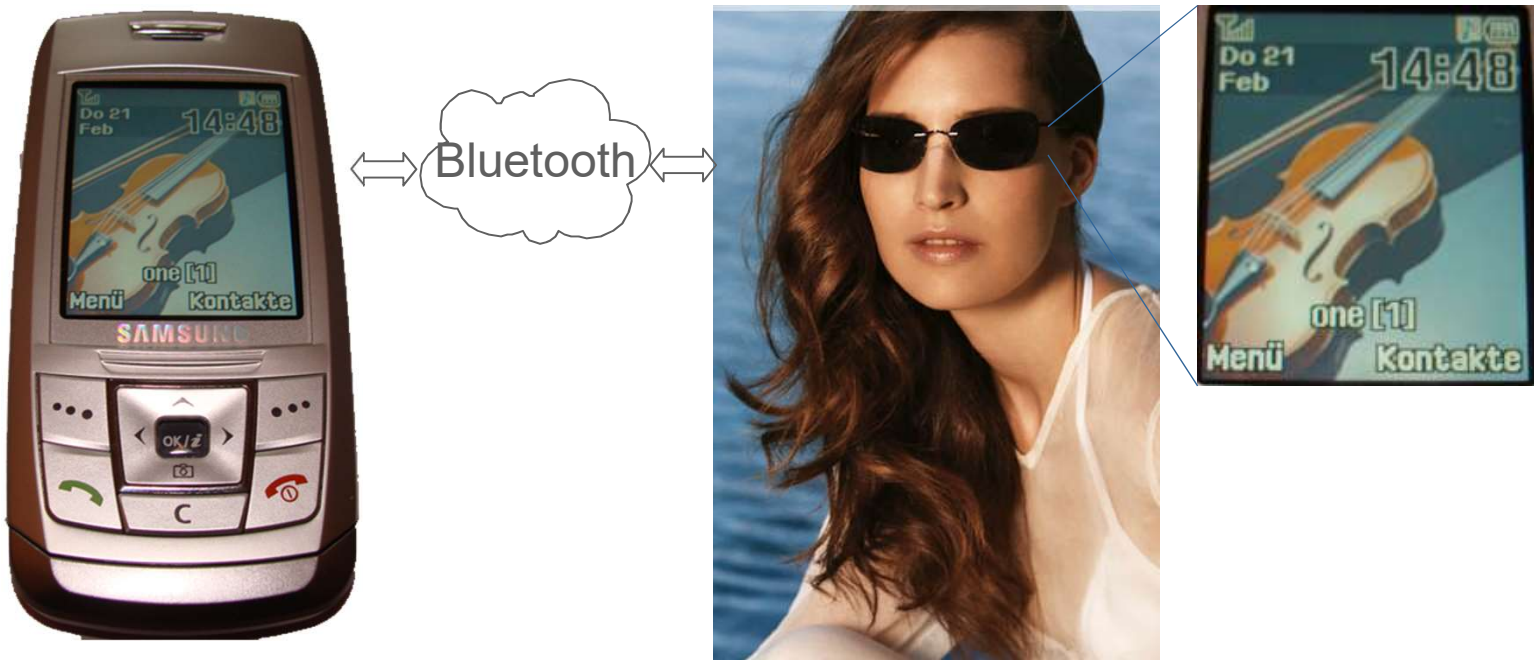
How:

- Export of the phones display to the SPECTACLES display
- Head gestures for important button functions

Scenario 4: Cell phone Interface

Connection:

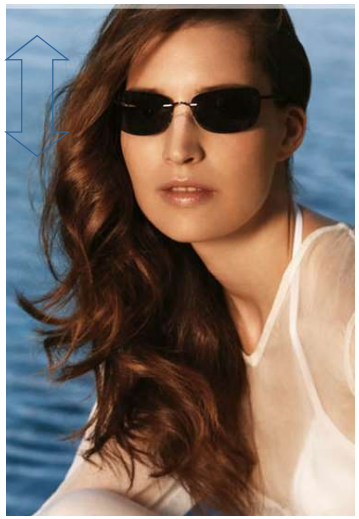
- The phones display content is sent over bluetooth to the SPECTACLES
- This content is then shown in the SECTACLES display.



Scenario 4: Cell phone Interface

Action:

Gesture:	Yes
Physic.:	vertical nodding
Result:	simulates the phones left function button

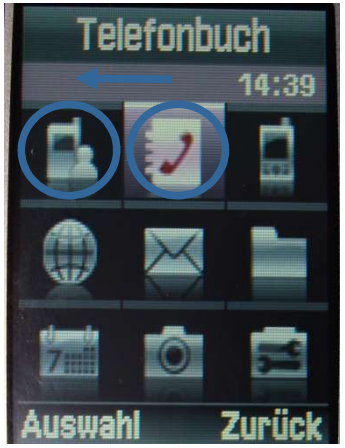


Gesture:	No
Physic.:	horizontal nodding
Result:	simulates the phones right function button

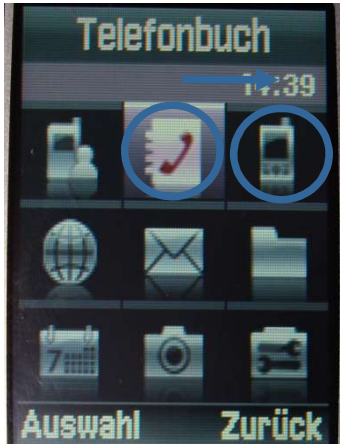
Scenario 4: Cell phone Interface

Navigation:

Gesture: Left
Physic.: tending head to the left side
Result: simulates the phones left button



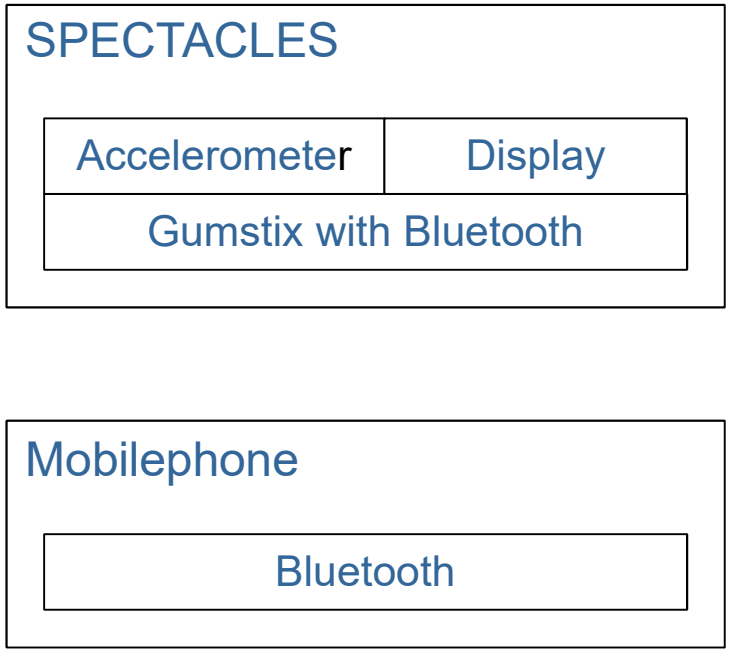
Gesture: Right
Physic.: tending head to the right side
Result: simulates the phones right button



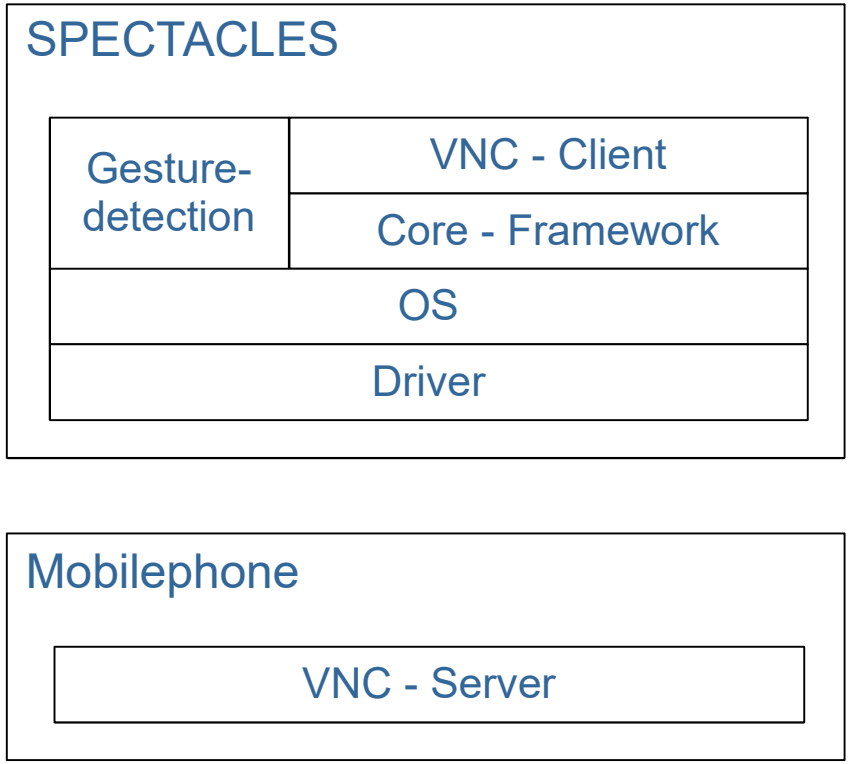
Scenario 4: Cell phone Interface

Hardware – Architecture:

- Accelerometer ADXL 202 for head gesture measuring.



Software – Architecture:



Scenario 5: Sports Coaching & Training Feedback

Goals

- Demonstrate life training feedback scenarios for athletes
- Acquire sensor data for performance measurement
- Visualize computed results with directions to trainee
- Domain: Rowing

Scenario 5: Sports Coaching Application

Raw data (sensors)

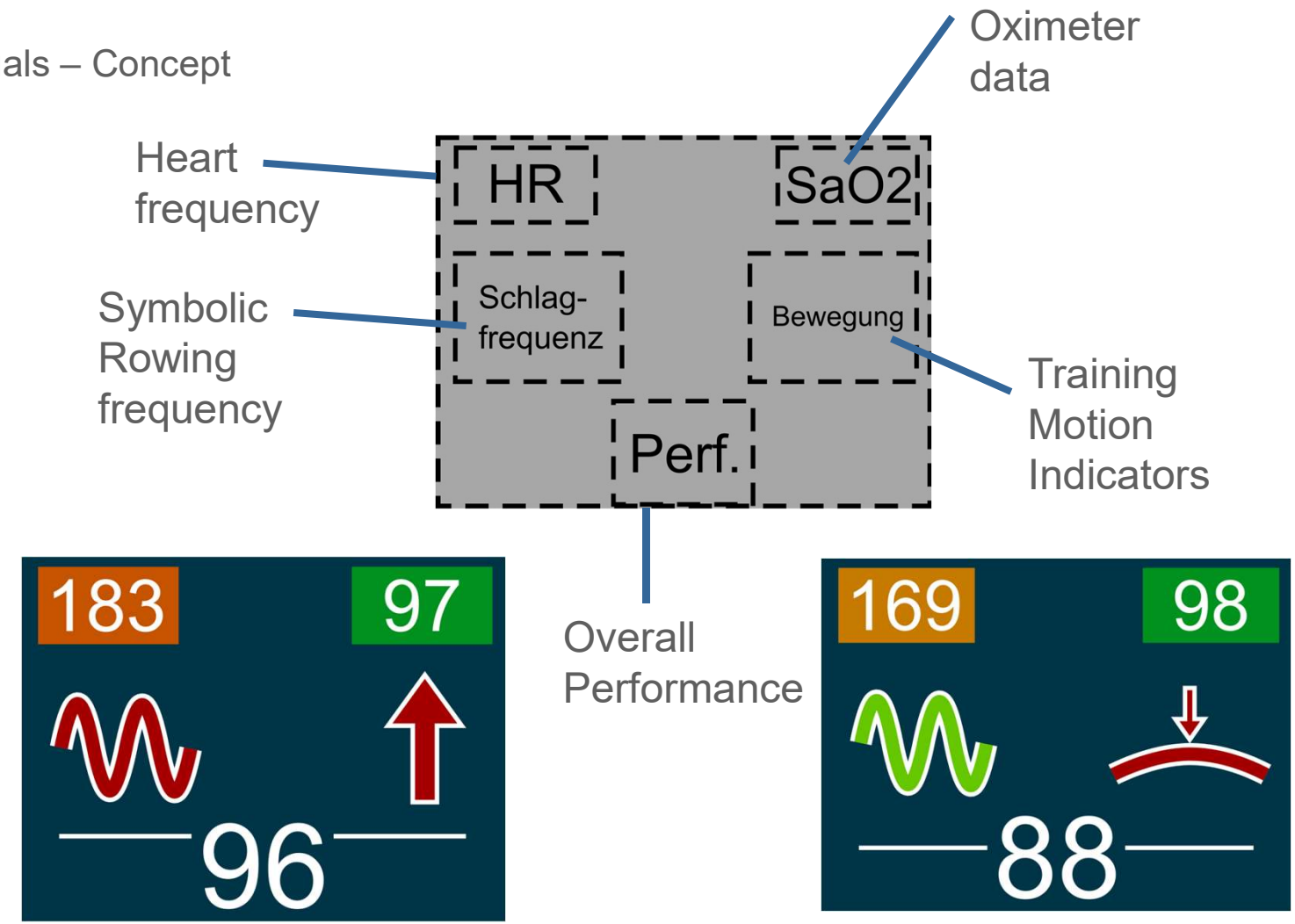
- Vital performance parameters
  - Heart beat
  - Oximeter
- Biomechanical performance data
  - Force sensors
  - Angle sensors (inclination)

Visualization: Analysis of

- Total rowing movement
- Team Synchronicity
- Efficiency analysis

Scenario 5: Coaching - Visualization

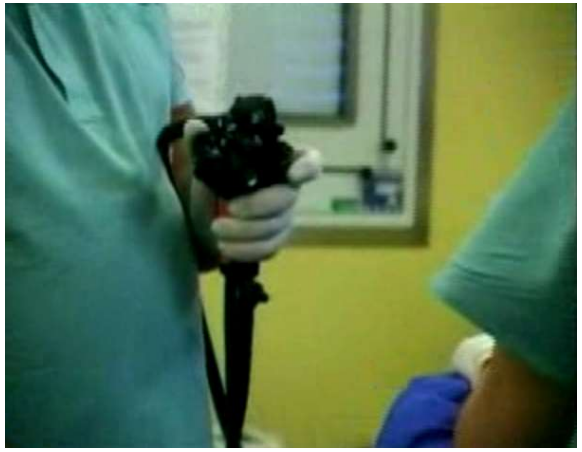
Visuals – Concept



Scenario 6: Endoscopy

Goals

- Support medical staff with patient vital data



Todo

- Access sensor stream (BT link)
  - heart rate data
  - Oxygen level
- Visualize data
- Integrate display & mirror into medical glasses

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Tourist guide with additional infos

Problem:

A tourist needs a guide through Vienna, but doesn‘t want to use a map. She/he wants to have additional information about buildings, pubs and other attractions.

Scenario:

The Spectacle Micro Display is integrated into the sun glasses of a tourist and marks her/his position on a map as compass rose. Now the tourist is guided through the Vienna downtown. On occasion the display advises him/her of the nearby buildings, pubs and other attractions.

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Support for product choice by nutrition comparing

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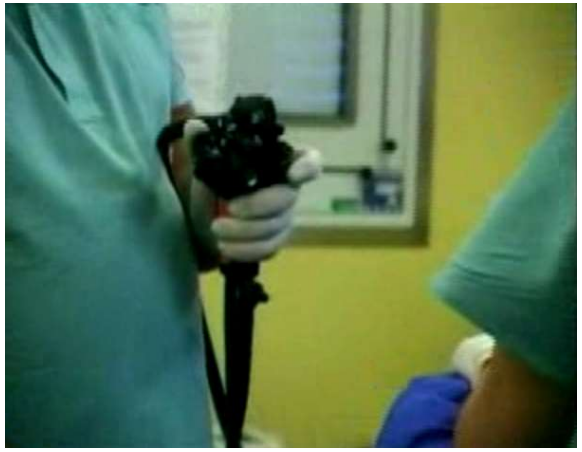

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vital functions:

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O trains with his oarsmen team. The vital function are now displayed via a PDA-Display, which can't be seen by O. The coach beats time via a megaphone.

Scenario:

O sits on the rower with Spectacles. The vital functions are shown on the Spectacles Micro Display. O's team-mate comes in and talks to him. He can't see O's vital functions.

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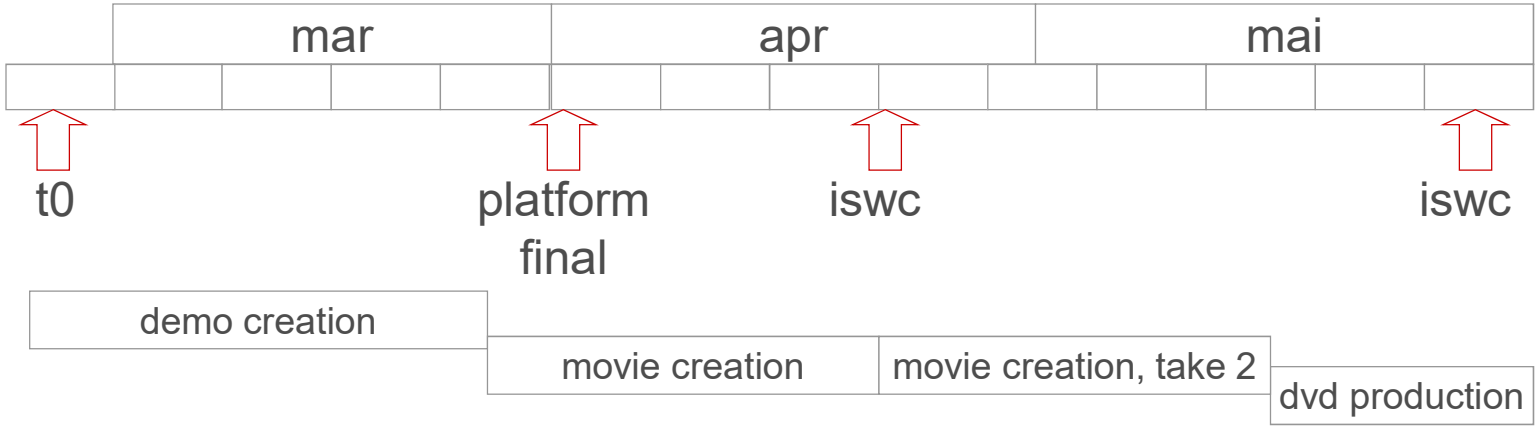
SPECTACLES Scientific Documentation

⑩ Project Timeline



Platform Integration Tasks

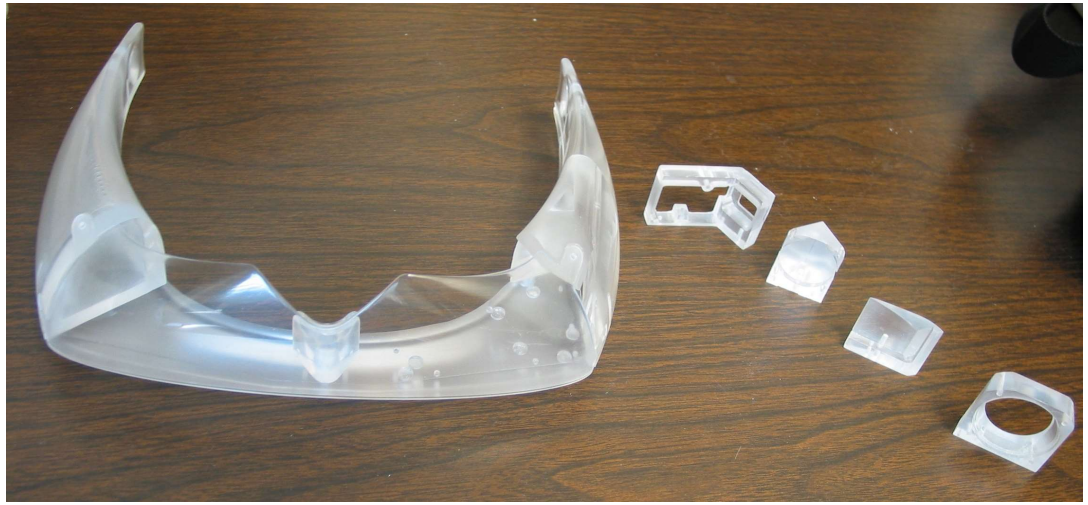
Scenarios

SPECTACLES :: Hardware Integration Tasks

Tasks for portable platform

- Add LiIon pack to platform
- Encapsulate computing platform in shell
  - Add control buttons (l,r,ok?)

- Integrate mirror, display in example frame for takes



SPECTACLES :: Hardware Integrarion :: Optics

Video Production requirements

- Integrate mirror, display in example frame for takes