Markers of healthy life styles adherence by using smartphones as monitoring device.

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OUTLINE:

1.- Introduction
2.- Goals
3.- System Architecture
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7.- Next steps
Introduction

Increasing life Expectancy

promotion of healthy lifestyles

aging with wellbeing guaranty
Introduction

Healthy life styles

- Exercise
- Socialization
- Nutrition
- Stress
- Drowsiness
- Circadian rhythms
Introduction

Variables:
- Physical activity
- Peripheral temperature
- Light exposition
- Heart Rate
- Social networks
- Respiration
- localization
- Position
- Psychology

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Goals

1. Development of sensor platforms for measuring biological and behavioral signals for the assessment of the condition of the individual

   Sensor platform = physical sensor + psychological questionnaires analysis

2. Development of a modular acquisition system, portable (wearable) ...and inconspicuous.

3. Development of signal processing algorithms to evaluate healthy life styles adherence
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System Architecture

Camera
Gyroscope
Acelerometer
Atmospheric pressure sensor
...

3G, 4G, ...

Low Power

Camera
Gyroscope
Acelerometer
Atmospheric pressure sensor
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System Architecture

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What have we done
Measuring Heart Rate Variability with accelerometer

Accelerometer signal: Z channel

RR interval calculation
What have we done

Heart Rate Variability as stress predictor.
How good is our signal?

Comparison: RR ECG / iPhone

FCB - Bàsquet Base - Resultados - Jugador D.M.

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What have we done

Measuring Heart Rate and respiration by video signal analysis

Very small changes in image <1LSB
What have we done

Drowsiness Detection

P9: Wireless for fleet tests

P9 – Drowsiness detection through the analysis of driver’s biological data. System addressed to driver’s fleets, is composed by 2 modules:

• Portable biomedical sensor that sends variations of the thoracic effort through Bluetooth.
• Smartphone: Application in the Smartphone that allows to analyze and store data and that it is used as interface with the user
• Possible system functionality

• User identification
• Characterization signal strategy
• Data sending remotely to a control center for testing purposes.
• Send an automatic SMS to a preprogrammed telephone number
What have we done

Drowsiness Detection

Drowsiness detection algorithms estimates fatigue based on the morphology of the respiratory signal

- **State 0 (Apt to Drive)**: Respiration signal characterized by stability in amplitude and frequency
- **State 1 (At-Risk to Drive)**: Respiration signal characterized by appearance of yawns and sights
- **State 2 (Not-Apt to Drive / Somnolence)**: Respiration signal characterized by appearance of "chaotic" patterns
What have we done

Drowsiness Detection

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What have we done

Bioimpedance Contactless Respiration Sensor.

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What have we done
Weekly Physical Activity Log (RSAF in Spanish)
What have we done

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Where we are now

RSAF, Automatic activity identification

Walking

Car driving

Climbing stairs

Acceleration spectrogram, file: AcelerometerData-13-05-10-03-33-22.dat

Acceleration module

Height (Atmosferic Pressure)

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Where we are now

RSAF, Automatic activity identification

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Where are we now

www.healthsportlab.com

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Who have made this possible
Resources
Next steps

Go on with Drowsiness detection

Go on with RSAF

Go on with FITLAB

Start with nutrition

Adding circadian rhythms

Built a set of modular systems

Recercaixa project
What’s the future?

Changes in current model of health care
- Personalized medicine
- Promoting Prevention
  - CHF, High BP, Diabetes, Asthma … (most common chronic diseases)
- Patient at home

http://www.qualcommtricorderxprize.org/