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Wearable monitoring of elderly in an ecologic setting: the SMARTA project

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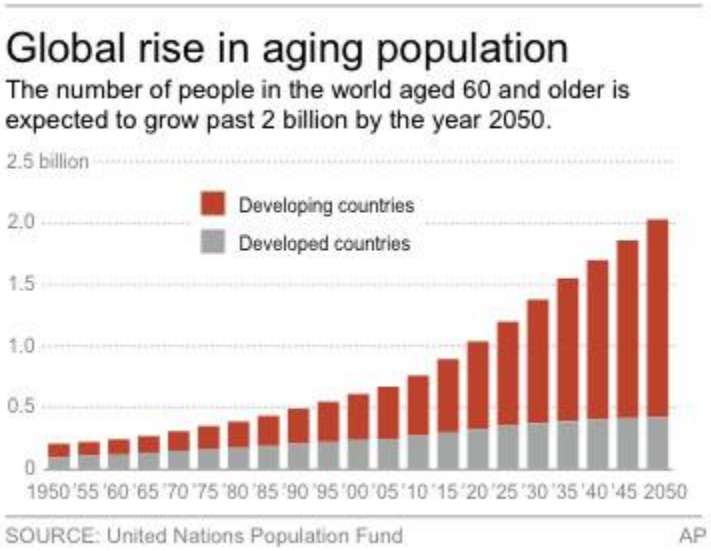
Introduction

2 billion people will be aged 60 and older by 2050.
This represents both challenges and opportunities.

World Health Organization



Older people make important contributions to society as family members, volunteers and as active participants in the workforce. The wisdom they have gained through life experience makes them a vital social resource.
However, along with these benefits come special health challenges for the 21st century.

It is important to prepare health providers and societies to meet the specific needs of older populations. This includes:

- training for health professionals on old-age care;
- preventing and managing age-associated chronic diseases;
- designing sustainable policies on long-term and palliative care;
- and developing age-friendly services and settings.

The SMARTA project

SMARTA project is developing and testing a system integrating personal and environmental sensors for the realization of services that are placed on different levels:

- Monitoring of vital signs and lifestyle (e.g. no. of steps inside the house/environment).

- Supporting the adoption of active lifestyles (e.g. performance monitoring of motor and physiological fitness exercises/prevention) and/or rehabilitation (exercises driven through video and the system is able to record the performance and movements).

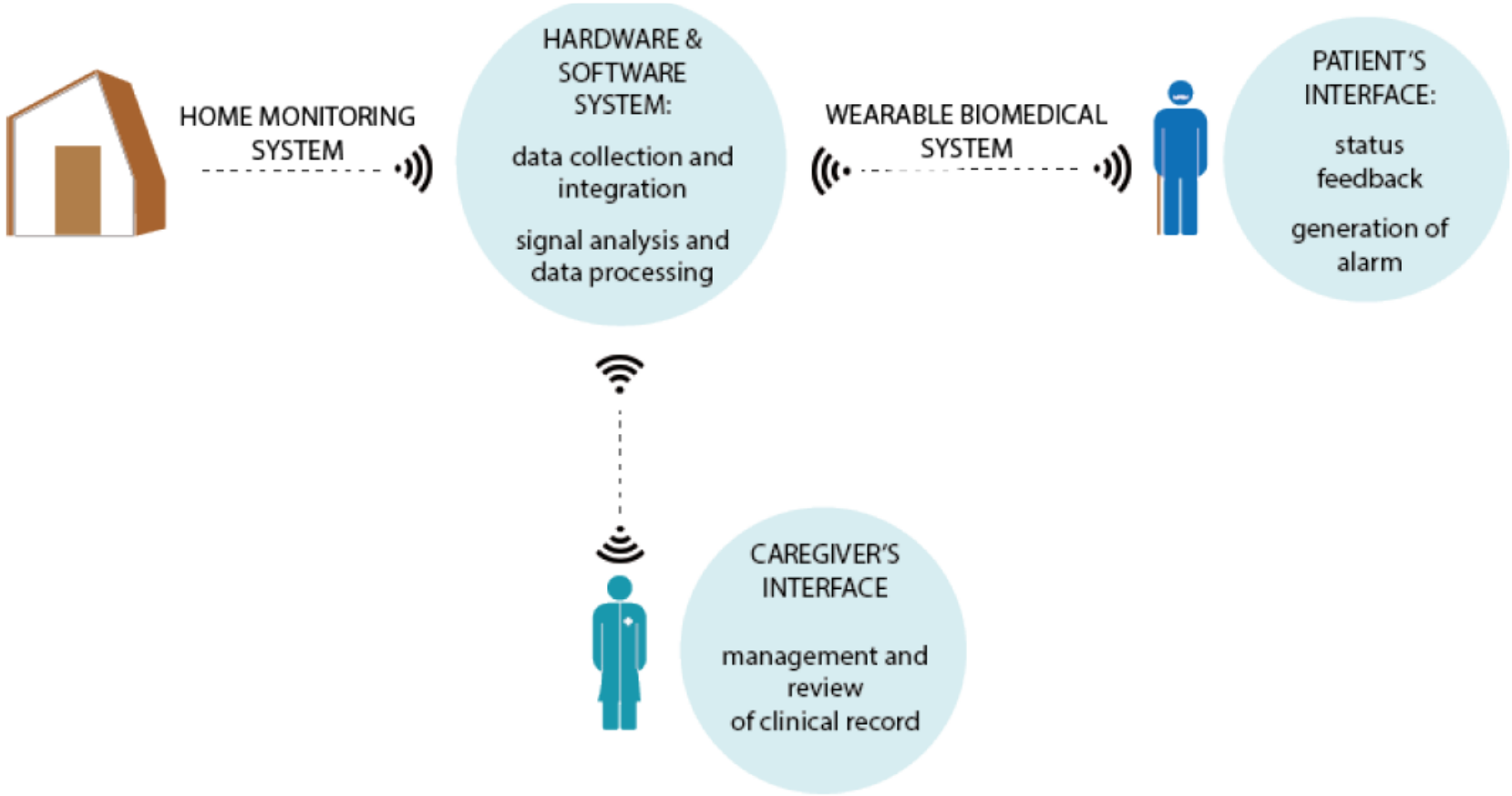
- Safety system environment (detection of falls, intrusion detection through detection of footsteps on the floor).

These sensory systems send data to a body/home gateway that redirects them to a center which concentrates the data and implements the above services.

The SMARTA Project

System architecture

The biomedical monitoring system is composed by wearable and non-wearable sensors. The wearable sensors are: Pulse-oxymeter, Sensorized garment for ECG; Fall sensor.

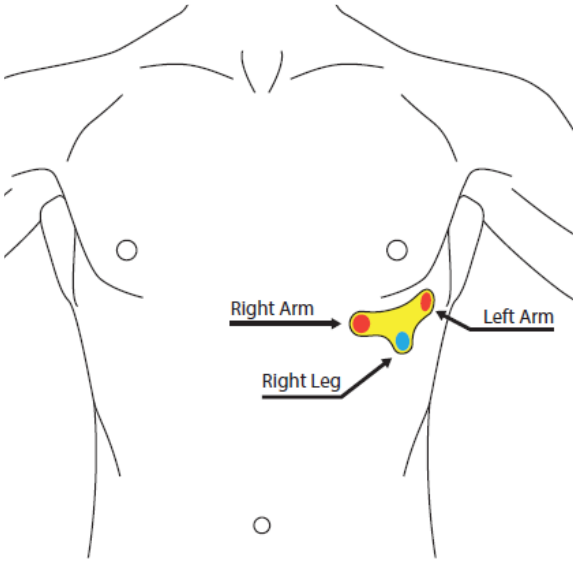


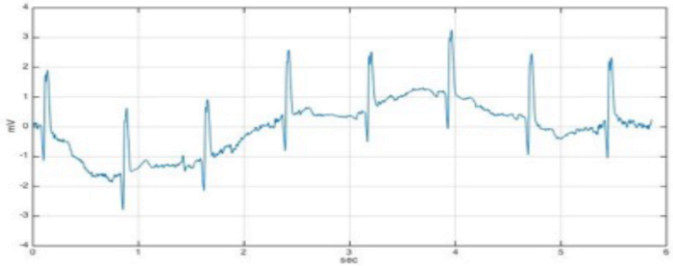
The SMARTA Project

System architecture

- Wearable system:

  a sensorized garment in male and female version and coupled with a small electronic unit (Flextronics, IT) for non-intrusive monitoring of 1 ECG lead and trunk actigraphy.





The signal is acquired at a sample frequency FS = 256 Hz with 24bit resolution. The raw signal and the processed data are stored in an internal flash memory then streamed through Bluetooth connection. The same device has also a three axes accelerometer used for wearable fall detection.

The SMARTA Project

System architecture

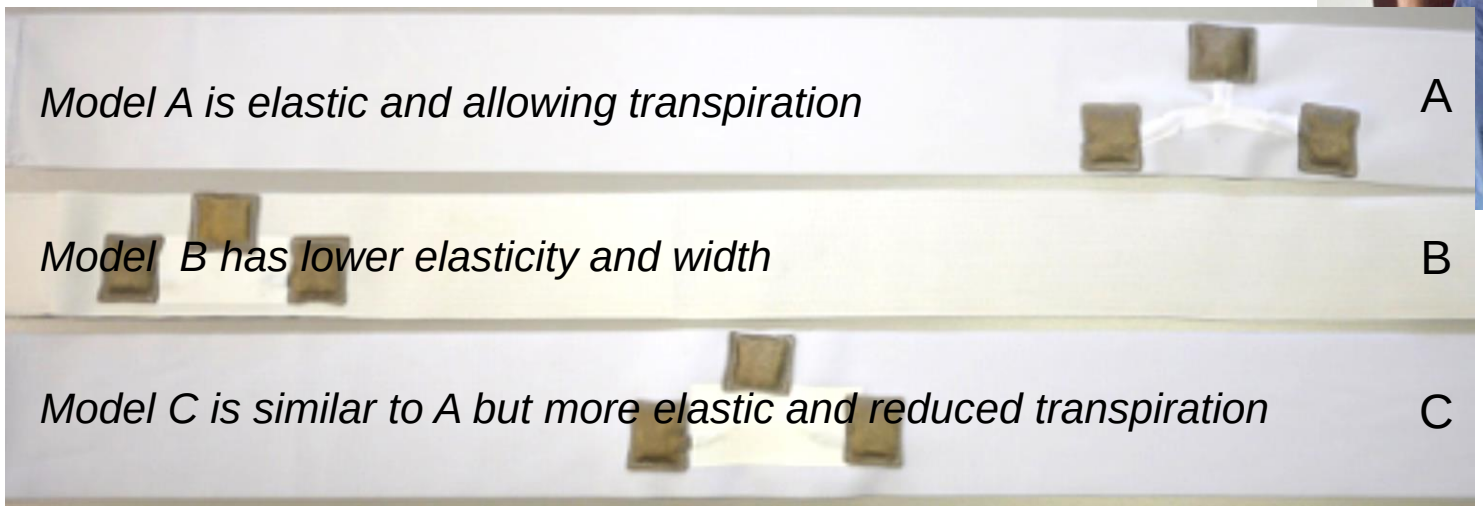
- Wearable system:

  Wearability analysis → male version

- Female version

  3 versions

  signal quality + wearability tests



The SMARTA Project

System architecture

- Environmental system:

  we proved the feasibility of detecting falls and ADL by a set of mono-axial and tri-axial accelerometers attached to a floor.

  Note: the proposed vibration method does not require sensors to be attached on the subject.

  3 phases:

  - Floor vibration transmission characterization
  - Fall and event simulation and modeling
  - Detection tests

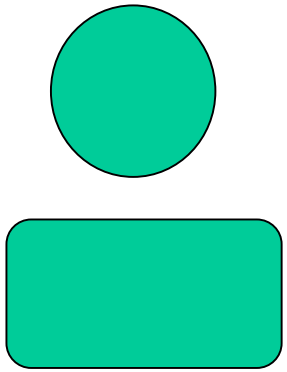
Conclusions

Ongoing clinical trials:

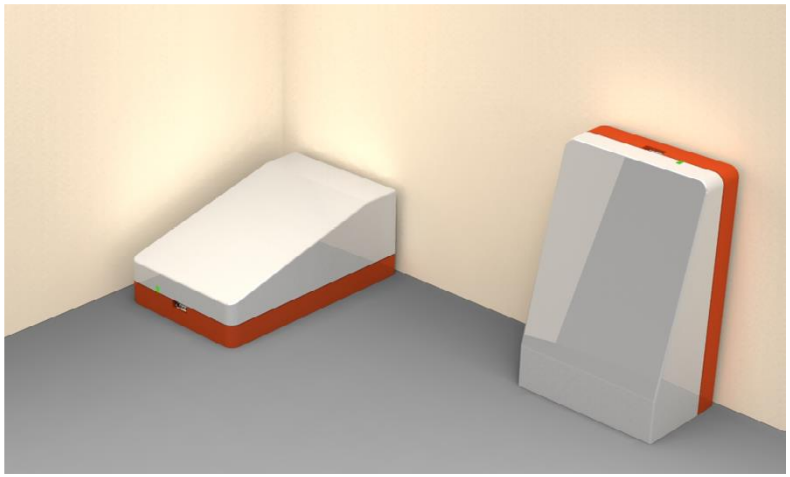
- Fondazione Don Gnocchi @ DAT
  - 5 healthy subjects
  - 10 cardiologic patients in home care setting simulation
- CoDeBri and INRCA
  - 5 cardiopulmonary patients in home care (after dismissal)
  - 5 elederly at home

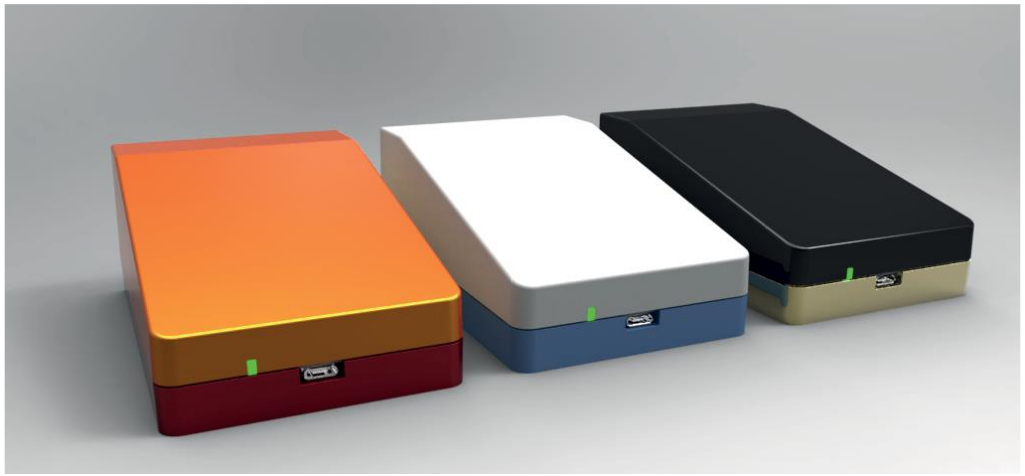
Conclusions

- System Design and Acceptability test
- 5 users (3 males, 2 females; aveg yrs 77,4±2,5)
- VAS (rate 0-10)



	circle	triangle	rectangle
avg	1,8	9	5,4
SD	0,8	0,7	0,5





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- For further reference: www.smarta-project.it

Thank You

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