TCare: An AI-based teleassistance system for emergency monitoring

Departamento de Automática, Universidad de Alcalá

Intelligent Systems Group

Aragon Open Future

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Intelligent Systems Group

ISG activity

- Responsible since 2008
- 9 PhD (3 departments)
- + 25 projects (public/private)
- Participation in 14 projects
- 40 indexed journal (JCR)
- 15 non-indexed journal
- + 100 papers Int. conferences
- 2 Spanish & 1 USA patents

ISG Research lines

- Artificial Intelligence and Robotics
  - AI Planning (tasks & paths)
  - Cognitive control architectures (in robotics)
- Machine Learning
- Optimization (i.e. Genetic algorithms)

ISG Projects

Private/Public funding

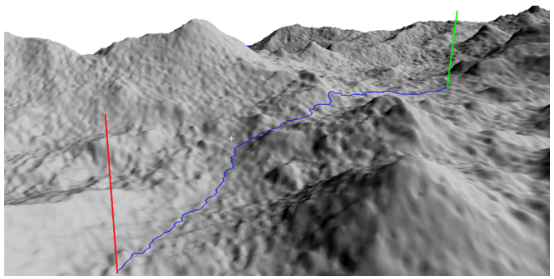
1. SAVIERX2: Demonstrator of man-machine interaction technologies with Drones. Airbus
2. Using ML as methods for maintenance prediction errors based on the condition in ships of the Spanish Navy (SOPRENE). Indra S.L for Spanish Navy
3. Cooperative systems for autonomous exploration missions. ESA
4. Autonomy for Interplanetary missions. ESA
5. LARES: Supervision in the assistance of the elderly and disabled. JCCLM-Spain

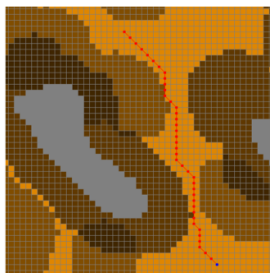
ISG Projects

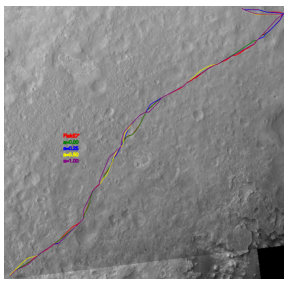
Path Planning

Jet Propulsion Laboratory
California Institute of Technology

- Agreement with JPL-NASA for using it with Curiosity & Opportunity
- Terrain feaures (map costs): Field D*
- Heights (DTM)
- 3Dana
  - Type *any angle* on real surfaces
  - Allows DTM and/or costs
  - Better results
- Google VR Cardboard: VR environment of Mars surface (HiRISE data)







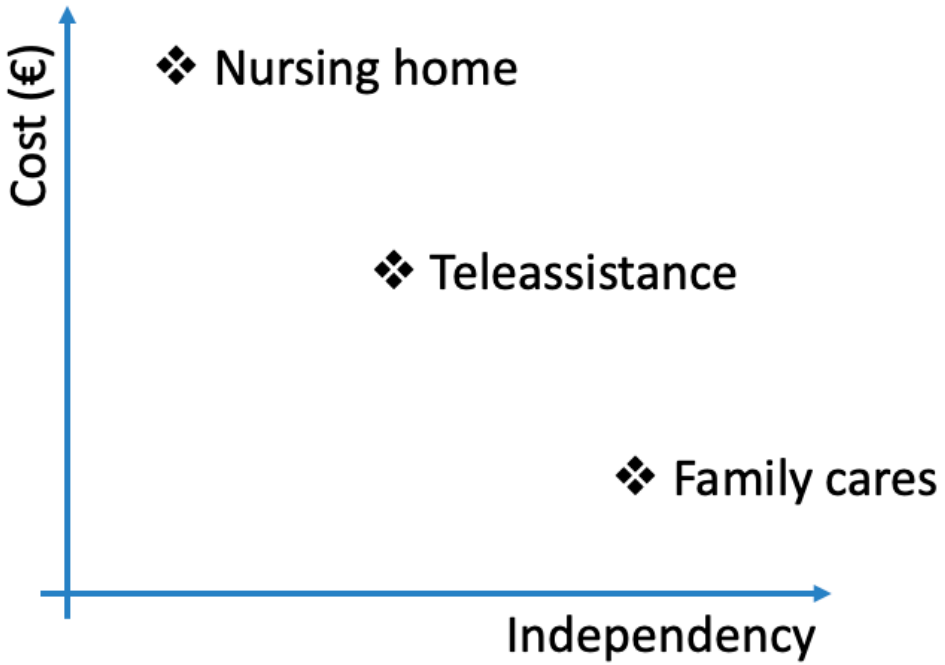
TCare

Supervision in the assistance of the elderly and disabled

Introduction

- Ageing population is a sign of an advanced technological society
- Ageing often reduces:
  - Mobility
  - Mental capabilities
- Disability has high cost of in social terms
- Older and handicap adults often require caregiving:
  - Nursing homes
  - Teleassistance
  - Family cares

Introduction



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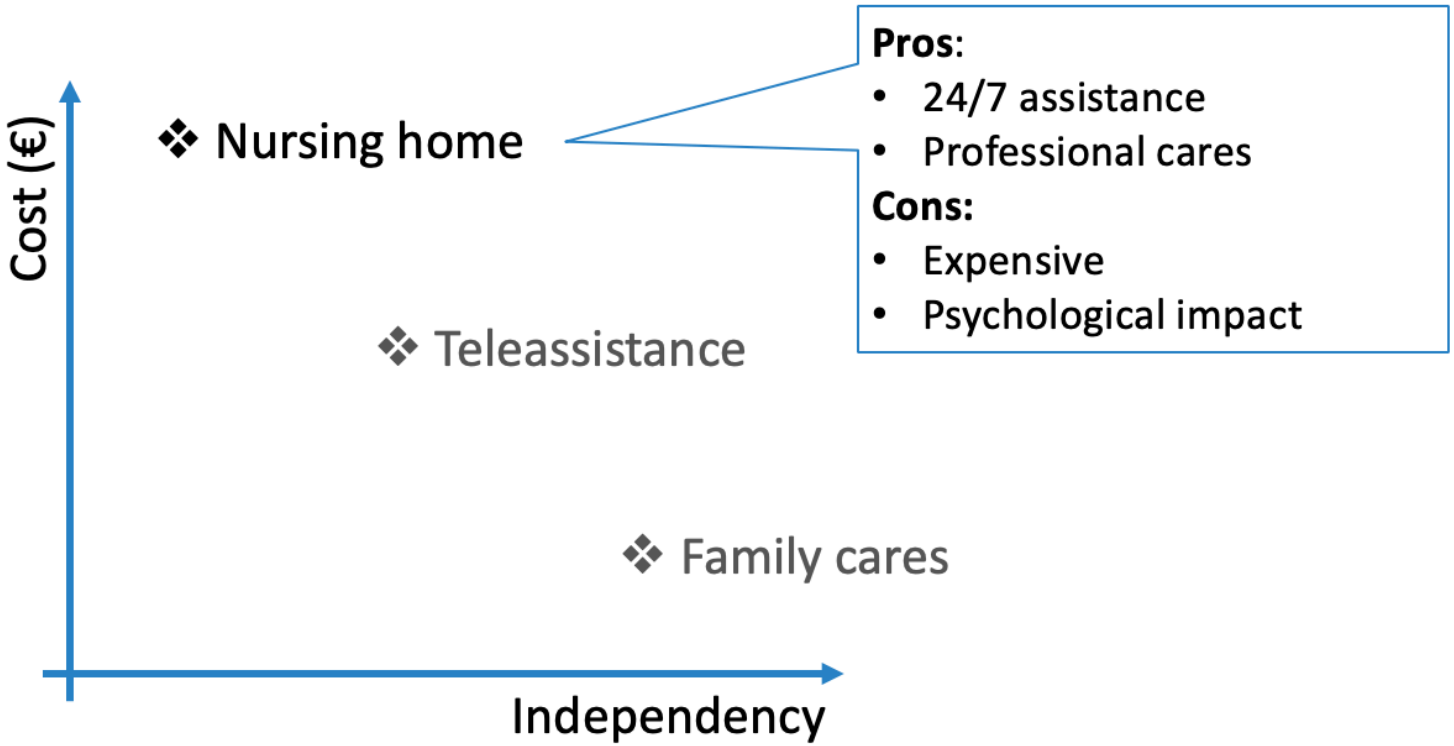

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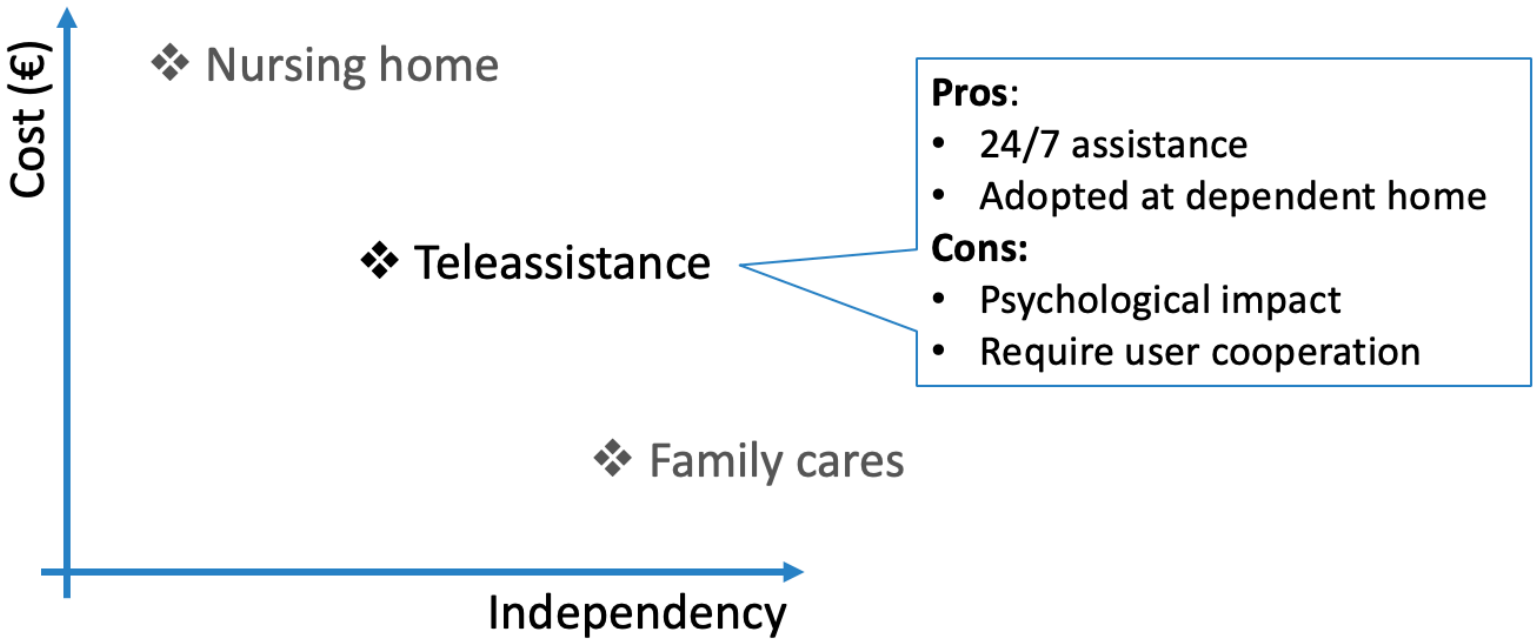

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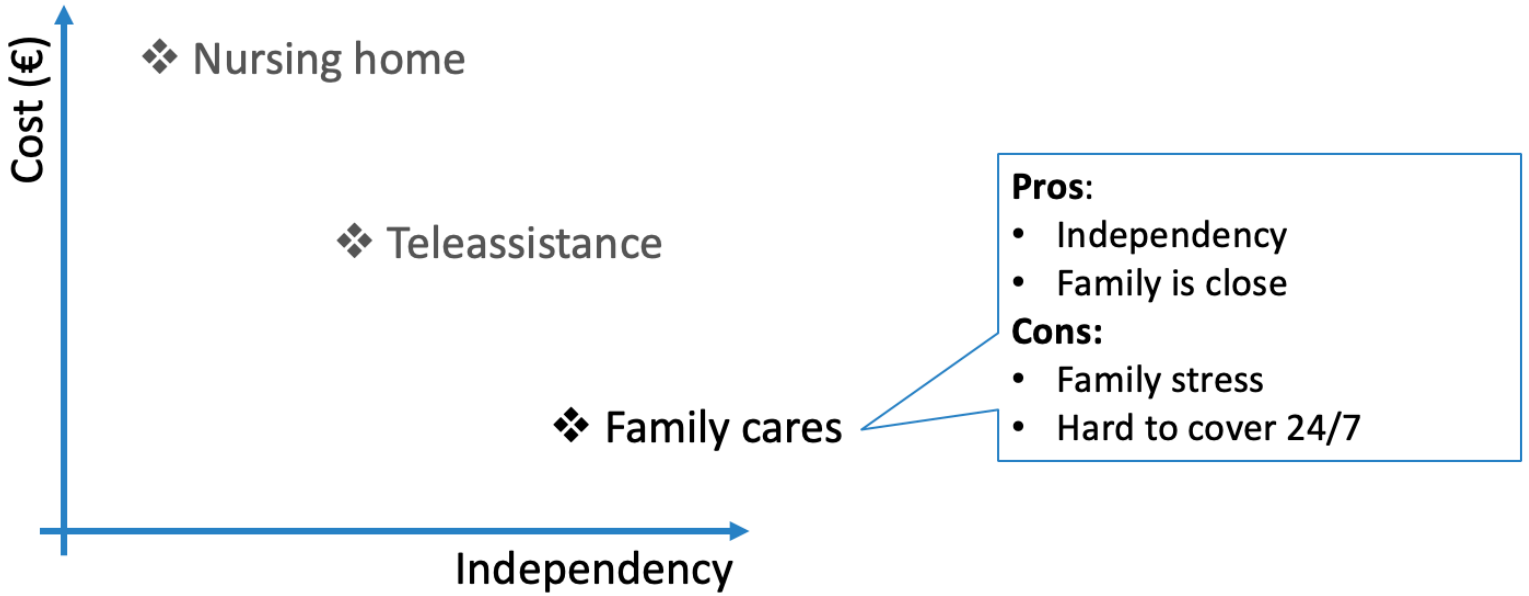
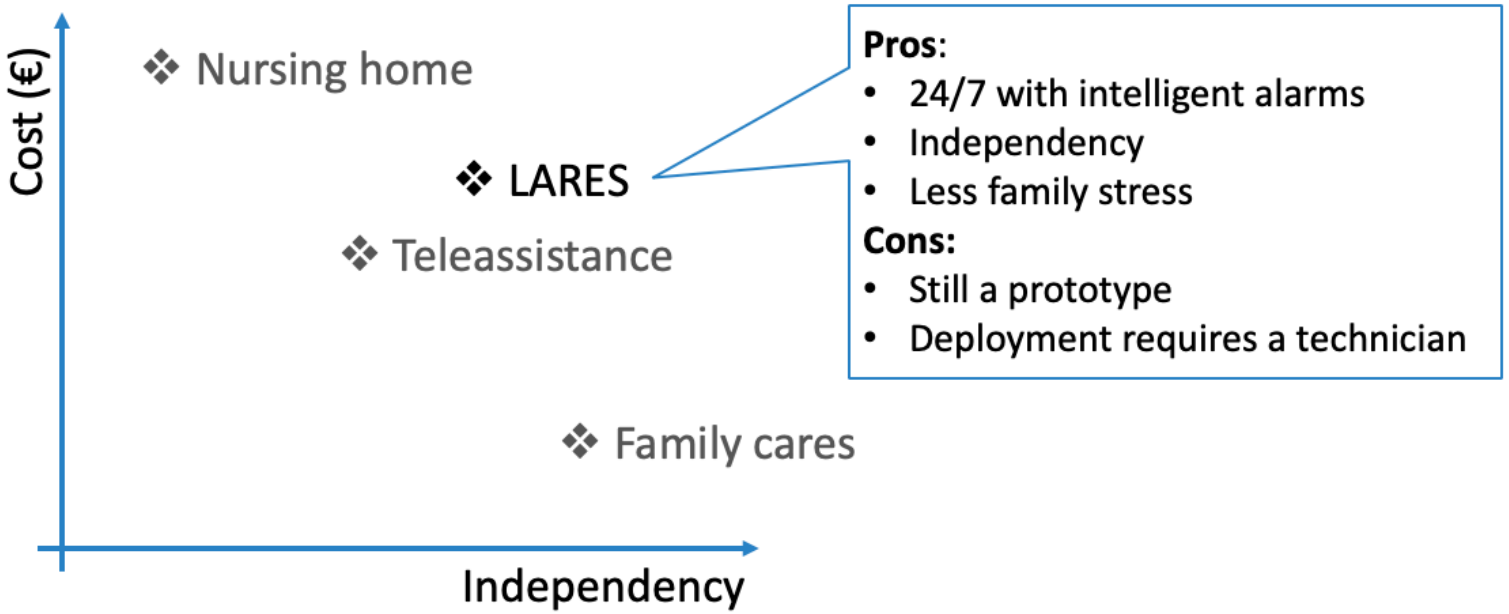


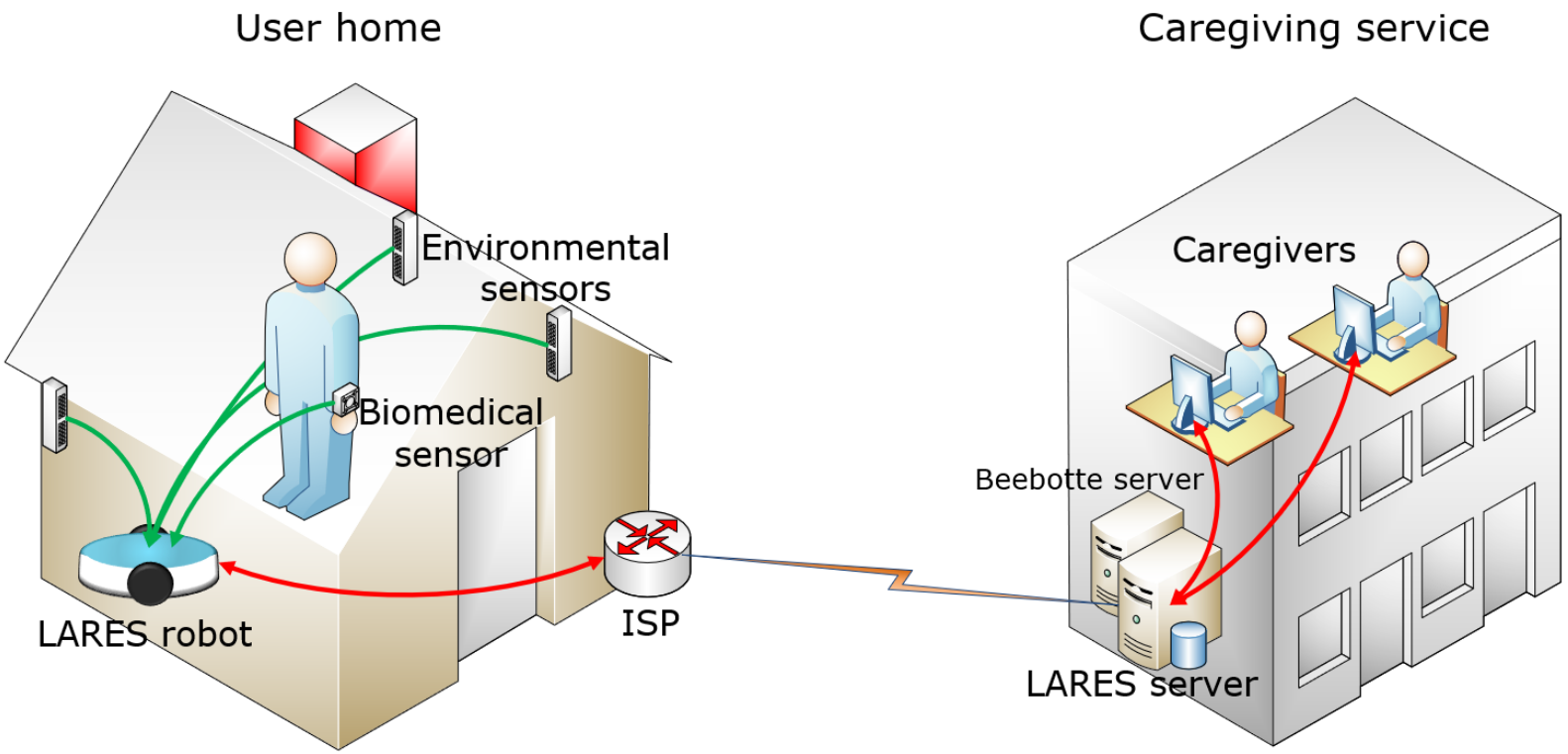
TCare Concept

- Classic teleassistance requires user cooperation
- TCare proposes:
  - Passive teleassistance
  - Telepresence
  - Privacy
  - Moderate costs

TCare Concept



TCare Components



TCare Components

Wireless Sensors Network

Enviromental sensors

- Low consumption IoT sensors
  - Temperature
  - Humidity
  - Presence
- XBee communication
- 2 months battery operation (approx)

Biomedical sensor

- Smart watch with Triaxial Accelerometer
- Detecting falls

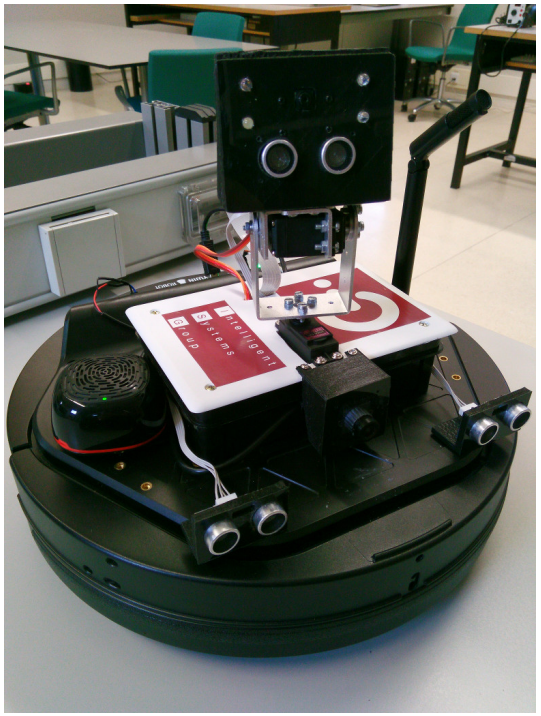
A Low Power Consumption Algorithm for Efficient Energy Consumption in ZigBee Motes. Sensors 2017, 17 (10), 2179;

Triaxial Accelerometer Located on the Wrist for Elder People's Fall Detection. IDEAL'2016

TCare Components

Autonomous robot

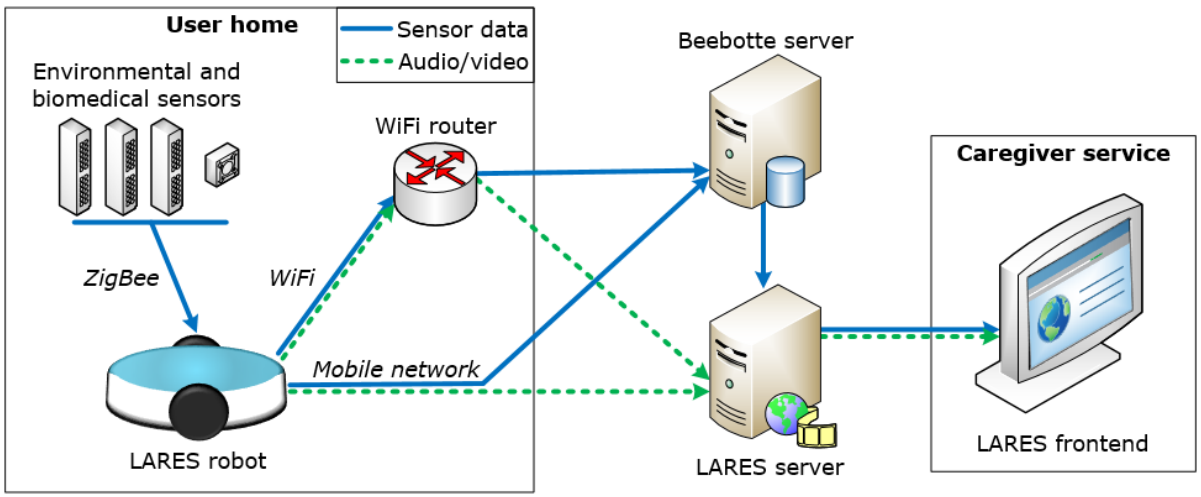
- Sensor data assessment
- Teleoperation on-demand
- Autonomous navigation:
  - From dock to alarm location
  - Return to dock
- Video from house to caregivers
- Bidirectional audio



LARES Components

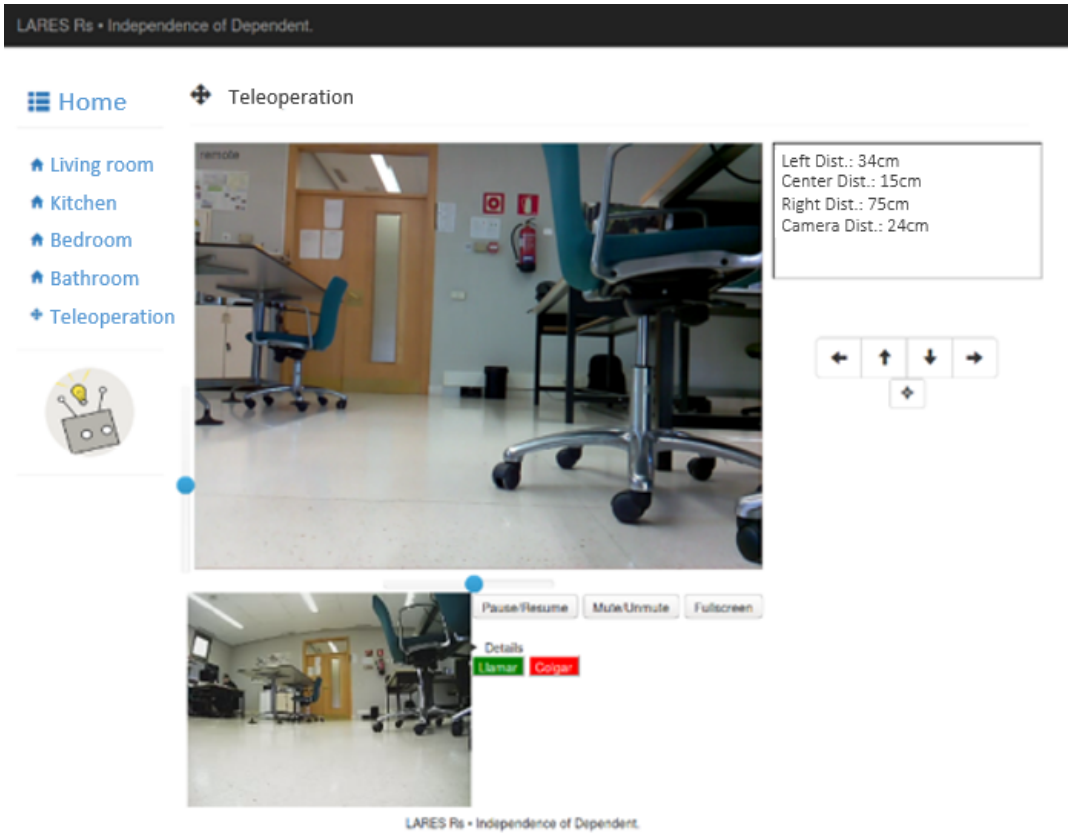
Cloud platform

- IoT server for storing sensors data
  - Last hours easily accessible
  - History storage
- Teleoperation interface



TCare Components

Frontend



TCare

Experiments

2 cases

- 75 years-old man living alone
  - Needs supervision
  - Flat with internet connection available
- 86 years-old woman living with a professional caregiver
  - Big house (three levels)
  - No internet connection

LARES: An AI-based teleassistance system for emergency home monitoring. Cognitive Systems Research. 2019

TCare

Future extensions

- Smartphone (falls, communication)
- Bracelet (falls, glucose, communication)
- Avoid technical frontiers & promote social interaction