Lucerne University of Applied Sciences and Arts
HOCHSCHULE LUZERN

i|Home|Lab

Swiss Think Tank and research Laboratory for Intelligent Living

Sensor Technologies in Ambient Assisted Living Applications

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Agenda

- **Introduction**
- **AAL Requirements**
- **Solutions in the iHomeLab**
  - Ultrasonic Indoor Localization System
  - Miniaturized Awareness Sensor Node
- **Application Examples**
- **The iHomeLab – Research Laboratory**

Introduction

Year 2035:
>1/3 people are older 65
>1/9 people are older 85!

HELP < --- > medication, memory, mobility, accidents

EXAMPLE --- > FALLING >**400'000** falls in the US; **3200** fatal

Care staff shortage; mistakes in medication; training shortfalls

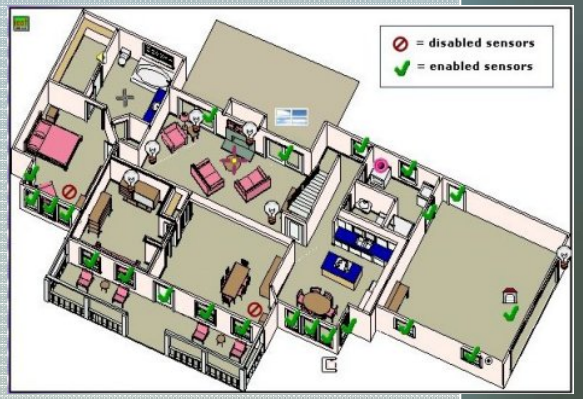
SOLUTION --- > PROCESS AUTOMATION

Sensor Technologies in AAL can
automate processes;
reduce burden on staff;
eliminate human error;
increase accountability

AAL Requirements

EFFECTIVE SUPPORT =

Condition Awareness
+
Behaviors



- **Informational Assistance**
- **Intelligent Environment Behavior**
- **Emergency Case Prediction**
- **Emergency Case Recognition**
- **Security**
- **Privacy**

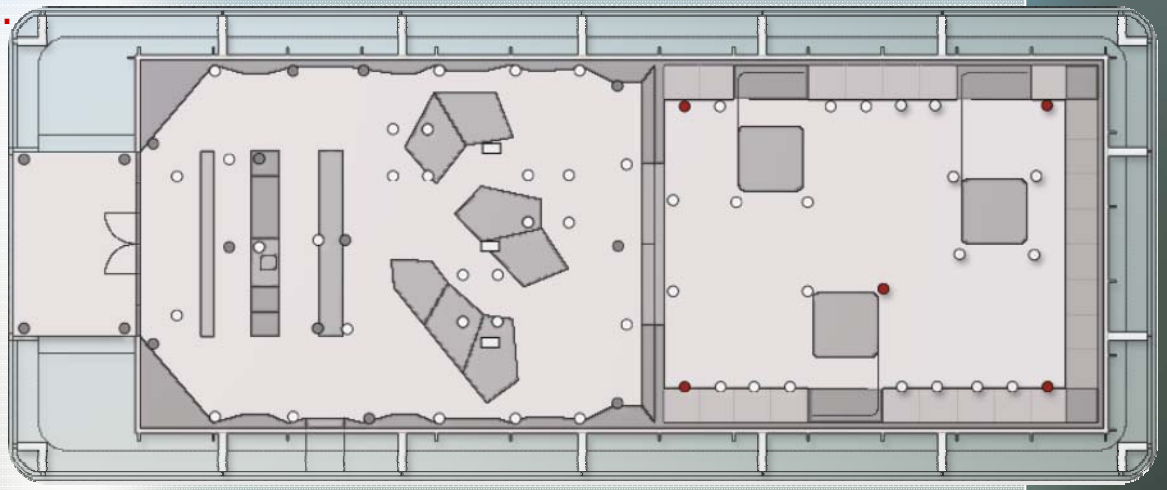
Ultrasonic Indoor Localization

Indoor positioning with
- **sensor data (acceleration)**
- **user feedback capability**
- **informational service**

Our system-in-test is composed of:
- **name tags**
- **reference nodes**
- **location estimation server**

The indoor positioning system shows reliable operation in initial prototyping stages, providing through selective data-fusion algorithm position detection accuracy fewer than 10 cm.

iHomeLab Installation:
- 70 nodes 6 clusters
- 16 meters max. signal range per node at 40kHz with 20 badges
- nodes are installed in-wall-ceiling-rack



Miniaturized Awareness Sensor Node

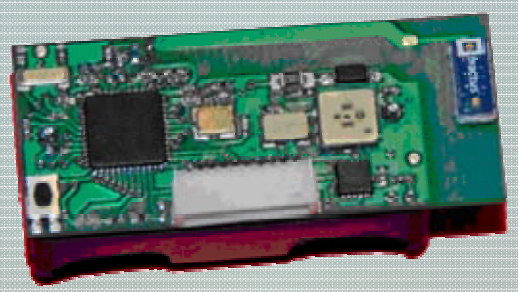
Sensors on Board:

- Temperature - precision of 0.2K
- Acceleration - ultra low power change of position interrupt
- Pressure - resolution of 0.03 hPa

WeBee 3G - versatile lowcost IEEE802.15.4 / ZigBee module for AAL.

Features

- Platform: TI-CC2430
- Size including antenna: 41 x 20 x 3 mm (w/o battery).
- Bidirectional transfer
- Lifetime: 2 - 3 years
- Cost < EUR 15



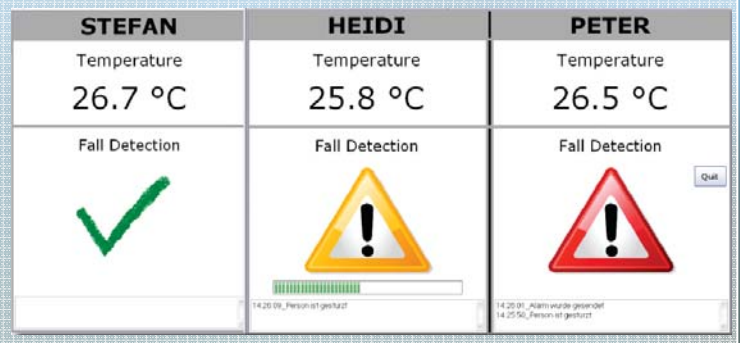
Applications

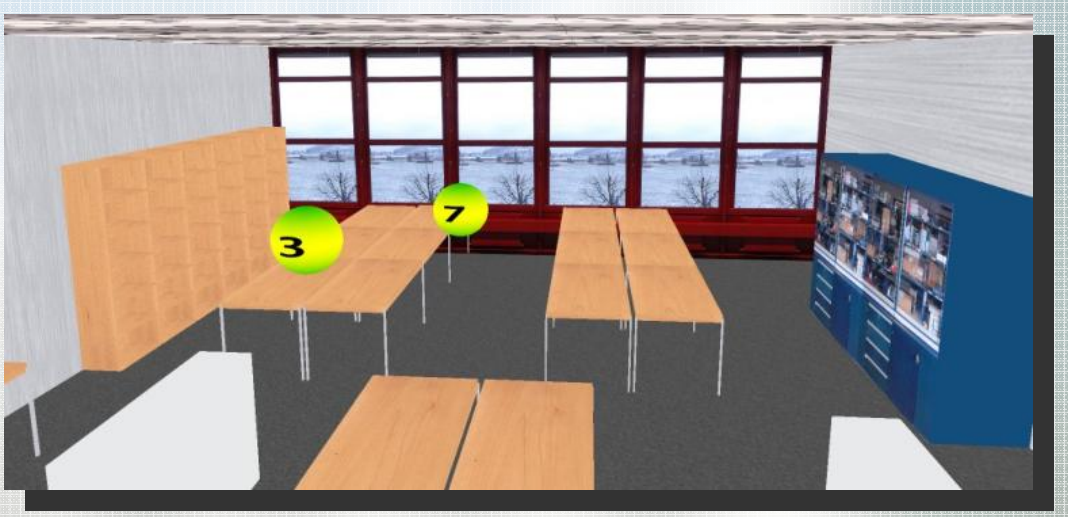
- Temperature measurements
- Loss of balance detectors
- Altitude change recognition
- Components of indoor localization system

Application Examples

Localization with Fall Recognition

- Simple C# applications to visualize location, and possible falls, using data stored on the location database.
- Extensible software framework exposes data for more complex applications and services.



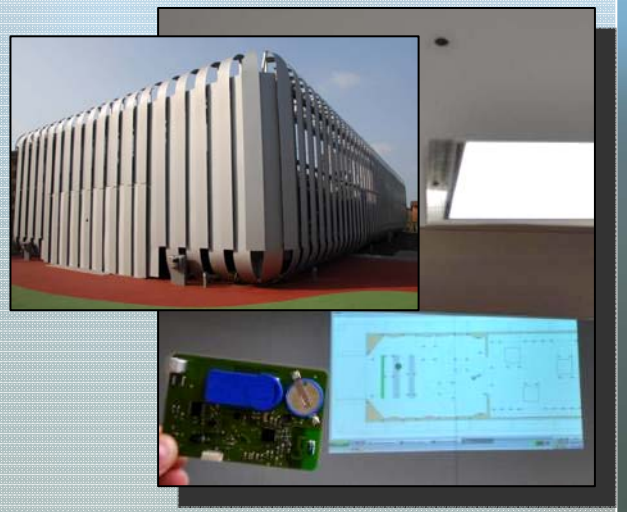


The iHomeLab - Research Lab

iHomeLab @ Lucerne University of Applied Sciences

Energy Efficiency
Ambient Assisted Living (AAL)
Human Machine Interfacing (HMI)
ZigBee
Indoor Localisation
Building- & Home Automation

Industry research partner
Partner for research consortia



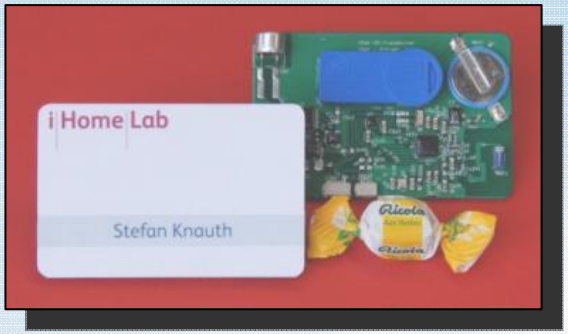
iHomeLab

- Deployment Location and Live Test Environment
- Since November 2008, 32 x 10 x 2 meters
- Latest building automation technologies..

Human-Building Interaction, Context Awareness & Indoor Localization, Home Network (KNX, ZigBee, digitalSTROM), Smart Metering, Edu & Infotainment, Content & Multimedia Management

- Think Tank for “Innovative Living Scenarios”
- Can be visited by public

Thank you for attention!



Ambient Assisted Living

To schedule a visit to experiments, see

▸ **www.ihomelab.ch** ◂