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
amtimate 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

Sensor Technologies in Ambient Assisted Living Applications
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

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

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Thank you for attention!