

Assistive Technologies 2

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Summer Term 2019

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15: AAL – Ambient Assisted Living

15.1 Introduction, Basics and Definitions

AAL - Ambient / Active and Assisted Living

Technology Assisted Living

Assistance à l'autonomie à domicile (AAD).

Techno-social discipline developed against the background of "demographic change".

The term was invented by VDI / VDE (Association of German Engineers).

An EU project 2004-2006 prepared a European Community initiative under Article 169 (Maastricht)

-> AAL-JP research funding program

Forced especially in Europe.

What does AAL have to do with communication?

Communication in the field of AAL

- Supplement / support in everyday life through technology as a form of augmentative / alternative communication
- (Social) communication, emergency call
- Human - machine communication
- Technology and people as a "team"
- Assistive technology (AT) with consideration of age-specific restrictions

What does AAL have to do with communication?

Communication in the field of AAL

- By this we mean communication of information and communication between people and their environment
- For old people, living alone can also become a barrier
- The AAL area is not just about old people but also information / communication for relatives
- So far in the lecture it has been focused on communication through AT, in the AAL area it is also about the social element in communication

Interaction takes place via the "user interface"

Assistance systems are complex systems consisting of many different components with many functionalities

Question: How to give the user access to this functionality in an intuitive and easy way?

In most cases, an assistance system offers several possibilities of interaction, e.g. Control with gestures, touchscreen (GUI), language.

Combined use of multiple interaction forms / modes (e.g. pointing device on device and voice command "turn on") possible (-> **multimodal interaction**)

Different interaction variants:

"Explicit interaction" is the deliberate control of the system, e.g. by hand gesture "Radio on", by GUI / Touchscreen, by ASR

"Implicit interaction" controls the assistance system by behaviors that do not require the attention focus of the user, e.g. entering a room or sitting on a chair

Is continuous access to all possible functionalities really useful?

Or is a restriction to a lower number of functionalities (see Apple) useful from the outset?

Goal: Simplification / clarity of operation

"Intentions-based interaction": the system learns / estimates which functionalities the user desires / needs in a particular situation and hides the remaining functionalities

"Goal-based interaction":

the user does not call certain functions of individual devices ("coffee machine") but he formulates goals that the assistance system should implement ("I would like to have breakfast in 5 minutes")

Relationship AAL \Leftrightarrow Assistive Technology?

AAL aims

with the use of intelligent **products**

and providing new **services** (such as in the elderly care) ...

- to extend the time while the elderly can stay in their familiar environment
- to increase their autonomy
- and to assist them in doing daily work to overcome barriers

AAL introduction

The process of implementing AAL was finally started on 14 June 2007 with the European Commission's Action Plan "Aging Well in the Information Society".

Since 2008, the AAL JP (Ambient Assisted Living Joint Program) has been implemented and has been extended each time. The participating countries change.

2014 renamed AAL JP (Active and Assisted Living Joint Program).

In some countries, additional national programs.

In Austria: "benefit" program of FFG and Bmvit (Ministry of Transport, Innovation and Technology).

In 2012 **AAL Austria** was founded as an association:

Building an Austrian AAL community.

Bringing together vendors and users.

Efficient exchange of experience between the participants involved.

Improving the "visibility" of AAL in public.

Raising awareness of the challenges posed by demographic change.

AAL Austria defines AAL and the objectives as follows:

Subsuming **concepts, products and services** that combine new technologies and the social environment with the aim of improving the quality of life for people in all phases of life, especially in old age.

AAL can be translated as: "Age-appropriate assistance systems for a healthy and independent life".

But: Technology is not everything, people are in the focus of AAL.

The technology consequently adapts to the needs of the user - and not vice versa.

AAL technologies also make it possible to meet the increasing comfort and security needs, as well as to facilitate communication and integration with the social environment.

In AAL (because of their side effects) ethical, social, ergonomic, legal and economic aspects play an essential role alongside the innovative supporting technologies and products.

Such solutions can also help reduce healthcare cost increases.

But it's not just about designing special applications for older people. What will be in demand in the future are products in a **universal design that are increasingly aimed at all generations**.

"AAL = concepts, products and services that combine new technologies and social environment to improve the **quality of life for people in all phases of life**"

See www.aal.at

AAL Definitions from VDE Application guide

VDE-AR-E 2757-1 (2013-05)

(shortened excerpts)

Mai 2013

	VDE-AR-E 2757-1	VDE
	Dies ist eine VDE-Anwendungsregel im Sinne von VDE 0022. Sie ist nach der Durchführung des vom VDE-Präsidium beschlossenen Genehmigungsverfahrens unter der oben angeführten Nummer in das VDE-Vorschriftenwerk aufgenommen und in der „etz Elektrotechnik + Automation“ bekannt gegeben worden.	DKE
Technikunterstütztes Leben – Ambient Assisted Living (AAL) – Begriffe		

Technical Assistance Systems (AAL) ...

Promote autonomy,
mediate or provide auxiliary services in the domestic
environment and
create an intelligent environment that adapts to the needs
of the user.

People are relieved, especially in situations of excessive
demands, fatigue and excessive complexity, and are able
to largely compensate for age- or disability-related
functional limitations.

AAL is based on the use of **information and communication technology (ICT)** in the objects of daily life.

The use of ICT technologies ranges from the intelligent data processing right up to the automatic decision support.

The acquisition of vital and environmental data is carried out by close-to-body and spatially distributed sensor systems.

AAL therefore includes ...

- methods
- concepts
- (electronic) systems
- products as well as services
 - which support the daily life of the people
 - depending on the situation (Context Awareness)
and
 - in an unobtrusive way

An AAL system is ...

- user centric and
- individually geared to the specific individual
- integrates into its direct living environment
- the technology used in the AAL environment can be modular and networked to allow adaptation to individual needs and the individual environment
- More than a single tool equal for all



AAL Austria

<https://www.youtube.com/watch?v=D2udr6l9gjk>

15: AAL – Ambient Assisted Living

15.2 AAL and the Demographic Change

The "**Demographic Change**" (Source Statistics Austria) – facts as driving force behind AAL

The group of "young old people" between 65 and 79 years will grow very strongly.

Already in 2015, with 1.17 million there were 9% more younger than in 2010 (1.08 million),
2020 by 14% more (1.23 million).

By the year 2030, their number will rise to 1.52 million (+ 42% compared to 2010).

The "Demographic Change" (Source Statistics Austria)

The number of old and very old persons (age group 80 and more) will experience the strongest growth in the long term.

Already in 2015, with 426,000 people in Austria there were 5% more over 80 years old than in 2010.

By 2020, their number will increase to 486,000 (+ 20%).
By the year 2030, their number should already be 57% higher at 635,000 than in 2010.

The "demographic change" (source www.aal.at)

Since 1993, the number of long-term care recipients in Austria has steadily increased from 230,344 to 431,914 (+87.5%).

From 2011 to 2012 from 359,521 to 431,914 (+ 20.1%)

83% of those in need of care are cared for at home.

Only 17% housed in nursing homes.

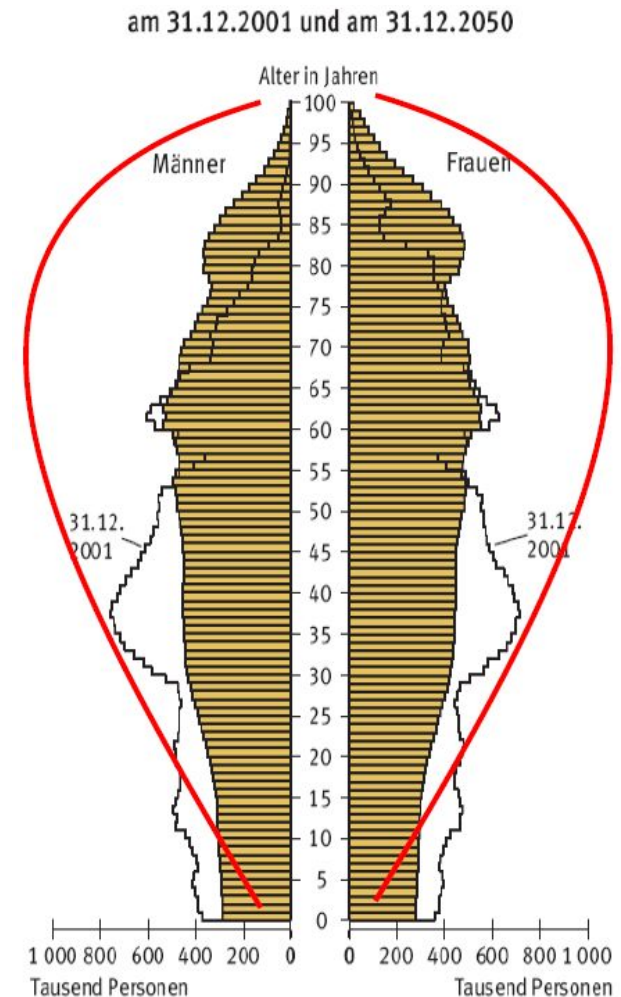
The total cost that the state will spend on care in 2012 is estimated at € 4 billion.

By 2020, costs are expected to increase to around € 5 billion.

Panic: Help, we are getting older!

Much is therefore summoned ...

- ... the "sword of Damocles" of demographic development
- ... the "care emergency"
- ... the "apocalypse of the pension system"
- ... the "aging" of the population threatens.



Fears: Economic aspects

„Die Presse“ – 11. November 2010

„aging endangers credit rating“



Studie. Die steigenden Ausgaben für Pensionen und Gesundheitssystem könnten laut „Standard and Poor’s“ schon in zehn Jahren dramatische Konsequenzen haben. VON NORBERT RIEF

Überalterung gefährdet Kredit-Rating

Fears: Economic aspects

„Die Presse“ – 11. November 2010

„Age makes debt all over the world explode“

**Das Alter lässt
weltweit Schulden
explodieren**

S&P prognostiziert für 2050 eine
Schuldenquote von im Schnitt 245
Prozent in 49 Ländern.



Optimism: Economic aspects

TU Wien – 03. November 2010

„Don't be afraid of the birthrate decline“



Technische Universität Wien

TU Wien > Aktuelles

2010-11-03 [[Florian Aigner](#) | Büro für Öffentlichkeitsarbeit]

Keine Angst vor dem Geburtenrückgang!

Die Bevölkerung altert – und demographischer Wandel verändert auch das Arbeitsleben. Doch laut Studien der TU Wien können die Auswirkungen durchaus positiv sein.

Concepts: Economic aspects

“The economy expects savings potential of around three billion Euros if only about one-tenth of older people could remain in their own households for a year longer using assistance systems”

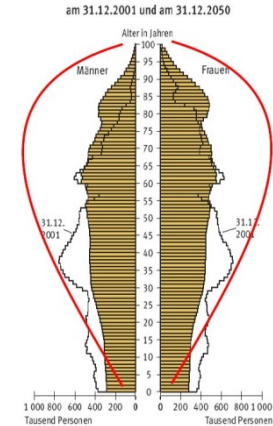
**Deutsches
Ärzteblatt**

Source: Deutsches Ärzteblatt 2009; 106 (7)



The situation is complex
And AAL cannot solve everything

Connections and future developments
are difficult to predict.



Michael Amon writes in The Standard
of 3. 9. 2010 under "Demographic gap or lie":

“Anyone who claims that the pensions of 2050 have
been secured is a charlatan.

Whoever claims the opposite is the same.”

Extending independence brings benefits for the elderly (AAL could be a welcomed solution):

“Only 9% are willing to change into a care home, 91% of older people want to grow old at home”

Studie: Nur wenige wollen ins Heim

Nur neun Prozent von über 6.200 Befragten können sich vorstellen, den letzten Abschnitt ihres Lebens im Heim zu verbringen.

Das ist eines der aufschlussreichen Ergebnisse einer aktuellen Untersuchung in Deutschland. Nach Ansicht der Bundesinitiative Daheim statt Heim sind die Resultate ein klarer Auftrag an die Politik.

15: AAL – Ambient Assisted Living

15.3 History of AAL

Root of AAL: technical design of the living environment for the disabled and the elderly

Developments until about 2005:

- Emergency call systems

- Environmental controls

- Smart Homes

Developments from around 2005

- Ambient Assisted Living (AAL)

- Tele-Health, Tele-Monitoring

- Service robot

Emergency call systems (Social alarm systems)

First Generation: Wired ringer systems.

Second generation: transmission of an emergency call via the telephone, triggering the alarm via the transmitter on the wrist.

Future (AAL) systems: triggered by sensors:

- Monitoring activity and behavior

- Measurement of movements and accelerations

- fall detection

- Measurement of vital parameters: pulse, ECG, body temperature, oxygen saturation, blood sugar level, etc.)

Emergency call systems (social / senior alarm systems)

Previously tied to landline phone which is replaced today by mobile phone (availability after power outage?).

Often also in combination with a smartphone via Bluetooth.

Increasingly with own Internet connection (central unit).
Increasingly also WLAN and additional sensors.

Environmental Control Systems = ECS *(Umgebungssteuerungen)*

Remote controls in the broadest sense
Doing things that would otherwise be beyond
the reach of the (disabled / old) person.
Literally and figuratively.

Main components of an ECS are:

User Interface

MMI = human-machine interface

HCI = Human Computer Interface

Controller

either a special device

or a PC or notebook with suitable software.

transmitter

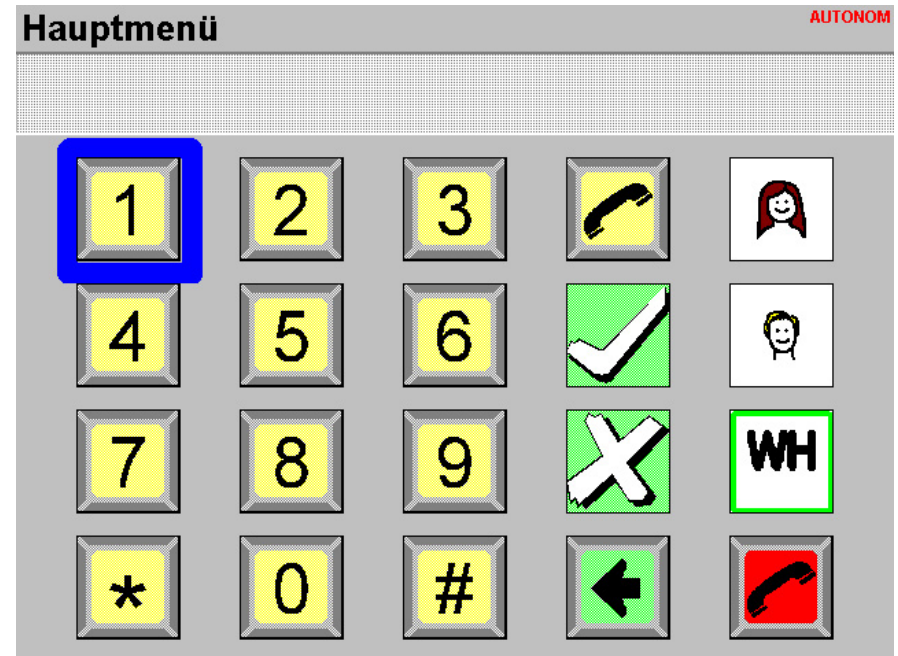
Transmission channel (wireless or wired)

Receiver

Target device (device to be controlled)

Sometimes a feedback channel

(Early) Example of ECS: A telephone remotely controllable via a PC via infrared receiver.



Smart Homes -> AAL

Network of sensors and actuators

(German: actuators = *Aktoren*)

Intelligent reactions based on sensor data

Detecting context, Context awareness

Derive conclusions, Reasoning, Inference-drawing

Triggering consistent actions

Learning

So, many base technologies exist, but AAL technologies

are much more user-centered (especially for the elderly),
are integrated into the personal living environment (embedded, integrated)
adapt to the user,
are modular and interoperable (networked, interoperable) designed,
sometimes have "virtual intelligence".

15: AAL – Ambient Assisted Living

15.4 Target Groups and Application Areas

AAL users do not represent a homogeneous user group (and are not typical “consumers”).

In addition to the **primary target group: old people**, also single people on the verge of loss of autonomy, up to young, healthy people who want to improve or maintain their quality of life through intelligent (cool?) technology.

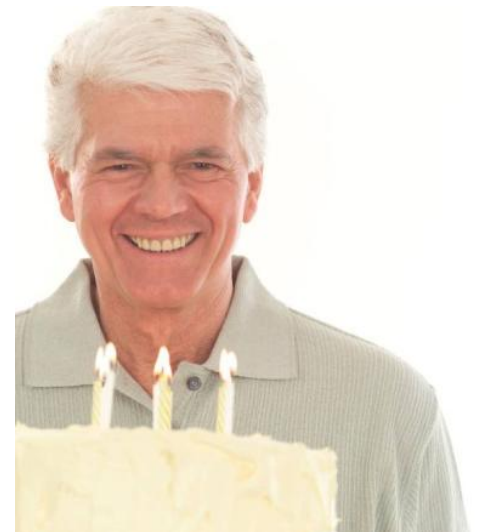
Disabled people who want to maintain their independence in their own walls.

Professional caregivers, medical staff -> **secondary users.**

Family members of the elderly seeking support for care, communication and social interaction -> **secondary users.**

Support for comfort and quality of life

To be able to do something easier.
To do something with more pleasure.
Give reason for happiness.
Play and laugh.
To be able to do something with less stress.
Do something with less cognitive load.
Have a sense of achievement.
To preserve self esteem and dignity.



Support for safety and health

Safety against dangers: fire, burglary, gas leaks ...

Safety, not to forget something: the keys, the glasses, the medicines ...

Safety in case of emergency:
that help comes in time
... in case of an accident
... in case of a fall
... when I feel bad ...



Social contacts and communication

In everyday life, when something is needed:

- ... Orders, shopping
- ... Appointments
- ... Authorities ...

In social terms:

- ... contact with the family, with friends
- ... preservation of social networks
- ... as a means against loneliness and isolation.



Example of an AAL project: e-Home

Funding by the Fit-IT Program (FFG)

- Simplest (logical, self-explanatory) operation e.g. for video calls
- Touch Screen = "Tangible Interface"
- Residential (non-technical) appearance
- Privacy protection (mechanical camera shutter)
- Fits to home environment (wooden frame)



<http://www.is.tuwien.ac.at/ehome/e-HomeErgebnisse.html>

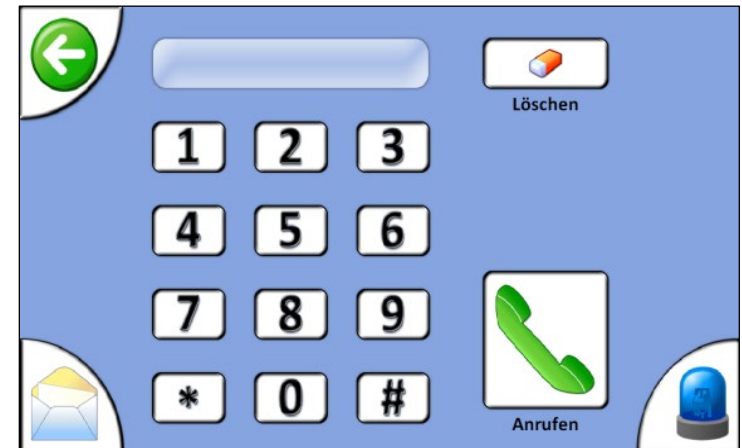
E.g. e-Home – Displaying information

Time of day, reminders



E.g. e-Home – Communication

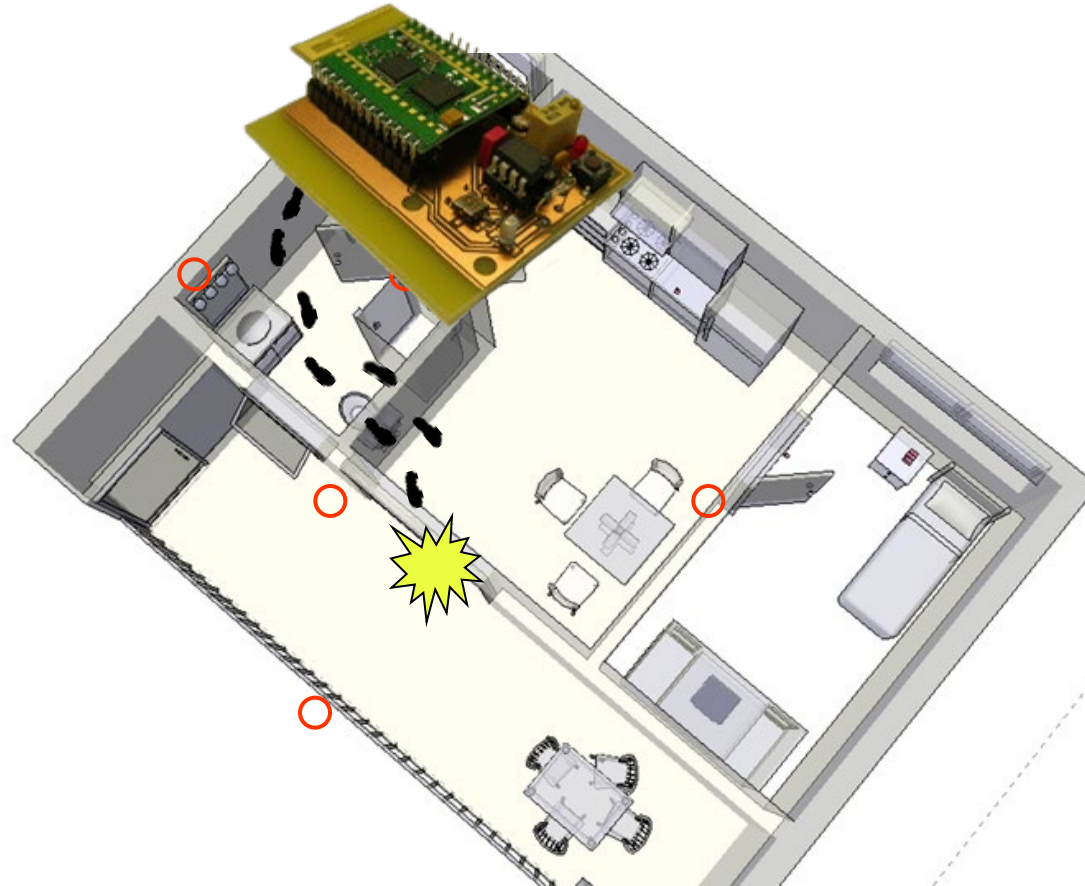
can be used with pre-stored or dialled numbers



E.g. e-Home - Safety



E.g. e-Home – Fall detection



<http://www.ceit.at/ceit-raltec>

<http://www.is.tuwien.ac.at/ehome/e-HomeErgebnisse.html>

E.g. "Prompting Devices"

Provide (intelligently controlled) hints on what to do in a given situation:

For people with dementia: "What comes first, then what comes next ...?"

For disoriented people "where am I, where should I go, what time is it ...?"

For people who forget the names of things (aphasia)

In time-critical situations "What should I do (concretely) when an alarm sounds?"

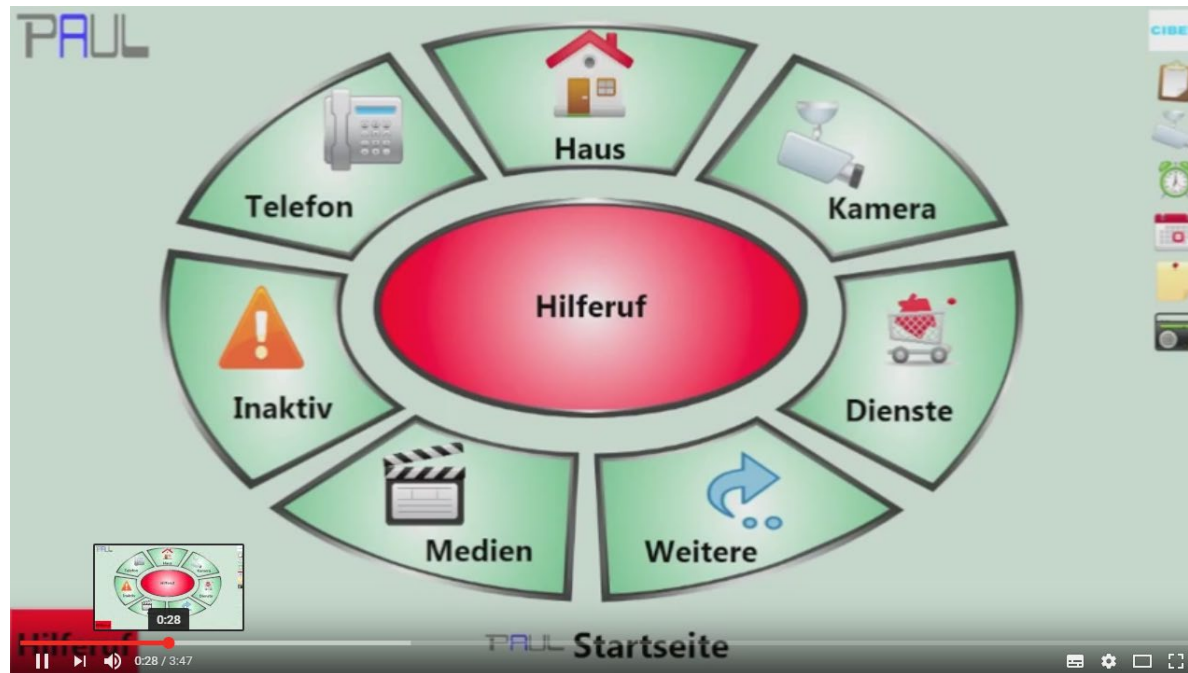
Prompting Devices

People are guided step by step through multilevel tasks (ADLs).

Example: hand washing sequence



Video: Typical System



Touchscreen Interface PAUL <https://www.youtube.com/watch?v=fTavKfvR7pg>

15: AAL – Ambient Assisted Living

15.5 The Technology of AAL – Sensors / Actuators

Aspect of the overview

knowing of what is going on

➔(sensors),

and to be able to do something

➔(actuators)

Let's have a look on modern cars Everything is there?



On every average car dump...

... more AAL can be found than
in 99% of apartments of old
people



Technology is also getting cheaper

Compare an offer from 1984:

hard disk...

10 MB for € 5.000

1 TB ... ? Mio € ?



Digital Rainbow 100
Der echte Proficomputer vom zweitgrößten Computerhersteller der Welt. Der Rainbow 100 ist ein ausgereifter Arbeitsplatzcomputer für den es ein nahezu unbegrenztes Angebot an Standardprogrammen für die verschiedensten Anwendungsgebiete gibt.

Technische Daten:
Doppelprozessor 2 80 A/8088 zur Verarbeitung von 8-Bit- oder 16-Bit-Programmen. 128 K.
Disketten Doppelaufwerk (2 x 400 K-Bytes), um ein weiteres Doppelaufwerk sowie eine Winchesterplatte bis 10 Megabyte ausbaufähig. Zahlreiche fertige Anwendungsprogramme, die täglich mehr werden. Textverarbeitung, Datenbanken, Kalkulation, Buchhaltung, Lohnverrechnung, Planung etc. etc., sowie spezielle Branchenpakete.
Druckerschnittstelle.
Seriell V24 V28.

Standardsystem bestehend aus:
Tastatur, Systemeinheit, Bildschirm und Betriebssystem. wahlweise CP/M 8086 oder MS/DOS.
nur **68.400,-** inkl. Mwst.

In den Filialen Wien, Praterstraße 44 - 46, Linz, Landstraße 101 und Graz, Sporgasse 17.

Unsere Serviceleistung:
1 Jahr lang kostenlose Telefonberatung direkt bei den Spezialisten von Digital in Wien, damit Ihnen jede Frage von der Aufstellung bis zur täglichen Anwendung sofort beantwortet wird.

Speichererweiterung mit Winchester-Festplatte:
5 Megabyte **33.600,-** inkl. Mwst.
10 Megabyte **68.400,-** inkl. Mwst.

In unserem neuen computer-Spezial-Shop in der Filiale Wien Praterstraße 44 - 46 finden Sie neben echter Fachberatung auch eine breite Auswahl an Heim- und Bürocomputern sowie Zubehör.

Applying existing sensors

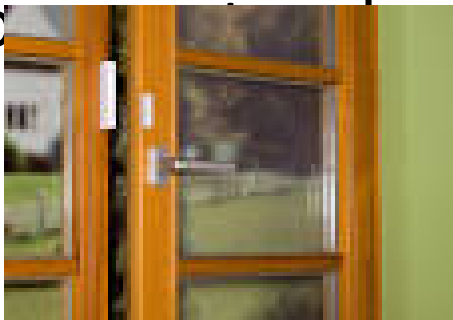
Non-invasive sensors for AAL (1)

Switches / contacts on doors, windows, drawers, boxes etc.

Contacts on various controls, toilet flushing etc. (activity monitoring).

Contact mats, sensor carpets (Localization).

Motion and presence detector (PIR).



Applying existing sensors

Non-invasive sensors for AAL (2)

Temperature sensors.

Heat radiation (stove monitoring).

Light.

Vibrations, floor vibrations (fall detector).

Water and energy consumption.

Non-invasive: not detailed,

Not invading in privacy ...

But: "Big Data" also gives insights



Applying existing sensors

Invasive sensors for AAL

Cameras

Video images

better: Thermal images, outlines, motion vectors

better: 3D images (Kinect)

Microphones

Voices, sounds

Person localization: Electronic markings to persons (radio, RFID etc.), in order to be able to determine their place.

Important: collect as little data as possible, locally processed, not or only saved (cf. GDPR/DSGVO)

Applying existing actuators

Actuators for AAL

Door opener

Window openers

Motorized blinds

Control of electrical appliances (lamps, stove ...)

Communication devices (telephone, door intercom)

Heating, ventilation, air-condition.

Radio and TV

Dispenser for tablets

Triggering of alerts (social alarms)

Reminder functions (appointments, medication)

15: AAL – Ambient Assisted Living

15.6 Interconnection and Platforms

Context Awareness = communication with the environment

By this we mean the (automatic) recognition of relationships from data.

From many sensor data an overall picture is obtained. Could also be called "situation-relatedness".

Linking data and derived inferences to automatically generate appropriate responses for the benefit of the users.

We usually live without a network - offline

With many, many individual bits of technology that know nothing about each other.

In itself, these can be highly complex devices and facilities (whether we perceive it or not).

- They communicate with the person.

- They do not communicate with each other.

- They therefore demand all coordination tasks from the resident.

AAL needs more „active“ devices.

Example 1: The traditional alarm clock

The alarm clock does not know anything about me.

It does not know when I went to sleep.

It does not know my schedule.

It does not know how well I slept.



It does not care if getting up in this weather is worth it.

It does not wish me “Good night”

“Good morning” must be whenever it rings, no matter how I feel.

Example 2: The traditional phone

It does not know how many steps I have to the phone and how fast I can walk.

It also rings when I'm in the shower.

It does not matter if I am at home, after the 5th ringtone it switches to answering machine.



It does not know that I'm just taking my afternoon nap. It wakes me up because the battery is running low.

It does not understand that I only want to be disturbed now in urgent cases.

Example 3: The traditional stove

The stove does not know what I want to cook. It does not make any good menu suggestions because it does not know my cookbook (not even my dietary requirements). It does not care what is still in the fridge or what I should have bought in time.



It does not care if I'm inattentive or called to the phone, it'll burn everything.

And even if it gets really critical, it does not even hear the smoke detector and heats up vigorously.

Future vision – reality?

The phone knows how many steps I have already taken, where I was and am. It takes a call for me. The alarm clock is integrated in the phone. The phone knows if I'm awake. The stove knows what I want to cook. It makes menu suggestions because it knows my cookbook (also my diet rules). It orders the ingredients so everything is in the fridge that is needed. It cooks automatically and does not burn anything. It detects own faults and external emergencies. The different functions work together for best support.



Networking – required for information exchange

Wired networks – wiring effort?

KONNEX (KNX) formerly EIB

digitalSTROM, powernet

Wireless networks – battery replacement?

Bluetooth and Bluetooth LE

Zigbee

Z-Wave

ANT +

enOcean

Plugwise, HomeMatic

QIVICON

15: AAL – Ambient Assisted Living

15.7 Social Robotics

Social Robots (Social Service Robots)

Supplementing and expanding AAL environments with features that ...

- either show a higher degree of mobility (in the home) and increased autonomous characteristics
- or by their nature build a higher social relationship with the user than a "smart home"



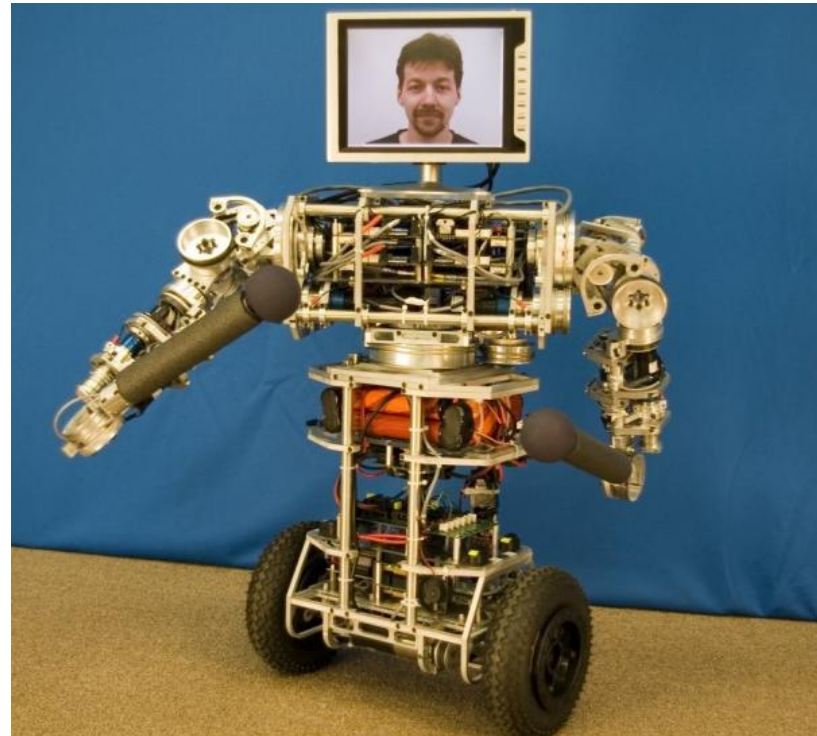
Robots not only can look very different ...



15: AAL – Ambient Assisted Living

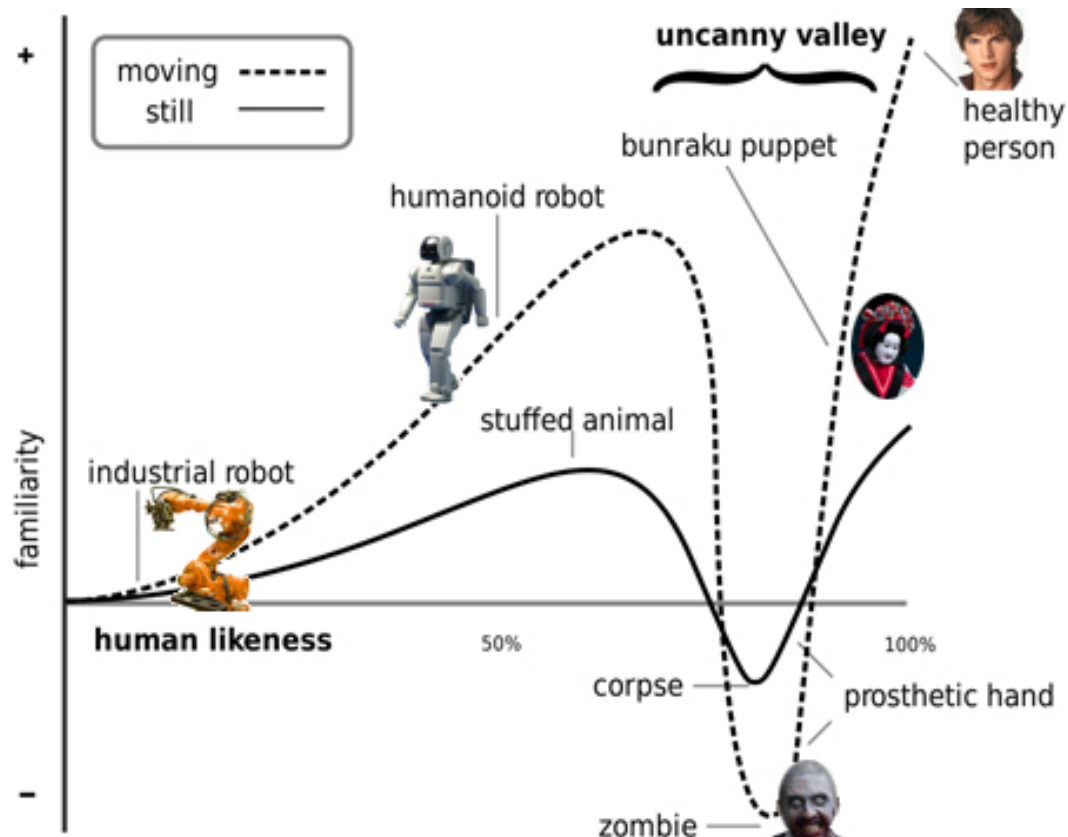
15.7 Social Robotics

... they also can provoke different emotions.



The “Uncanny Valley” (“das unheimliche Tal”)

Technical \leftrightarrow human like



Basic types of service robots

Functional robot without social behaviour
e.g. Vacuum cleaner robot



Pet / Tamagotchi robot
e.g. robotic seal "Paro"



Communication robot, a new interface
(fixed or mobile)



Universal robots that can also do certain work

1. Functional robot

Vacuuming, floor care

Lawn mowers

No special social behavior

No dialogue with humans



But: due to the autonomous movement
certain appearances of a living thing



2. Pet / Tamagotchi Robot, Therapeutic Robot

Respond specifically to caring, attention

Often elaborate sensors

But do not do any work

Examples:

Robotic seal "**Paro**", is modeled after the baby of a harp seal and should therefore have a calming influence.



The idea is based on experiences from animal-assisted therapy.



Dinosaur robot "Pleo"

Paro seal & dementia

Often surprisingly good acceptance but also just non-acceptance by patients.

The seal has a high "challenge character" ...

... it responds both to speech and non-response.

If nobody takes notice of it, it attracts attention with small movements and noises.

When it is approached, it looks at the person with her big eyes. Tucked in ones arms, it hugs its head.

The quality of the work is for the most part depending of the employee who uses the seal. (Care / occupational therapy)

Die Roboter-Robbe

Die Robbe wurde in Japan von Takanori Shibata am National Institute of Advanced Industrial Science and Technology (AIST) seit 1993 entwickelt, wurde 2001 der Öffentlichkeit vorgestellt und wird seit 2004 verkauft als Therapiehilfsmittel für Menschen mit Demenz. Die Robbe ist ein Roboter, der einer jungen Sattelrobbe nachempfunden wurde. Unter einem weißen flauschigen Fell verbergen sich Sensoren, die registrieren, wenn ein Mensch ihn streichelt oder anspricht. Hierauf reagiert der Roboter mit Bewegungen des Schwanzes, der Flossen, des Kopfs, der Augen und mit Geräuschen, die denen von Sattelrobben ähneln. Darüber hinaus kann der Roboter Namen lernen, und speichern, wer ihn oft anspricht. Auf diese Person reagiert er besonders intensiv. Der Roboter soll durch seine Bewegungen und Geräusche Schlüsselreize auslösen.



Paro-seal & dementia

Controversial opinions

Great potential,

Reassurance, opening of locked persons, creation of access

Ethical issues

Is it legitimate to lead a person out of the realm of reality,
who does not have the opportunity to consciously engage with it and, above all,
to return to reality in a targeted manner?

Is it okay to allow a person to spill out an
item on an item or enter into an emotional
relationship with a thing?

Maybe the person becomes calmer and more
balanced, speaks for a long time or shows a
reaction at all.

Does it matter how this is achieved?

Does the result justify the means?



DIE ROBOTER-ROBBE

Stichworte für den möglichen Einsatz

- Es braucht Mitarbeiter, die offen für den Einsatz sind.
- Die Mitarbeiter müssen im richtigen Umgang mit der Robbe geschult werden.
- Es muss klare Vorstellungen geben, wann, wie und wo der Roboter eingesetzt werden soll.
- Wer finanziert die Roboter-Robbe?
- Sie muss bedarfsgerecht eingesetzt werden.
- Man darf nicht zu viel von ihr erwarten.
- Man muss wissen, dass sie kein Allheilmittel ist.
- Die Roboter-Robbe spart kein Personal ein.
- Es muss die Bereitschaft geben, in einen Diskurs zu gehen, sich kritischen Fragen zu stellen.
- Es muss Transparenz geben im Umgang mit der Robbe bei der Begleitung von Menschen mit Demenz.
- Es braucht Faktenwissen zur Mechanik und Elektronik.
- Angehörige müssen in den Prozess einbezogen werden.
- Die Robbe muss periodisch eingesetzt werden.

Source: M Ganß: Die Pflegerobbe – fünf Jahre und immer noch kontrovers, in: demenz Das Magazin, 27/28-2015, S.18-20.

3. Robot as interface, for communication or for "telepresence"

More or less humanoid or animalistic (represent a person or pet).



Facilitate interface functions through natural dialogue. Support communication and make it more personal.

Represent a remote person.

Do not work directly.

Robot as interface, for communication or for "telepresence" (2)

Can also take on certain sensory tasks (detection of emergency situations such as fall or dangers in the home.



Animate to exercise training by example.



4. Universal robots that can (also) do “work”

Search and bring items

Serve and clear up

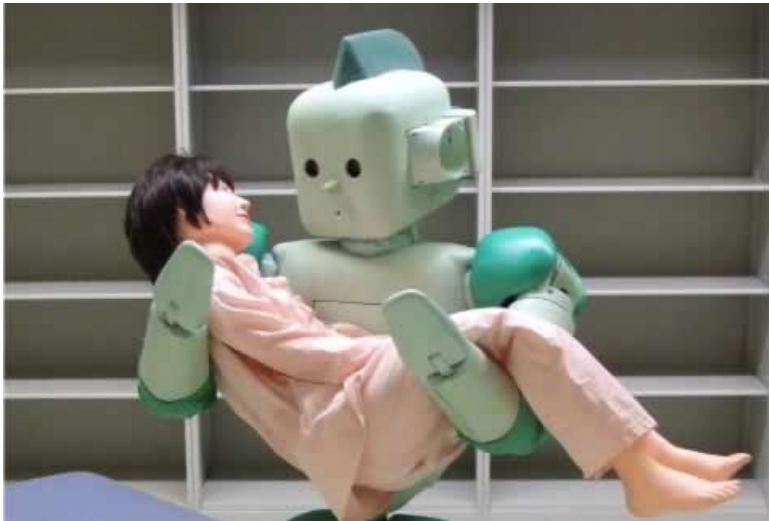
Picking up objects from the ground (tripping hazard)

Support and guidance while walking (stability?)



4. Universal robots that can (additionally) do work (2)

Patients lift and transport
(Japan)



16: Ethical Questions

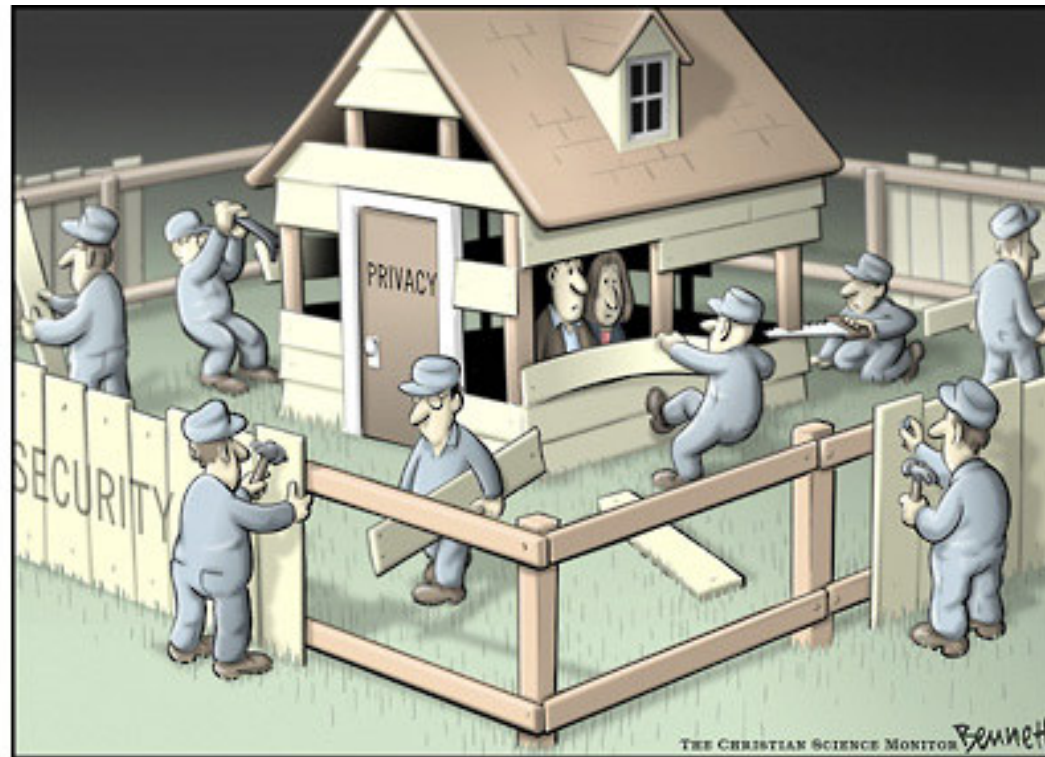
16.1 Privacy and Safety

16: Ethical Questions

16.1 Privacy and Safety



Conflicting goals between privacy and security



Often found: the "wash me the fur but do not make me wet!"

The conflict between hoped for help and feared side effects.

When presenting an AAL system to a group of social workers and carers, we heard:

- "We welcome this technique as a kind of guardian angel for the home".
- "We reject the use of any kind of sensors categorically."

Privacy protection – why is this an issue?

To detect dangerous deviations from the normal process,
to intervene to help (recognize wishes and intentions)

... a lot of general data has to be collected.

... many personal data on the behavior of the residents
must be collected and evaluated.

Privacy protection - many questions

What happens to this data?

Where are they stored?

Which conclusions are drawn from this?

Where are they being forwarded to?

Who has access to this data?

When and how are they anonymized?

How long are they kept?

When will they be deleted?

All these questions need clear and honest answers

For these questions also appropriate technical solutions must be found that they can stand ...

in front of an ethics committee ...

in front of a data protection commission ...

and of course in front of the “user” (!)

EU General Data Protection Regulation entered into force in 2018 (GDPR/DSVGO)

Only fully anonymous data (non-personal origin) are not covered, no more general registration required

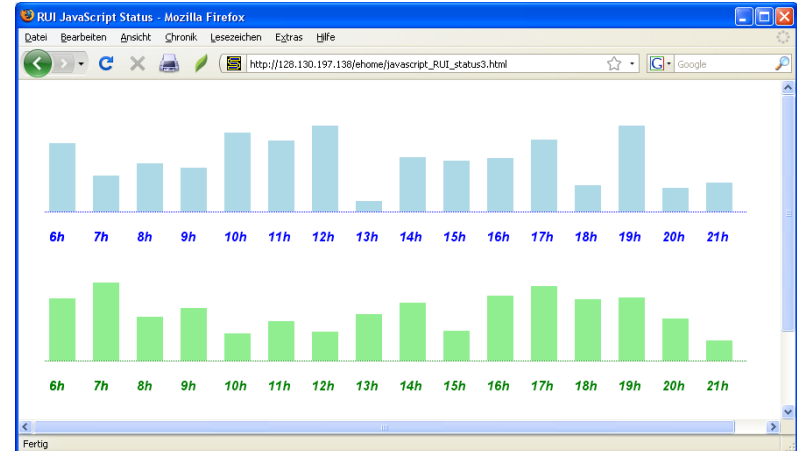
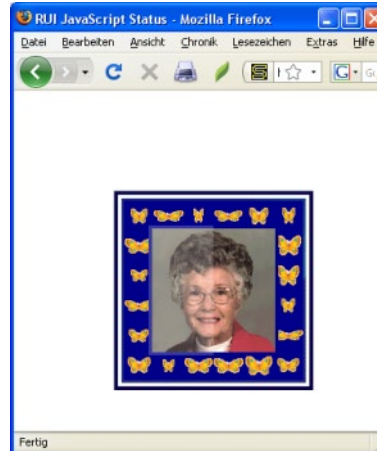
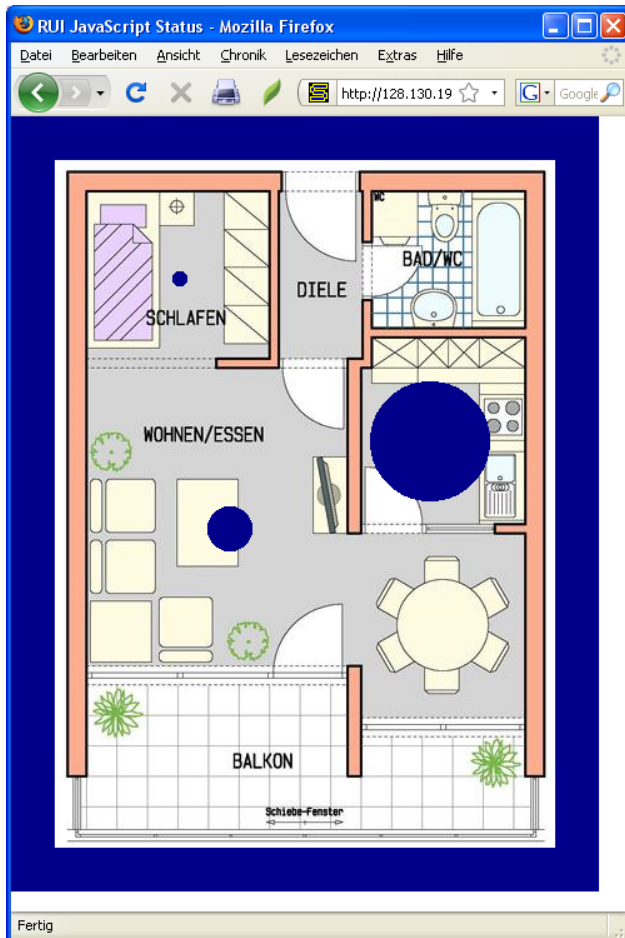
Responsibility of the processing party (records to be kept)

Right of user to information, rectification, cancellation

Approval and data economy must be observed
Legitimate interests of data collection count also

Example of less intrusive presentation

Principle: A person's activities are only displayed as (anonymous) overview data, but no private details are revealed.



Protection against laziness and rusting

Aside from requiring support -

People must / should keep moving:

in the literal sense, so that the muscles do not stop working and the joints do not become stiff.

in the figurative sense, so that the mental activity is preserved.

Both are certainly related.

Because: "Who rests will rust!"

Danger of paternalism, coercion

Protection against laziness and rusting

AAL solutions must not undermine one's own agility.

One must not unnecessarily be "lazy and comfortable".

One need to maintain a sufficient level of physical and mental challenge.

One cannot and will not take away all responsibility and all risks for a person.

=> Solutions should detect and stimulate own activity

16: Ethical Questions

16.2 Important Principles

1. Homes that do everything themselves destroy existing skills, make the residents lazy:

The positive aspects of help could be overshadowed by a kind of "over-protection".

Would not less "perfect" solutions be better?

Residents should not simply be deprived of all responsibility and self-confidence.

Offered help should have a positive training effect at the same time - help to self-help.

(A specific concept even asks for help by the user)

Bad memories can be annoying and cause the opposite.

2. All concerned must be made aware of what is happening with the many data collected:

In a context-aware system, a wealth of sensor data (patterns of behavior, medical data) must be collected.

Evaluations and conclusions should always be carried out locally (and not by a central “black hole”) and explained (also by the system).

Data should not leave the house, except in emergencies or if expressly necessary / agreed.

3. The benefits of AAL must be easy to convey and understand, they must be obvious:

They have to be very practical and non-technical.

e.g. by describing scenarios, case studies ...

- Not by hiding details!

Success stories should be quickly adjusted and repeated.

Not just for the residents.

Relatives and friends are involved.

As well as caregivers and financiers.

“Stakeholders”.

4. AAL technology must be conveyed convincingly and carefully:

AAL technique should possess and express an inner persuasiveness (it speaks for itself).

Appropriate choice of words is very important (watching, protecting, helping instead of monitoring).

The fear of "Big Brother" is omnipresent. You have to be able to show that there are also nice "Little Sisters".

5. AAL technology must be robust, reliable and sustainable:

It need to be built into existing homes - so wireless, modular and adaptive systems are an advantage.

Installations should pay for themselves in a short time (for example after 6 to 12 months) and work 24/7 over years.

Not waiting for the perfect 100% solution, even 80% can bring benefits - but also honestly point out the remaining risks of an 80% solution.

6. Residents must always stay the rulers in the house:

The decision on the use and non-use of the system is the sole responsibility of the users (after weighing the risks, of course).

Switching off must always be allowed and foreseen (duration must be discussed).

Technology should be unobtrusive but not necessarily invisible. Totally hidden (the voice from the off) can also be threatening.

AAL is working in a socially sensitive area. Therefore, application of AAL Technology should always be ethically „monitored“ and the implications assessed

⇒ MEESTAR model

Application of AAL also should be based on voluntary consent of the user based on being well informed

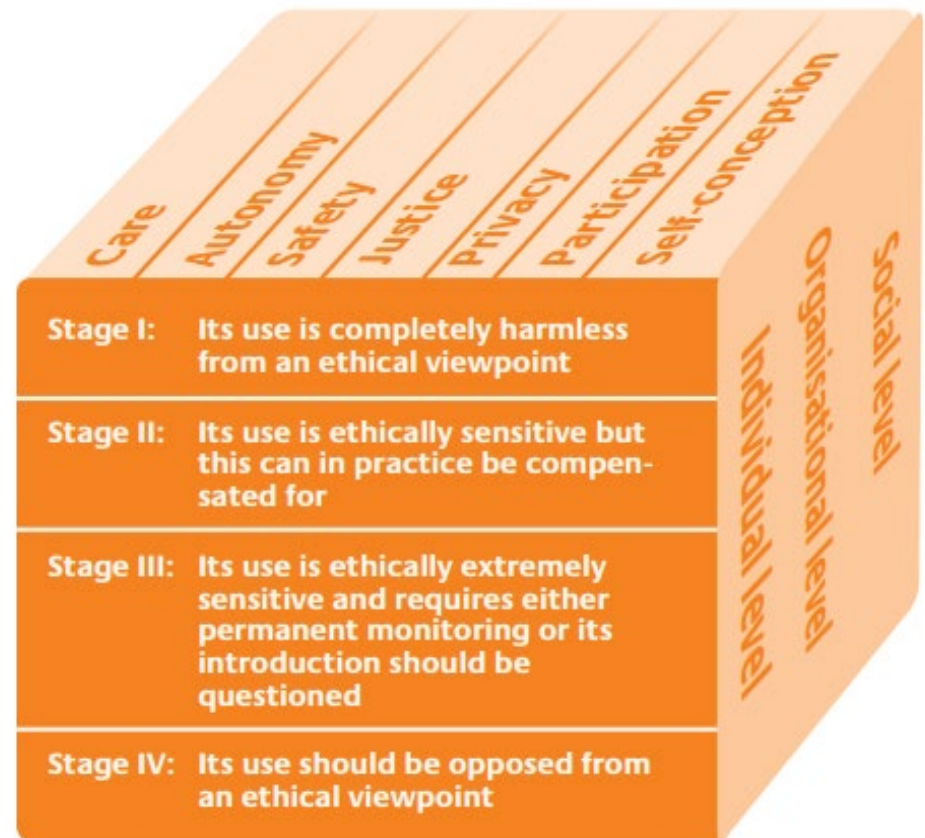
⇒ Informed consent (also legally important)

and ideally having the possibility to choose between personal and technical support.

MEESTAR

A Model for the Ethical Evaluation of Socio-Technical Arrangements

Ethical issues in the area of age-appropriate assistance systems



Questions in a MEESTAR workshop, for example:

Aspects of loading and unloading by technology
Impact of the mechanization of social interaction
Consequences of a shift from care to domesticity
Changes in decisions and responsibility
Technical security versus social security

Based on 3 axes an estimation of ethical risks is supported:

- Level from individual to society
- Area
- Severity

Informed Consent (EU Directive on clinical trials (2001/20/EC))

A (test-) person is giving "Informed Consent" if his/her decision to take part in a trial is ...

... given freely after that person is informed of the nature, significance, implications and risks of the trial and either:

- is evidenced in writing, dated and signed, or otherwise marked, by that person so as to indicate his/her consent, or
- if the person is unable to sign or to mark a document, his/her consent is given orally in the presence of at least one witness and recorded in writing.

Informed Consent conditions:

The subject has had an **interview** with the investigator, in which he/she has been given the opportunity to **understand the objectives, risks and inconveniences** of the trial and the conditions under which it is to be conducted.

The subject has been informed of his/her **right to withdraw** from the trial at any time.

The subject has given his/her **informed consent** to taking part in the trial.

The subject may, without being subject to **any resulting detriment**, withdraw from the trial at any time.

The subject has been provided with a **contact point** where he/she may obtain further information about the trial.

In AT 2 we have analyzed different approaches and possibilities of assistive technologies (in terms of aids) for communication despite barriers (disability, restrictions).

The goal was to give an introduction and an overview, both historic and current situation, emphasizing the advantages by modern technologies.

Not or little in focus were differentiation of age groups (from small children to senior citizens), job situation, details on applications of AT etc.

Other related lectures:

- In VO Assistive Technologies 1 (winter term) the focus is on the influenced abilities through disability and age and the adapted use of assisting technologies / aids
- The VO + UE Assistive Systems (winter term) deals with more self-reliant, context-sensitive ATs, which become active on their own initiative, such as: the user can start an interaction with it.
- The VO + UE Barrier-free Internet (summer semester) is about the accessibility of the increasingly important Internet for all

Usually done as a written exam:

Approximately 10 questions on topics that were dealt with in VO.

Time: about 30 minutes

Tips:

Try to give short answers, especially if no description is required.
It does not count the amount!

Dates: about every 2nd month. Details and registration please in TISS.

If you have any questions, please contact us (email preferred)

Winter term:

VO Assistive Technologien **1** (187.A59)

VO Assistive Systeme (187.A95)

UE Assistive Systeme (187.A96)

Summer term:

VO Assistive Technologien **2** (187.A60)

VO Barrierefreies Internet (187.A57)

UE Barrierefreies Internet (187.A58)

The products mentioned in this and other of our lectures (and also the mentioned manufacturers) are to be considered as mere examples.

In most cases, comparable products are also offered by other manufacturers.

In the case of a specific need, therefore, a search on the current market is to be carried out.

The focus of our lectures is the exemplary presentation of the approaches and methods as well as the clear communication of the basic principles.

The goal is to give an overview. Due to the breadth of the area and ongoing development, not all aspects can be addressed.



Background info for AAL: (partly German)

Active and Assisted Living Programm - ICT for ageing well

<http://www.aal-europe.eu/>

AAL AUSTRIA - Innovationsplattform für intelligente Assistenz im Alltag

<http://www.aal.at/>

FFG / BMVIT benefit

<https://www.ffg.at/benefit>

BMVIT Active and Assisted Living (AAL) Research and Development Programme

<https://www.bmvit.gv.at/en/innovation/ict/aal.html>

Altersgerechte Assistenzsysteme als Hilfe für künftiges Wohnen und sicheres Leben

<http://nullbarriere.de/aal-altersgerechte-assistenzsysteme.htm>

Studie Unterstützung Pflegebedürftiger durch technische Assistenzsysteme

<http://www.vdivde-it.de/publikationen/studien/unterstuetzung-pflegebeduerftiger-durch-technische-assistenzsysteme>

Albert M. Cook und Janice Miller Polgar: Assistive Technologies: Principles and Practice, Elsevier Health Sciences, 14.11.2014 - 496 Seiten

Oishi, Meeko Mitsuko K., Mitchell, Ian M., Van der Loos, H. F. Machiel (Eds.) Design and Use of Assistive Technology - Social, Technical, Ethical, and Economic Challenges, Springer, 2010

Stefano Federici, Marcia Scherer (2012) Assistive Technology Assessment Handbook, CRC Press, 26.03.2012, 484 Seiten

Juan Carlos Augusto et al. (eds.) Handbook of Ambient Assisted Living, IOS press, ISBN 978-1-60750-836-6, 2012

Alan F. Newell: Design and the digital divide: insights from 40 years in computer support for older and disabled people, Morgan and Claypool Publishers, 2011

Parisa Rashidi and Alex Mihailidis: A Survey on Ambient-Assisted Living Tools for Older Adults, IEEE Journal of Biomedical and Health Informatics, vol 17, number 3, May 2013, pp.579-590

Conference proceedings: ASSETS, AAATE, ICCHP, ...

Hobbit Robot

<https://www.youtube.com/watch?v=zLr-9aEOPjs>

Wheels

Face with screen to show “emotions”

Can express different behaviour

Manipulator arm

Tests done in homes of old people in AT, SE, GR

Pepper Robot

<https://www.youtube.com/watch?v=-negyZmzmOU>

Very strong expression, but only
“communicative”

Questionable mechanical stability (can it
support a person?)

Despite its hands it cannot manipulate
anything

By his moving arms there could be dangerous
situations provoked

Robot Kompai (Project DOME0)

<https://www.youtube.com/watch?v=GciSisi1cMg>

Wheeled platform

Head imitation (but without function)

Mediator for remote consultation of medical services

NAO Robot (Project KSERA)

NAO

<https://www.youtube.com/watch?v=fYbSME1muXQ>

Small (60 cm), humanoid, walks on feets (also plays football)

Slow

Unconventional interface with LED Projector on ist back

Projector could also highlight or mark objects

BAYMAX

<https://www.youtube.com/watch?v=taWN4m3lXC4>

(Well-meant help can also cause problems)