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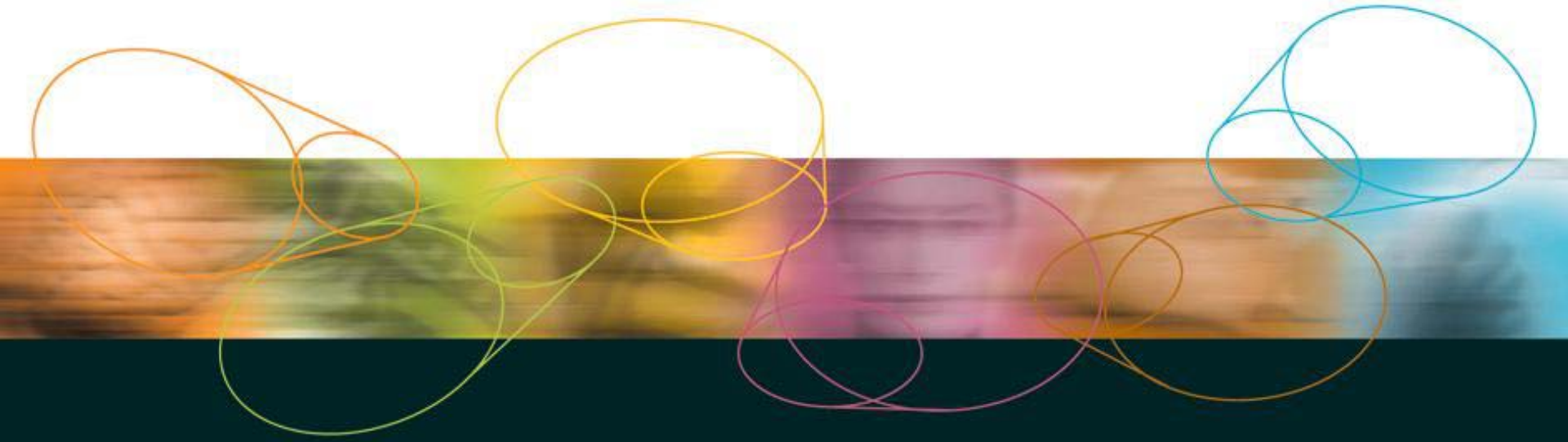

Welkom in de wondere wereld van Usability

Tobias Heffelaar

TestNet **Wageningen, 28 September 2005**

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Before we start

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Usability defintion

ISO 9241-11 standaard:

The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

Effectiveness
Efficiency
User Satisfaction

Functional vs Usability

Functional Testing	**Usability testing**
Does it work?	Can users use it?
Does is crash?	Will users use it?
Focus in system (i.e. technology)	Focus on user (interaction with the system)
Functional design	**Task model**
In-house testing	On-site (or simulated environment)
System + tester	(future) Users required

Task modelling: example

Make a martini

- **Place two martini glasses in the freezer for a minimum of 15 minutes.**
- **Place ice cubes into cocktail shaker.**
- **Pour four ounces of Beefeater gin in the cocktail shaker.**
- **Pour a quarter teaspoon of the vermouth into the cocktail shaker.**
- **Stir with stainless steel spoon or stirrer.**
- **Remove martini glass from the freezer.**
- **Impale one Spanish olive on a toothpick.**
- **Place the Spanish olive into the glass**
- **Pour the contents of the cocktail shaker through strainer to catch the ice** (into glass #1)**.**
- **Repeat steps 2-9 to make a martini for Dr. Mac** (and add a touch of Kir for flavoring)
- **Sit back and sip slowly.**

Task modelling: example

Chatting with MSN messenger

1. **Start MSN messenger**
2. **Log on**
   1. **Enter email adress**
   2. **Enter password**
3. **Open buddy list**
4. **Select buddy**
   1. **Check if buddy is online**
5. **chat**

User-Centered Design

Observing (and listening) to the user at 'work'

- Users specify Functionality
- Context of use important

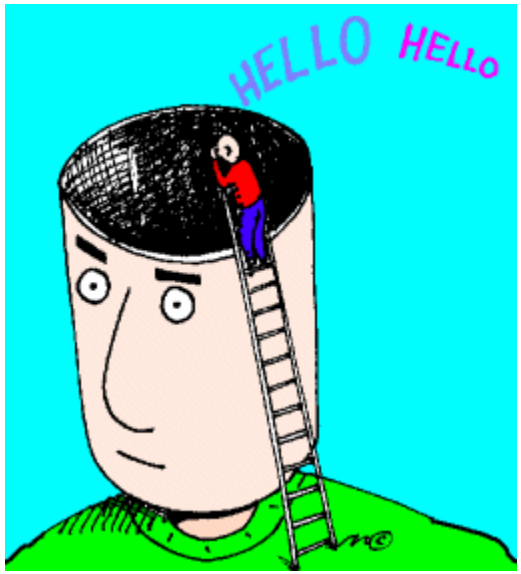
Usability

what to look for?

- Learnability
- Flexibility
- Robustness

Usability: learnability

- predictability
- Synthesizability
- Familiarity
- Generalizability
- Consistency



Usability: flexibility

- **Dialog initiative**
- **Multi-threading**
- **Task migratability**
- **substitutivity**
- **customizability**

Usability: robustness

- **Observability**
- **Recoverability**
- **Responsivenss**
- **Task conformity**

What skills are required?

- Knowledgeable in Human factors, cognitive sciences (often psychologists do usability testing)
- Communicative
- Flexible
- Comfortable with ambiguity
- Good listener
- Open minded
- Quick learner

Technical

Not much (Basic computer skills, Video recording knowledge)

Usability testing

Types of tests

- Heuristic evaluation
  - Ask HCI experts
- Formal analysis
  - Cognitive Task Analysis (CTA)
  - Goals Operators Methods Selection rules (GOMS)
- **Usabilty testing**
  - ‘ask’ real users
  - Different stages (prototypes, finished products)

How to set up a test?

- Set goals
- Identify relevant user characteristics
- Recruit participants
- Choose test equipment:
  - Video equipment
  - Coding scheme
  - Test site
- Design and verify scenarios
- Practice coding scheme
- Test run the total setup
- Carry out the tests
- Analyze and report

Analyzing a test

Common types of analysis

- Video highlights

- Effectiveness
- Efficiency
- User satisfaction

Video highlights

- Illustrate your findings: seeing is believing!
- Add video and audio clips to slideshows, documents and web pages
- Create video library of beha
  for research and training

A video clip says more than a thousand statistics!

Usability metrics: Effectiveness

Purpose

- Measure the effort a user will need to put in to achieve desired results with an application

Common measures

- Frequency of assists
  - Assisted task performance
  - Unassisted task performance
- Frequency of resource usage, e.g. (online) help
- Percentage task completion (% of participants that achieved a goal, sometimes weighted)
- Frequency of errors

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Product: Example

Dealing room software

What's the key?

Sell/buy quicker that the competition

Effectiveness

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Usability metrics: Efficiency

Purpose

- Measure the level of effectiveness in relation to the quantity of resources expended

Common measures

- Time-on-task (task completion time)
  - Mean
  - Standard deviation
  - Standard error
- Completion rate (#tasks completed/unit time)

Interval	Mean duration (mm:ss.d)
task 1	17:19.2
task 2	09:42.0
task 3	13:20.4
task 4	10:23.0

Product: Example

Phone operators

What's the key?

Connect callers as quickly as possible

Efficiency

Usability metrics: User satisfaction

Purpose

- Measure to what extent users liked interacting with the application

Ingredients

- Satisfaction
- Usefulness
- Easy of use

Product: Example

Cars

- They all drive (too) fast
- They all can be used (more or less) the same way

What's the difference?

User satisfaction

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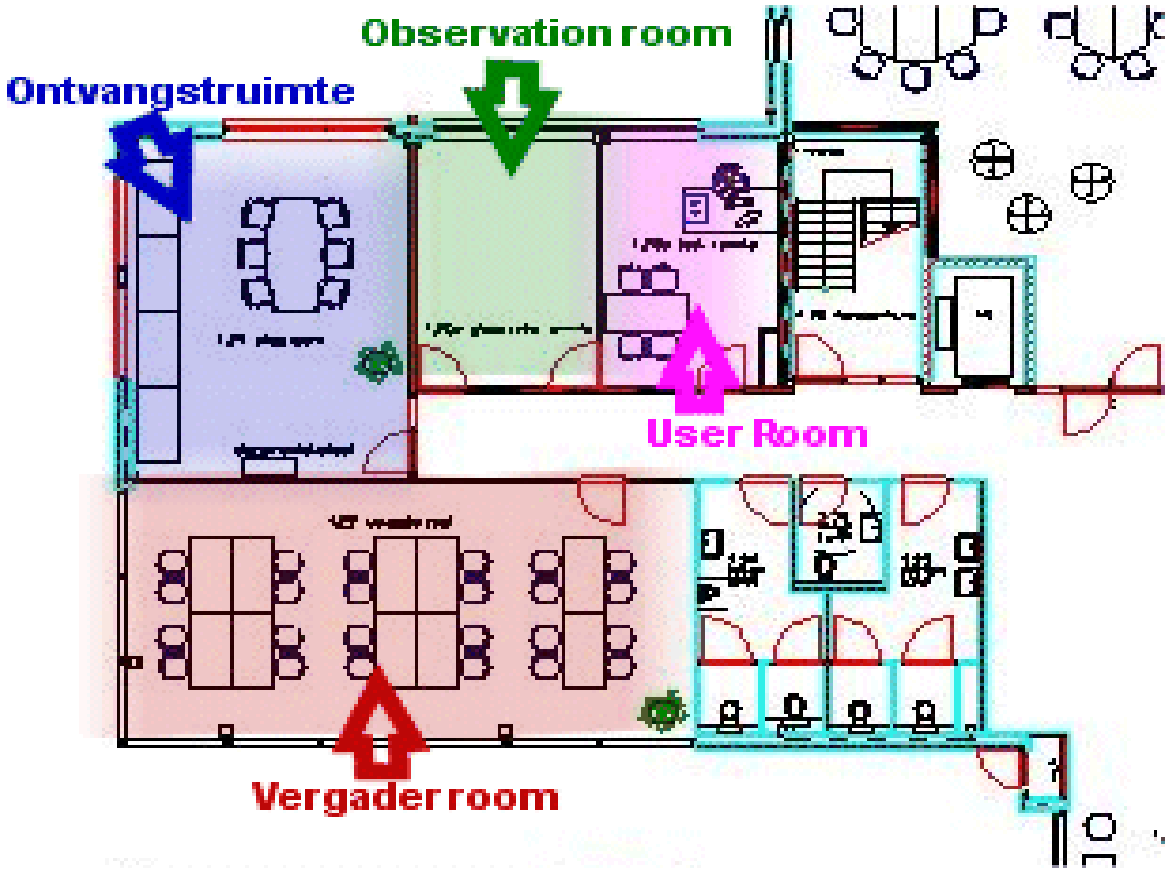

Experience Lab

4 rooms:

- User room: where the tests take place
- Observation room: where data collection and analyse happens, contains all equipment
- Vergaderzaal: large observation room or large user room
- Ontvangstruimte: ‘waiting room’ for participants

Experience Lab

Equipment:

- Video camera’s
- Audio equipment
- Screen capture technology
- Recording equipment
- Annotation software
- Analysis software
- Network technology

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Multimodality in the Lab

The Observer XT: Core of the lab

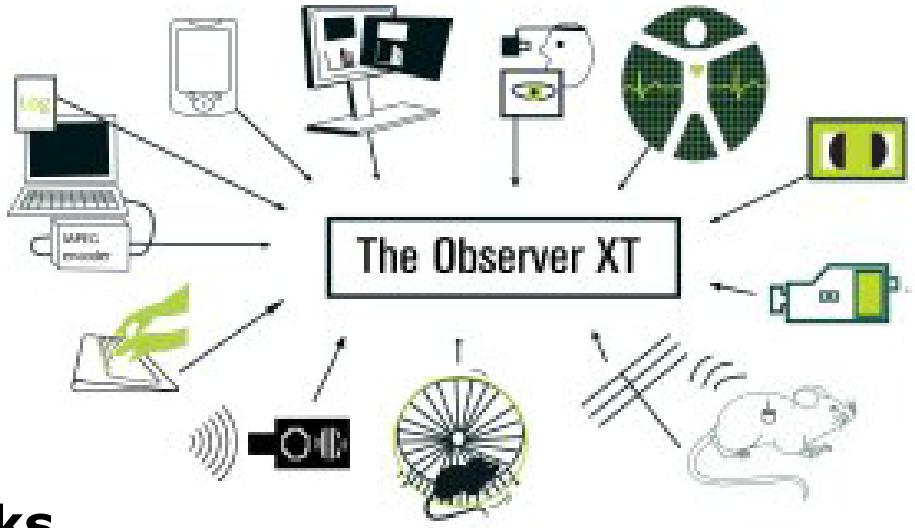
- Integration of multiple types of data

The Observer XT

Multimodality in The Observer XT

Synchronizing and integration of different data sources

- **behavior**
- **Live video**
- **Digitale VCR**
- **Media files**
- **Screen capture**
- **Physiological signals**
- **Eye tracker**
- **Log files**
- **Key presses, mouse clicks**
- **Live observaties from handheld computer**



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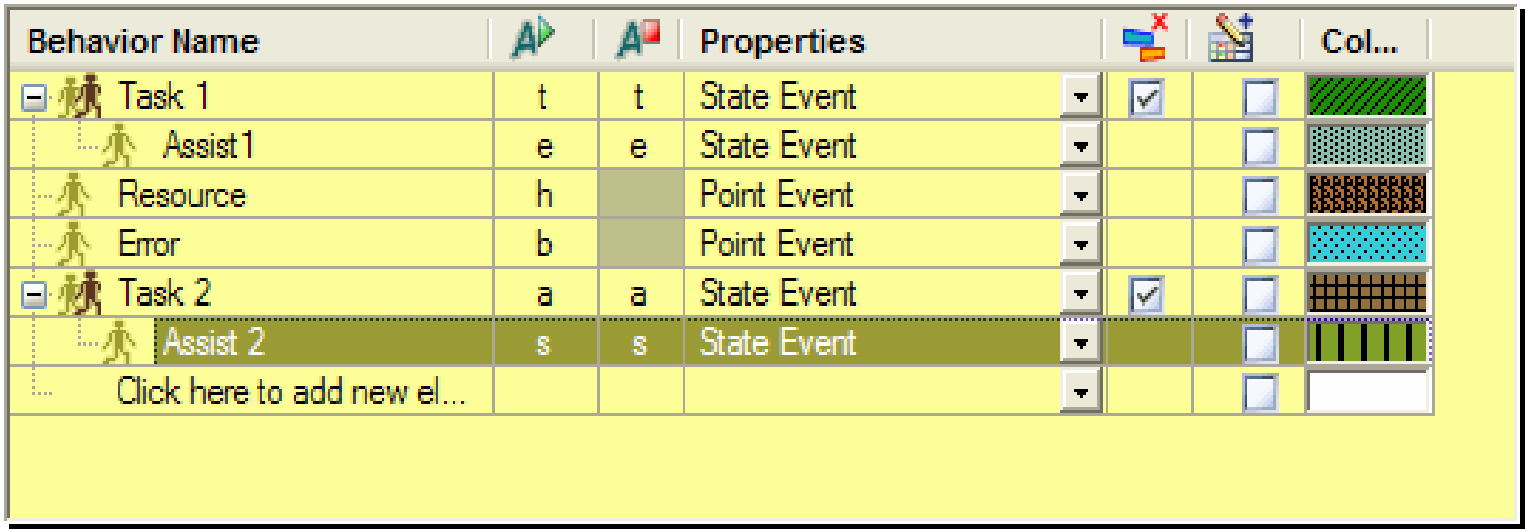
Coding observed behavior



Behavior Name			Properties			Col...
Task 1	t	t	State Event	☑	☐	
Assist1	e	e	State Event		☐	
Resource	h		Point Event		☐	
Error	b		Point Event		☐	
Task 2	a	a	State Event	☑	☐	
Assist 2	s	s	State Event		☐	
Click here to add new el...					☐	

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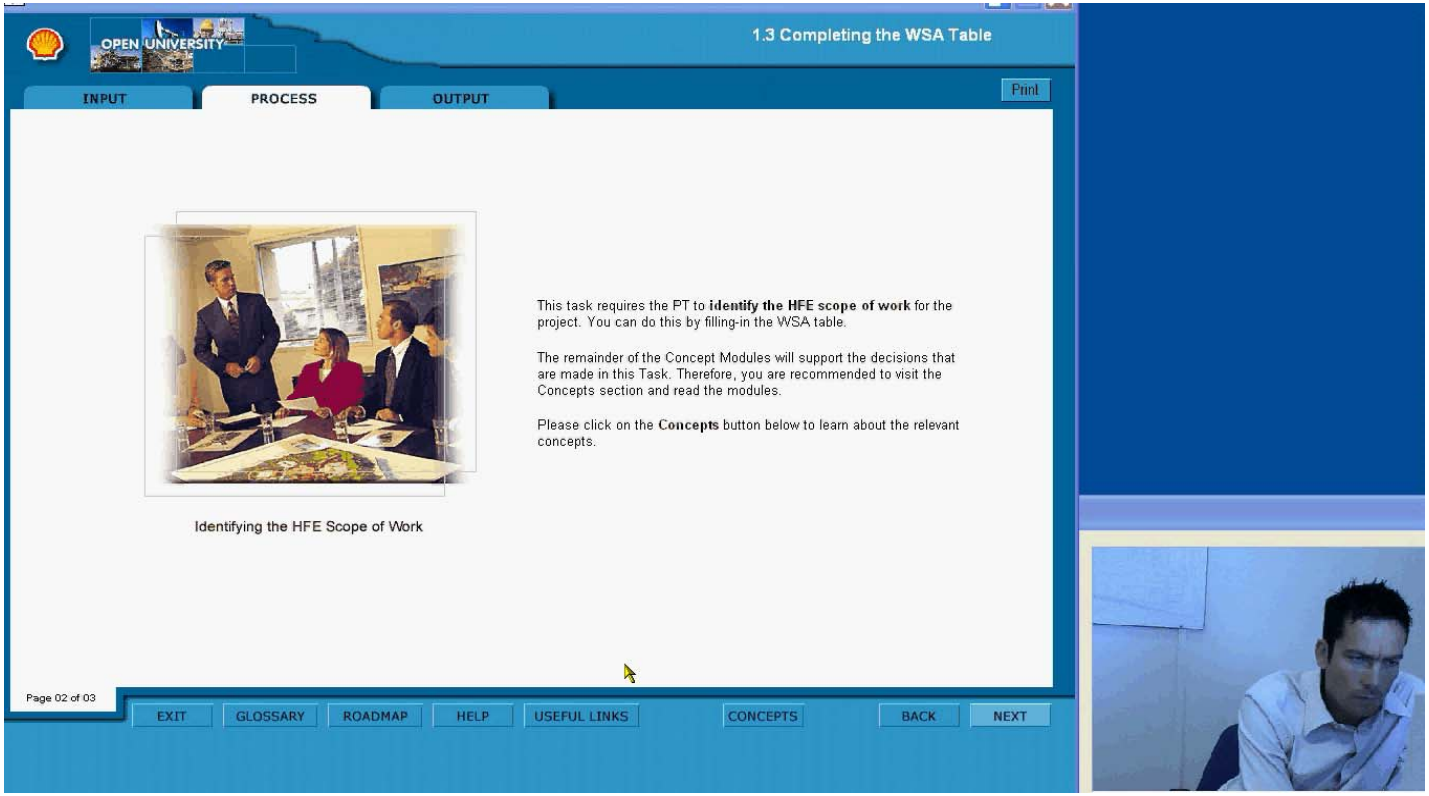
Screen capturing



Picture-by-picture

Electromyogram

- EMG measures contraction of muscles
- Electrodes applied to skin surface
- Can be used to measure difficulty of motor tasks, e.g. UI operations: cursor positioning, drag & drop, resizing windows
- But: rather laborious and obtrusive

Photo: Ab de Haan, University of Nijmegen, The Netherlands

Other signals

Finger clip

- Skin temperature
- Skin conductance
- Pulse frequency
- Pulse amplitude

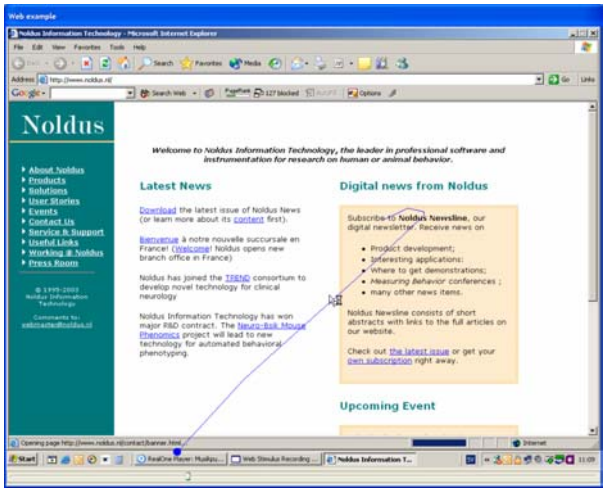
Objective assessment of feeling (stress, fear, anger, relaxation, concentration)

BioMedical

TIM-Lab, Danube University Krems, Krems, Austria

Eye tracking

- Infrared camera records eye movement - measure attention
- Head mounted, in computer screen, or stand alone
- Analysis: eye tracks, hotspots, fixations, areas of interest



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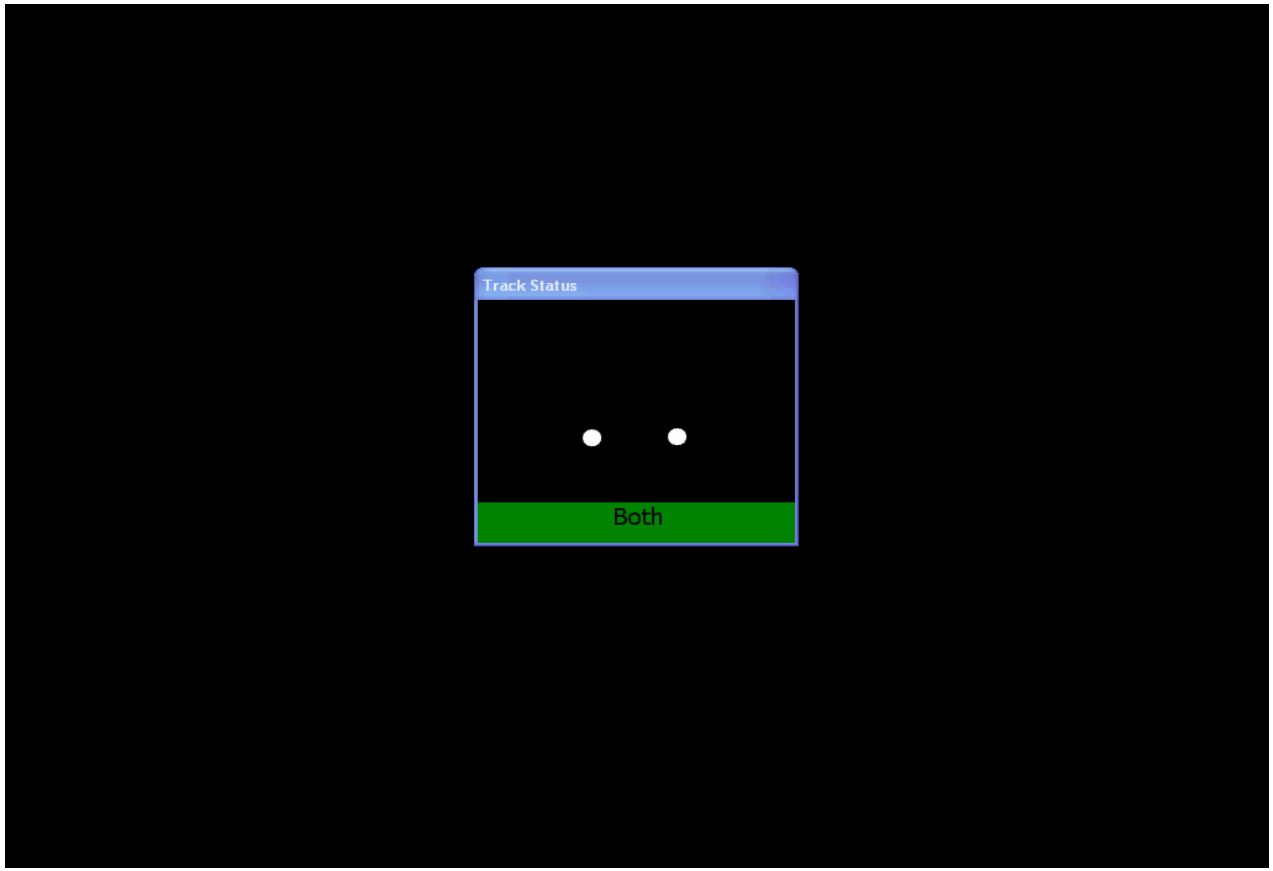
Eye tracking



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Emotions

- Mark expressions of emotion
- Questionnaires
- ‘Read’ emotions from the face of users

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Home lab

Usability testing of:

- TV and audio equipment
- Entertainment
- Games
- Appliances
- "Aware" applications



Philips Research

Eindhoven University of Technology

TNO Human Factors

Lab on wheels

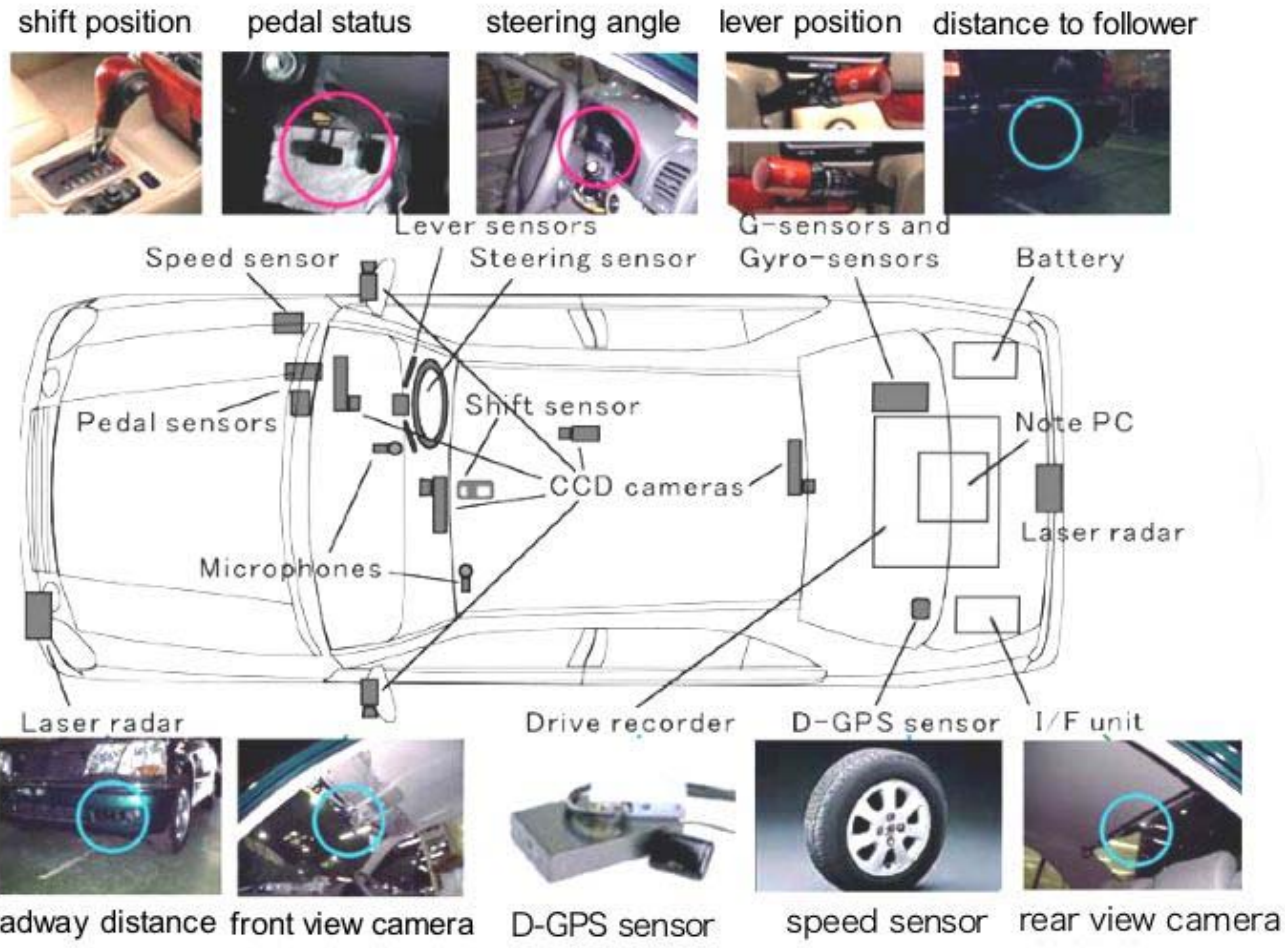
Usability testing of:
- Dashboard design
- Navigation systems
- Audio equipment

Integrate video recording with:
- Speed, acceleration, turning
- Position (GPS)

SensoMotoric Instruments

AIST, Tsukuba, Japan

Instrumented car



AIST, Tsukuba, Japan

Examples

Our own products

Observer

- **'our' sequence:**
  1. **Create configuration**
  2. **Create project**
  3. **Collect data**
  4. **Etc…**

users

Examples

ATM Machine

steps:

1. **Insert card**
2. **Enter PIN**
3. **Enter amount**
4. **Take out money**
5. **Take out card**

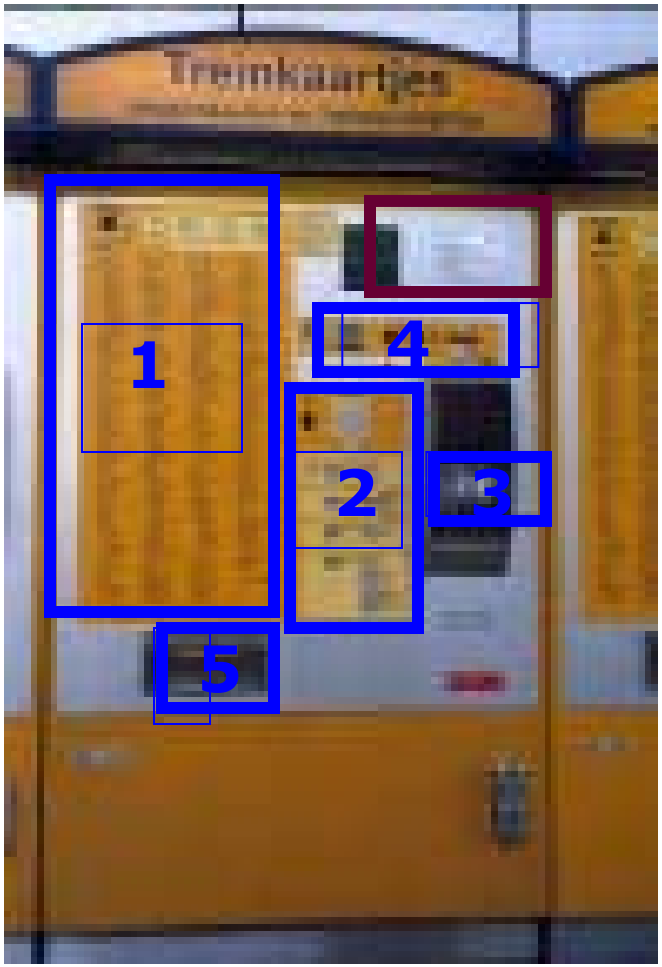
Examples

Flight stick control problem in aircraft

Examples

NS ticket vending

1. **Find destination**
2. **Select card type**
3. **Enter destination**
4. **Enter money**
5. **Get ticket**



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Examples

Requirements:

- **Users from 8 to 80**
- **All should be able to get a ticket**

NOTE:
Computer people had more difficulty using it