Noldus

Information Technology

The Observer XT

Computer-aided Usability Study

RusCHI, Moscow

Maurits J. Lenting, M.Sc.

Thursday, 02 November 2006

Overview

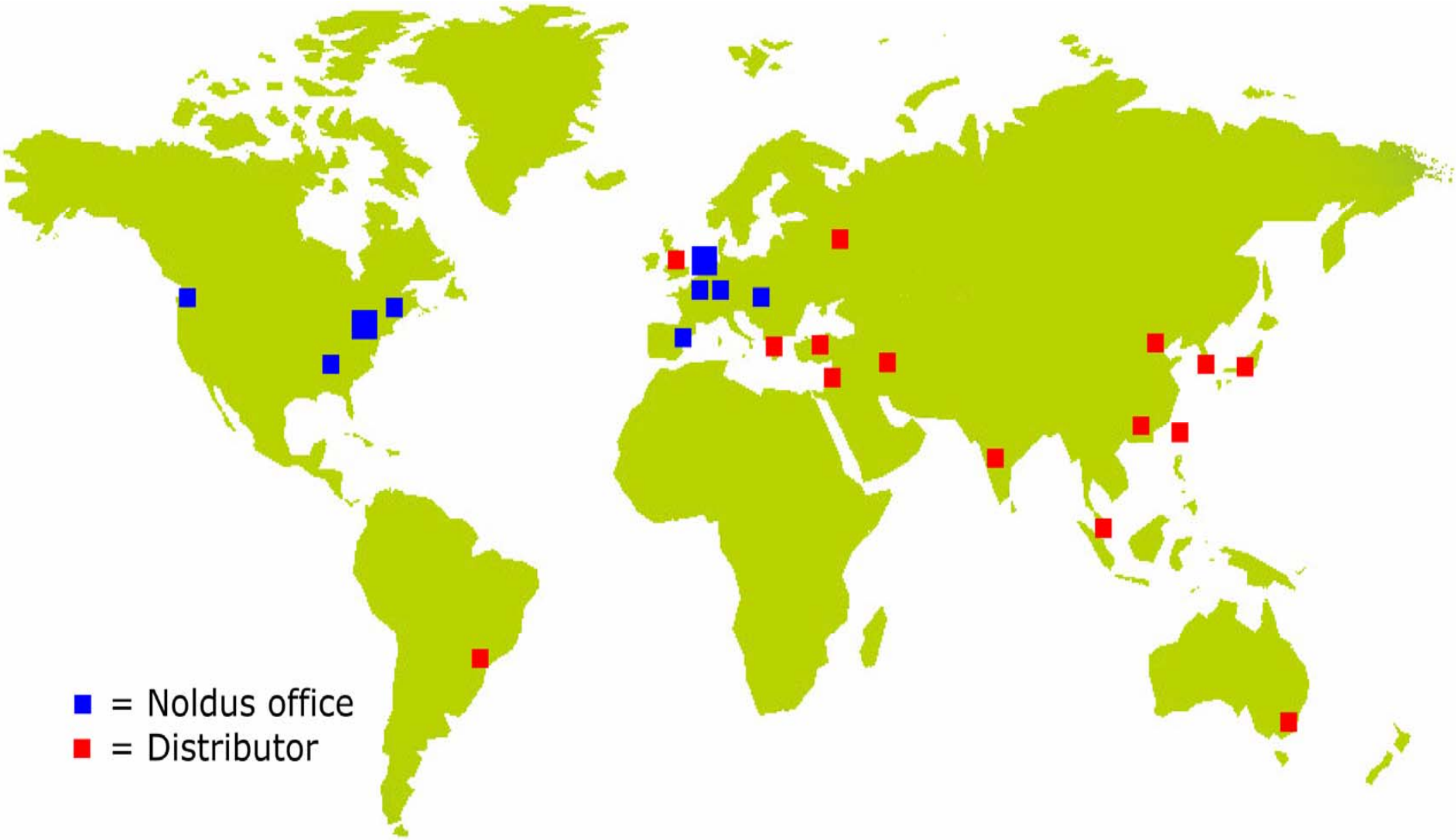
- Introduction - Usability
- Why The Observer XT?
- How to use The Observer XT
  1. Choose research/observation set-up
  2. Prepare The Observer XT
  3. Data Collection
  4. Synchronize Data
  5. Data Analysis and Output
- Live demonstration & applications

- Question time

Company Profile Noldus

- **Developer of professional software and instrumentation and services for behavioral research**
- **Founded in 1989 by Dr. L.P.J.J. Noldus**
- **Customers in >75 countries**
- **Installed at >3500 organizations**
- **80+ employees**

Worldwide sales and support network

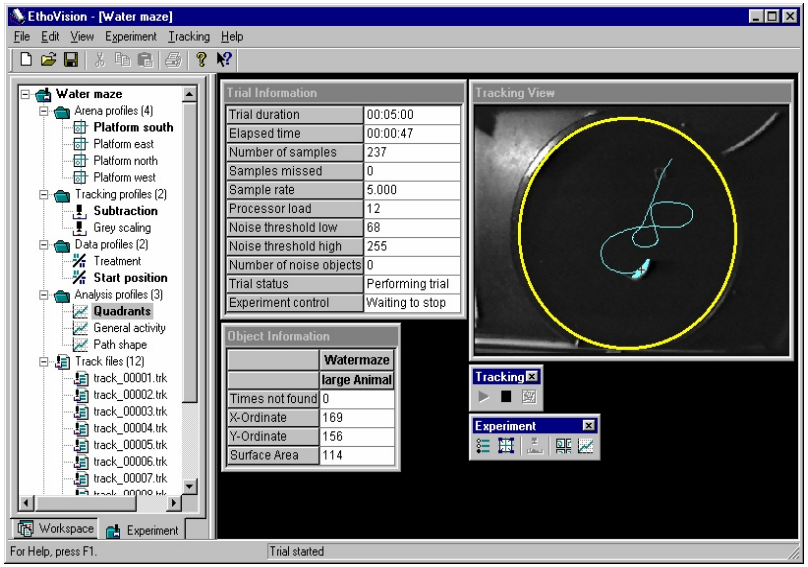


Product Group
Automated Observation

Description

Systems for movement tracking and complete automation of behavioral experiments

Based on digital image processing and pattern recognition technology



Products

EthoVision Basic, Pro, Color-Pro and XT

Product Group
Direct Observation

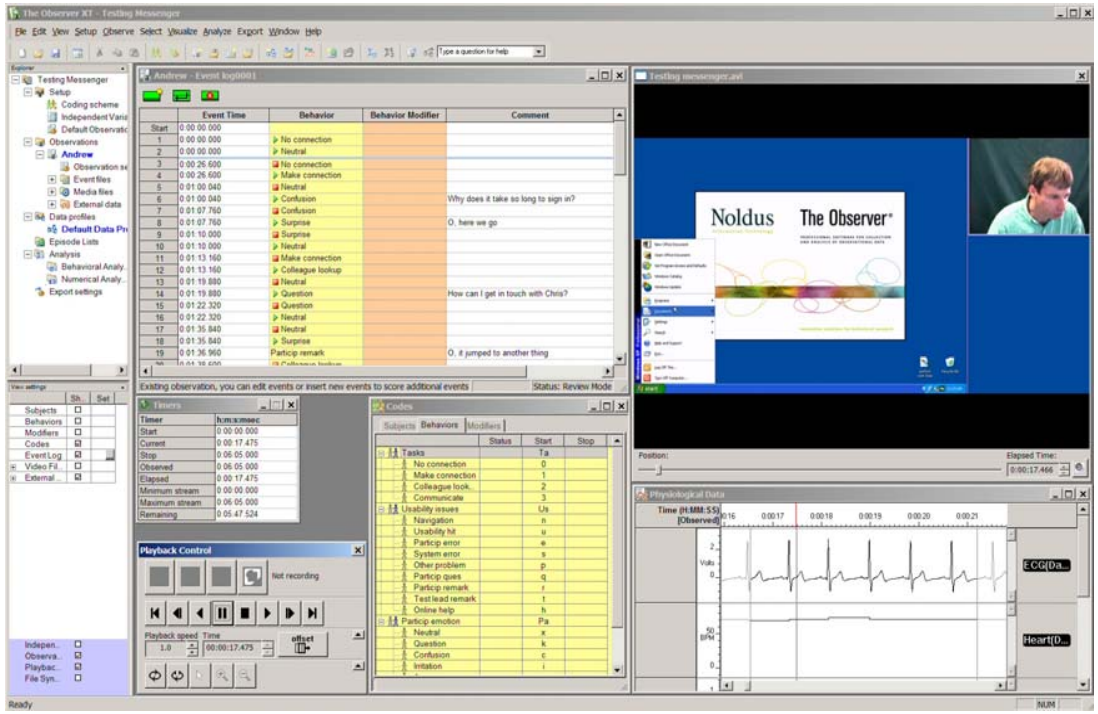
Description

Systems for computer-aided recording and analysis of human or animal behavior, based on manual data entry by a human observer

Products

The Observer XT

Base, Mobile, Video, External Data Module, Screen Capture Module



Selected Clients

Electronics
- Hewlett-Packard
- Intel
- Philips
- Samsung
- Siemens

Software
- Ariba
- Symantec
- Oracle
- Microsoft
- PeopleSoft
- Symantec
- Huawei / Futurewei
- SAP
- Infosys

Telecom
- AT&T
- Bell Atlantic
- Deutsche Telekom
- Nokia
- Ericsson

Automotive
- BMW
- DaimlerChrysler
- Nissan
- Rover
- Toyota
- Volvo

Aerospace
- BAE Systems
- Boeing
- Eurocontrol
- Lockheed Martin
- Matra BAe Dynamics
- NASA
- Thales

Transportation
- Alstom
- KLM
- SNCF

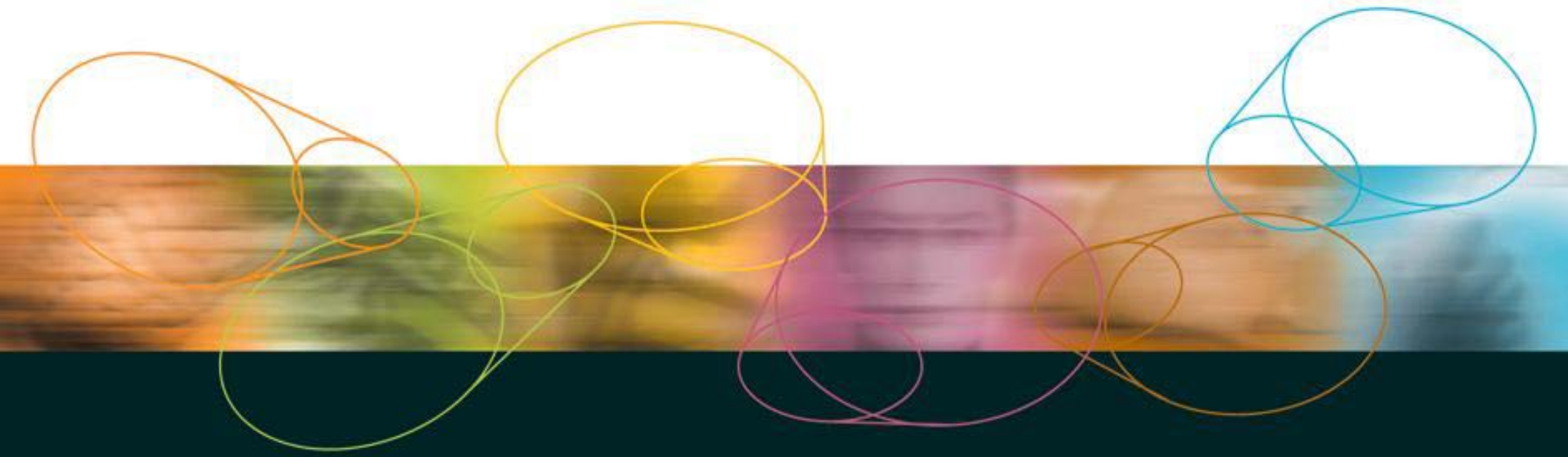
Consulting
- American Management Systems
- Accenture
- TNO Human Factors
- Usercentric Design

Information / Finance
- America Online
- Barclays
- Dow Jones
- NatWest
- Rabobank
- Statistics Netherlands
- U.S. Bureau of Labor Statistics
- U.S. Bureau of the Census
- Yahoo!

Consumer Products
- Unilever
- Herman Miller
- MacDonalds

Noldus

Information Technology



The Observer XT

The Ne**XT** generation of observation software

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Usability

Usability Testing

Usability testing gives you the tools to improve the quality and user friendliness of your products

- **interaction between a product (software) and a potential user**
- **objective data about your product**
- **Measuring effectiveness, efficiency, satisfaction in relation to well-defined tasks**

- **Productivity tools, office applications**
  – *time is money*

User experience research

User Experience testing gives you the tools to improve the quality and user friendliness of your products

- **interaction between a product (software) and a potential user**
- **objective data about your product**
- **Measuring complete user experience, emotion, fun, excitement, trust**

- **Consumer products, games, learning systems – *fun* is money**

Usability Testing

Usability / User experience testing has its bottlenecks and problems:

- **Time-pressure –> labor-intensive**
- **Video and audio must be available quickly**
- **Tools are only used when they are easy to set up**
- **Tools need to shorten the analysis / reporting time & increase information availability**

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Demonstration

Traditional *versus* **Automated**

Pen and paper **The Observer**

Usability ?

Manual Observations: In the past

-watching the behavior of his subjects
-writes his observations down on paper
-using a clock to have time information.

Disadvantages:

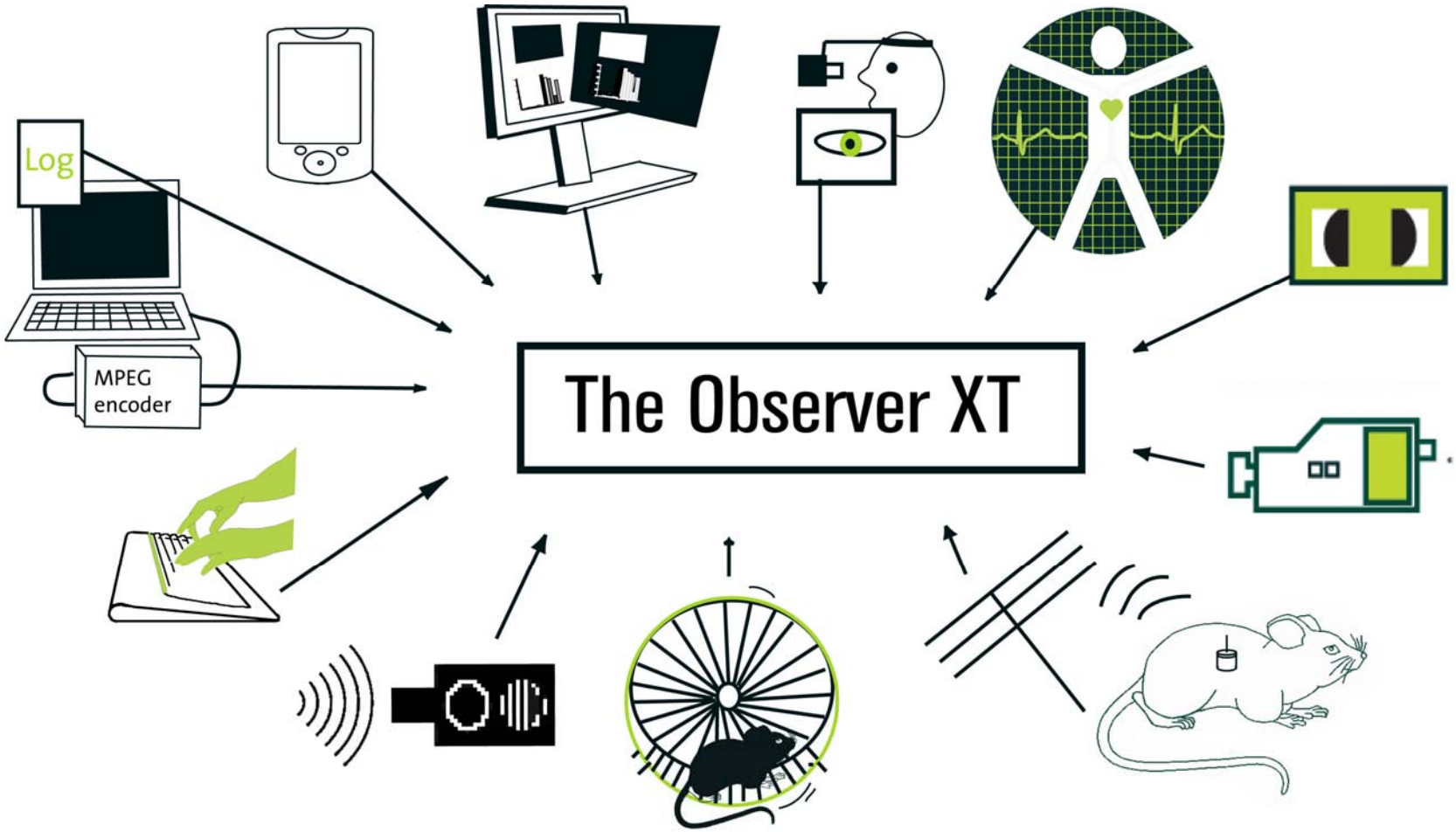
- Subjective observations (no fixed coding scheme)
- When person is writing he cannot look at his subjects
- No ways to check if data was correct (no review)
- Very labor intensive (because data later needs to be transferred to computer, which takes time and can cause mistakes)
- No integration of physiological/external signals

Solution: The Observer XT

A coding scheme is made in which behaviors are given a keyboard key. During observation, just press the keys corresponding to the behaviors.

-The Observer XT allows you to synchronize video files, physiological data and behavioral data, the only program in the world that can do this!

External data co-acquisition



Synchronize all data !

The Observer XT, 3 versions

Base:

allows live scoring using a desktop computer or a notebook

Mobile:

allows easy scoring of data in the field using a handheld computer (Palmtop or Psion Workabout Pro), live scoring only

Video:

Data-files can be linked to video. For analyzing and re-analyzing multiple videos in detail, with search functions and automatic video editing.

Why not an automatic system?

Progress is made, BUT we want no mistakes !

Some behaviors are too difficult to 'see' by an automatic system.
→ Thus a human observer is still necessary.

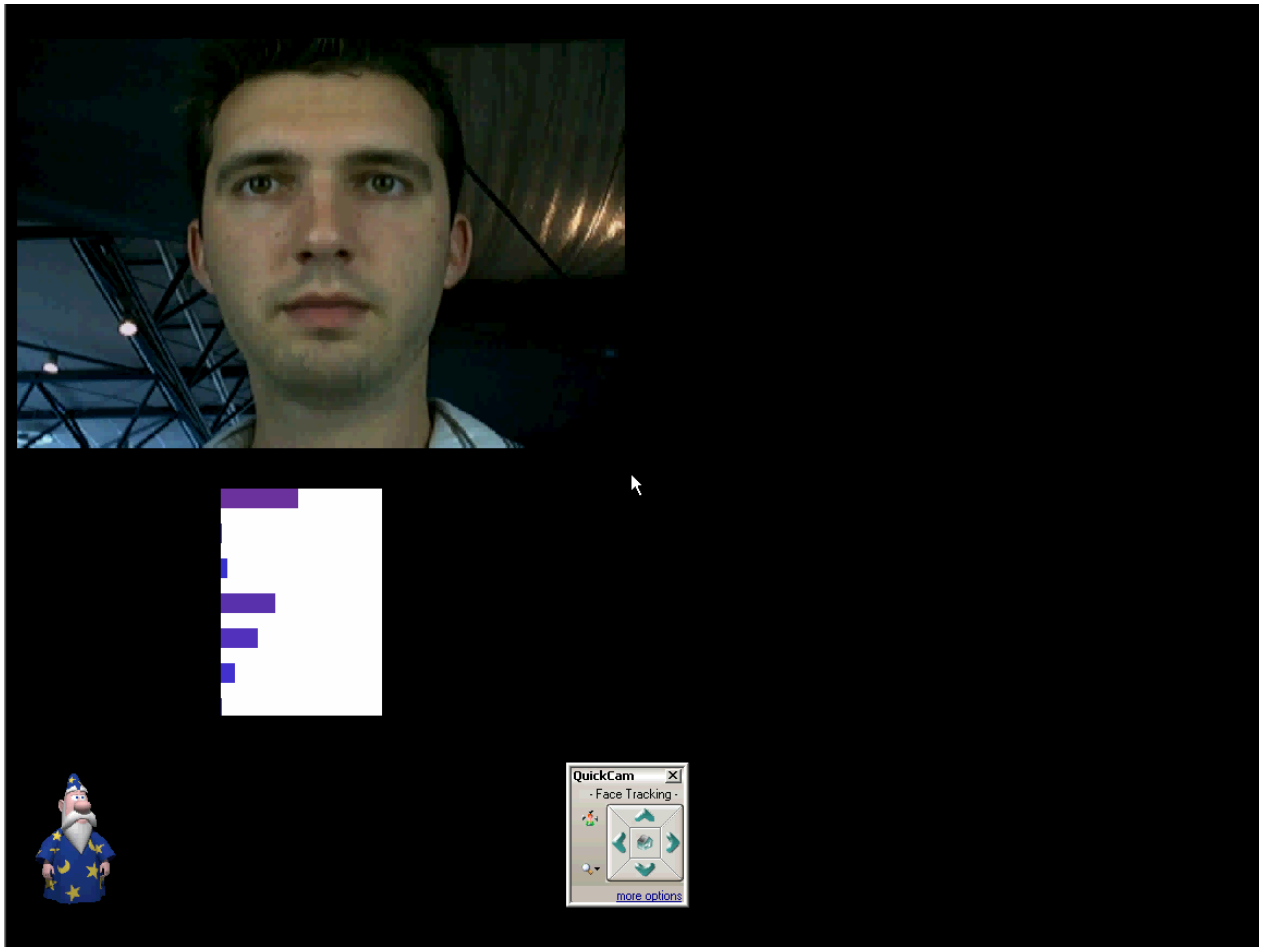
Examples of these difficult behaviors:

- **Mood of a person: happy or sad**
- **Meeting of two subjects: friendly or aggressive**
- **When performing a test: mistake made, yes or no**
- **Observations in a group: is every person participating?**

Why not an automatic system?

Example: New development: FACE READER

- Mood of a person: happy or sad
  → still difficult to calibrate cross-cultural faces and expressions



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How to use The Observer XT
Five steps

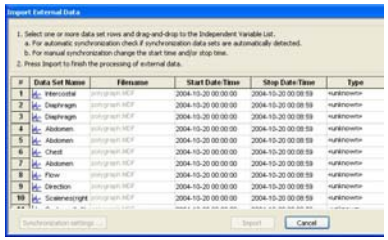
1 Choose Setup

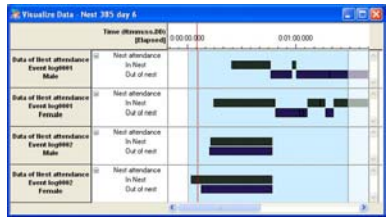
2 Create Coding Scheme

3 Collect Data

4 Import external data

5 Select + Analyze Data





How to use The Observer XT

STEP 1 - Choose setup

Observing live

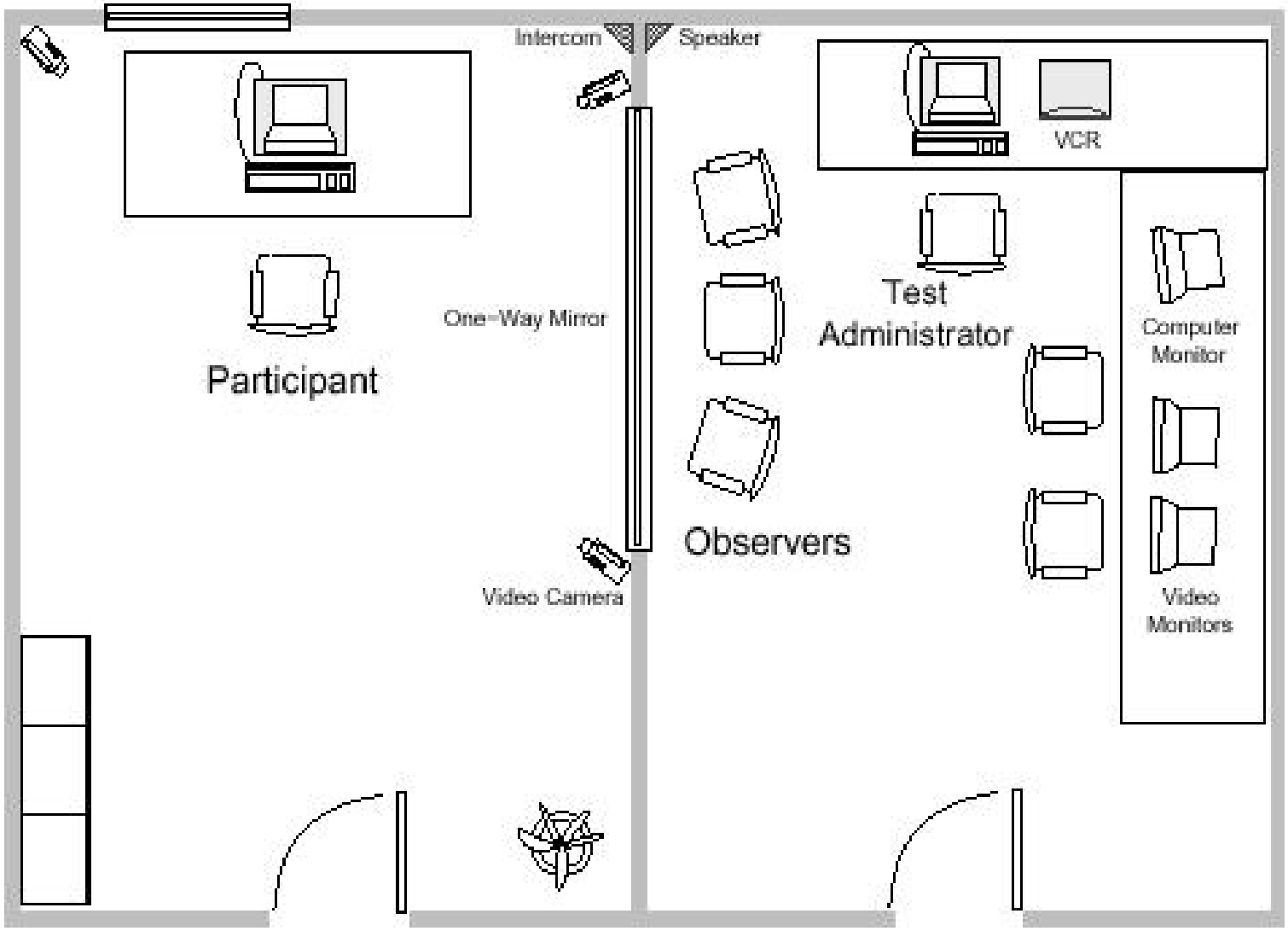
How to use The Observer XT

STEP 1 - Choose setup

Connect video camera to PC

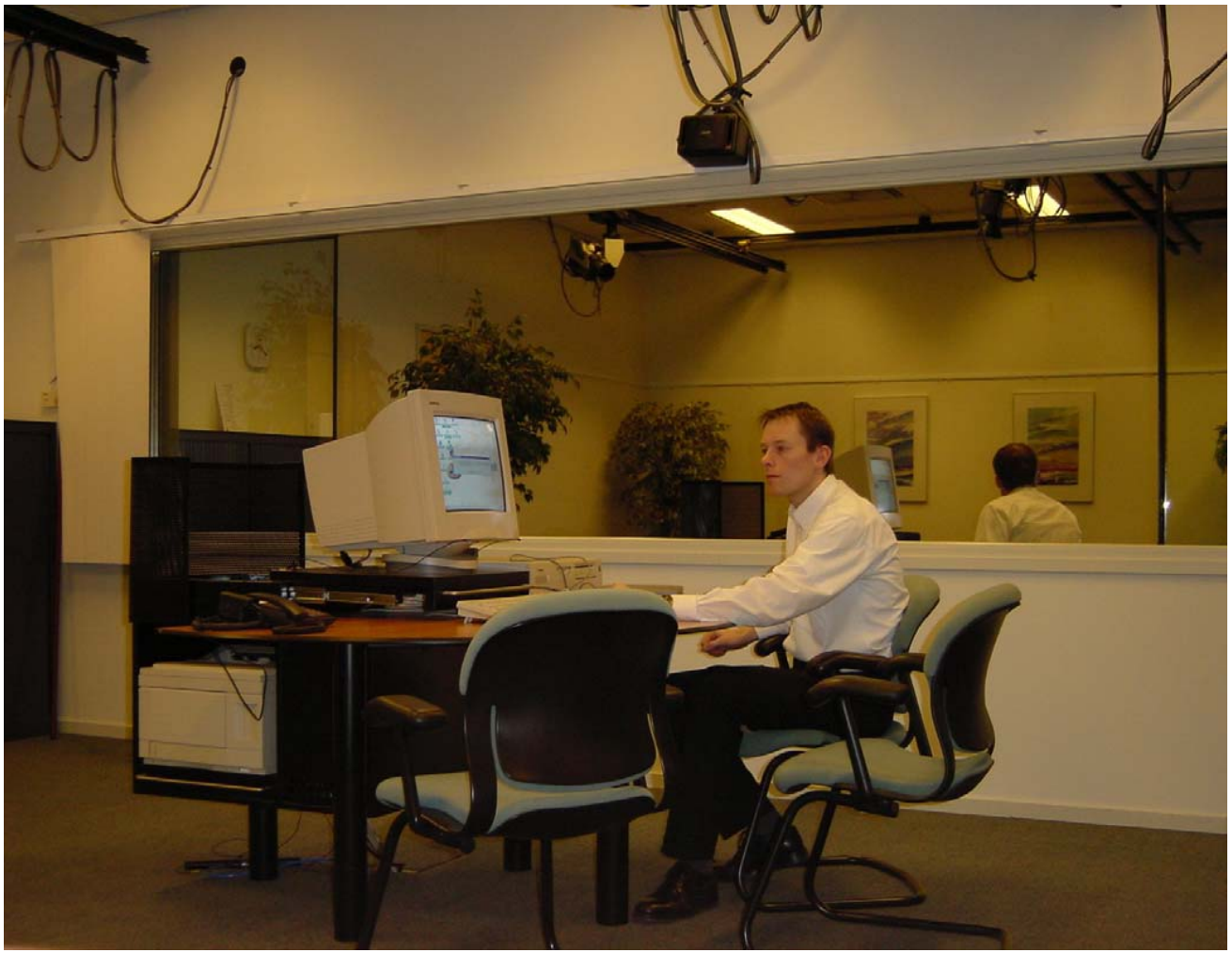
Observing with video signal

Usability lab (floor plan)

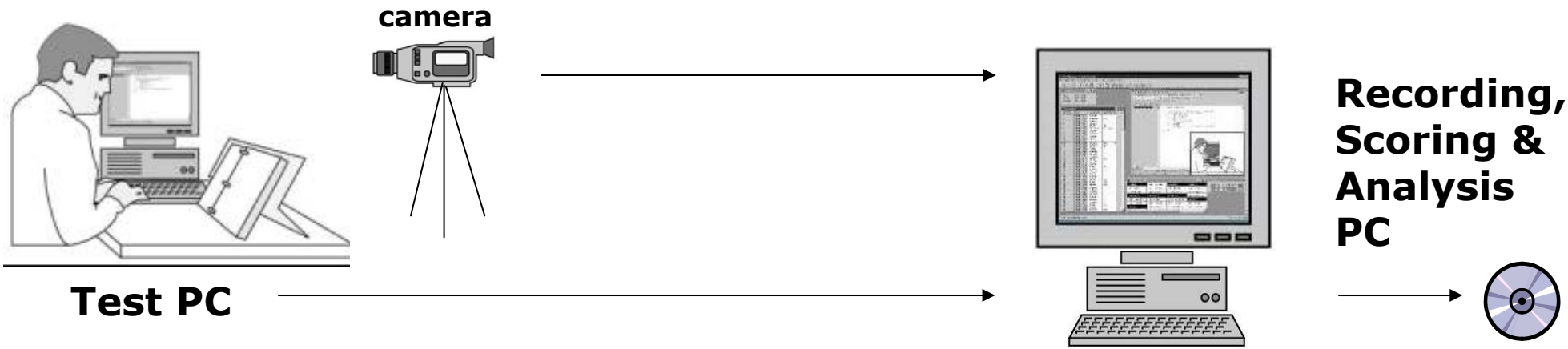


Usability lab

Usability lab



Digital Screen Capture



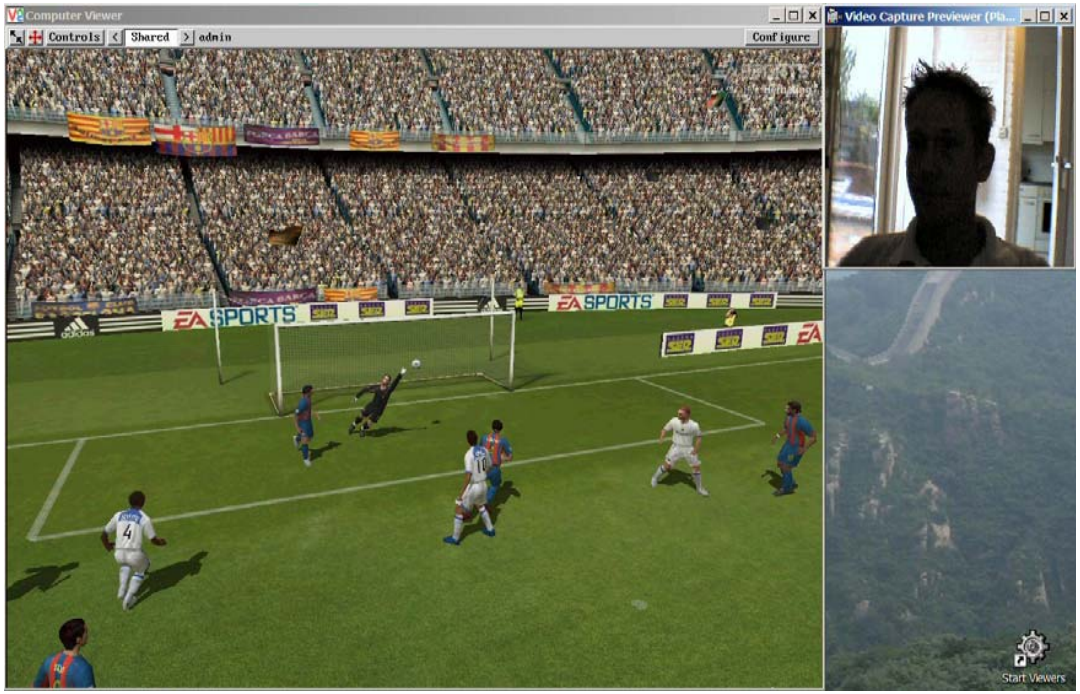
- High quality: read exactly what you've captured
- Integrate Facial expressions.
- Automatic synchronization with event log

- ***No software has to be installed on test PC!***

Screen Capture Module

Test-User Interface in high resolution!

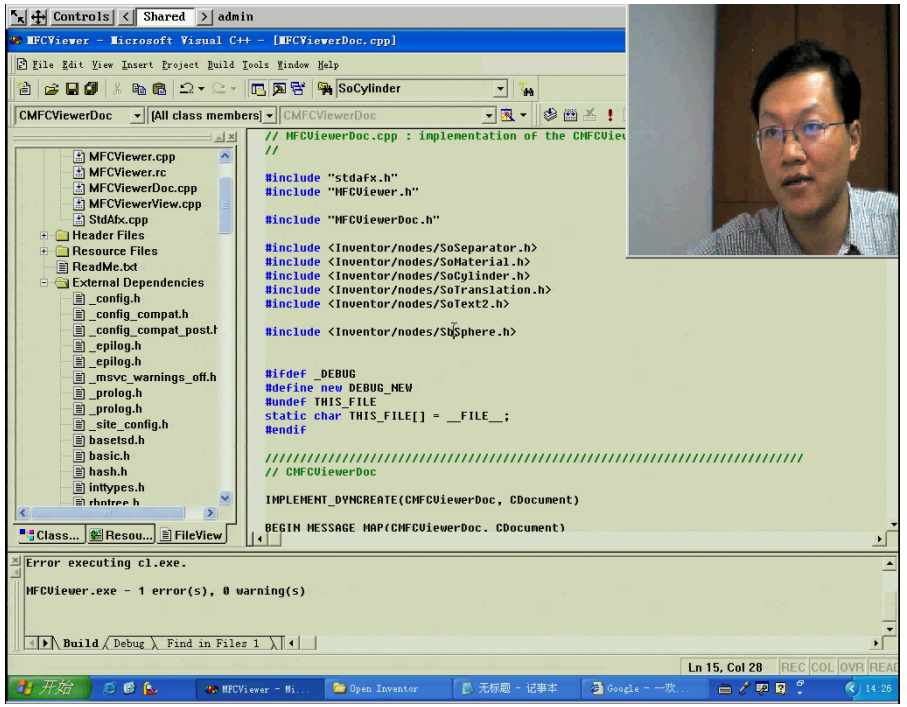
SCM: Whatever UI you want



Fifa 2005

- Game play
- Developers' work

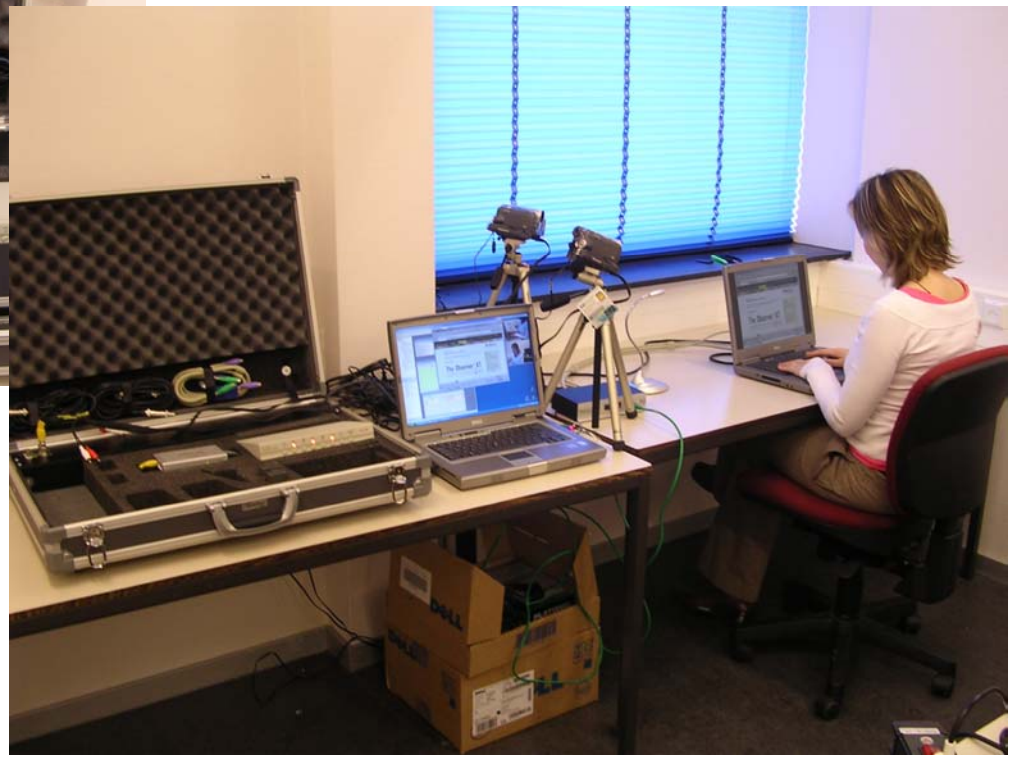
- Picture next to picture
- Picture-in-picture
- Multiple video
- Etc…



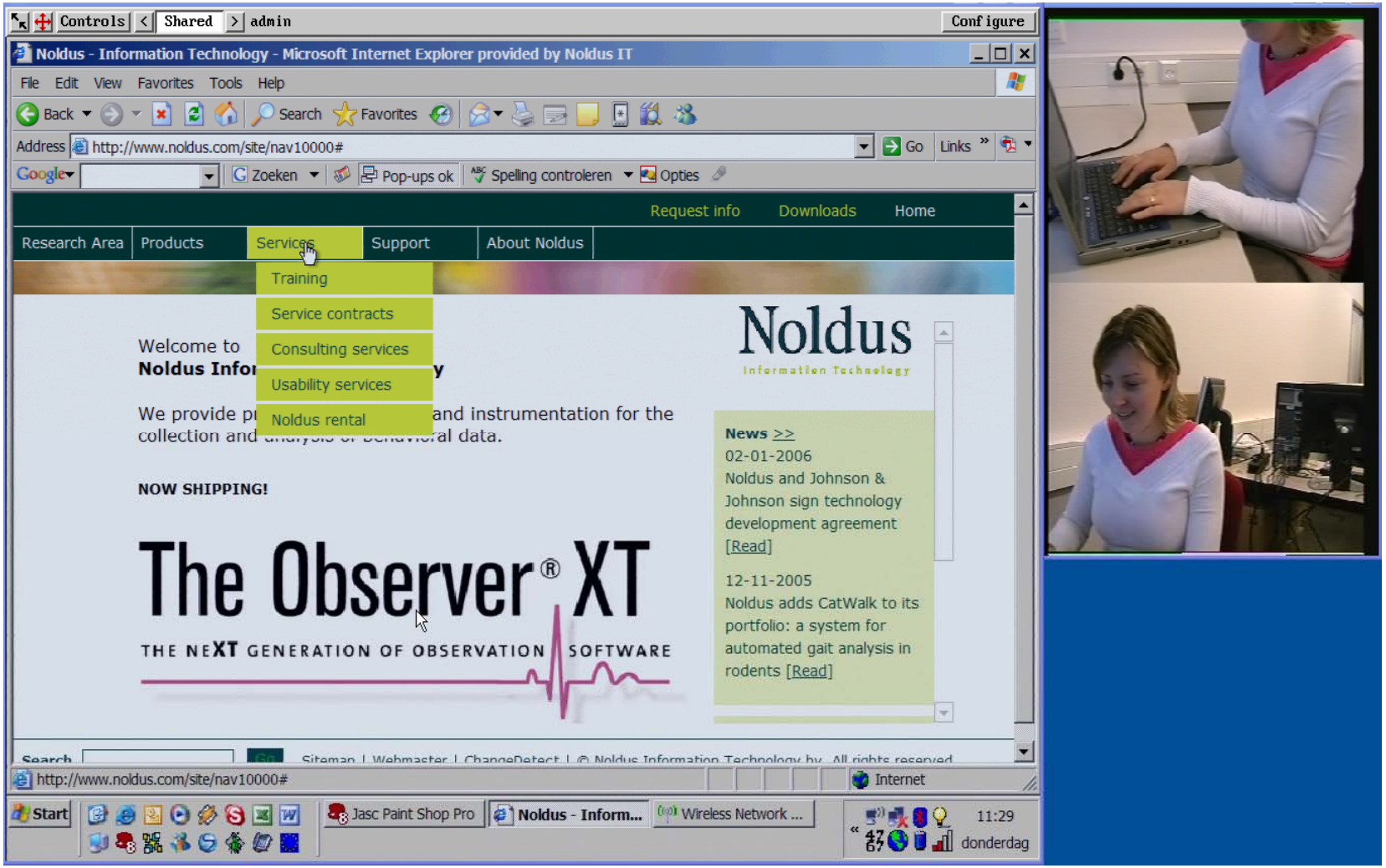
IEL, CAS

Portable usability lab

Portable observation lab

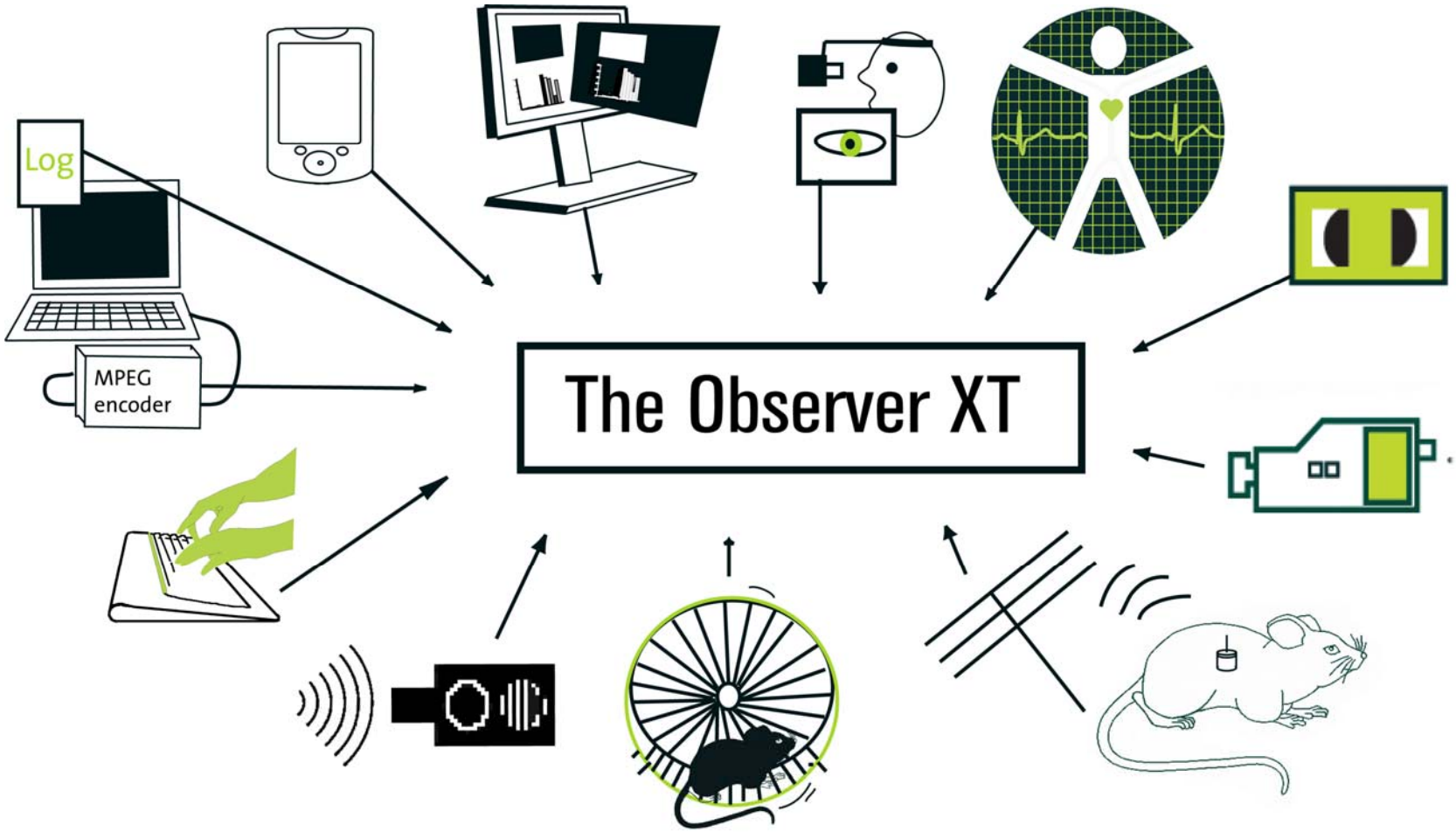


Screen Capture setup



Step 1

External data co-acquisition



External data co-acquisition

Choose, set up and prepare other acquisition systems like:

- Physiological equipment (heart beat, transpiration, blood pressure, etc)
- Eyetracker
- Automatic user-action logger (mouse clicks, keystrokes)
- Any other sensor with data-output, etc.

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How to use The Observer XT
STEP 2 – Prepare The Observer

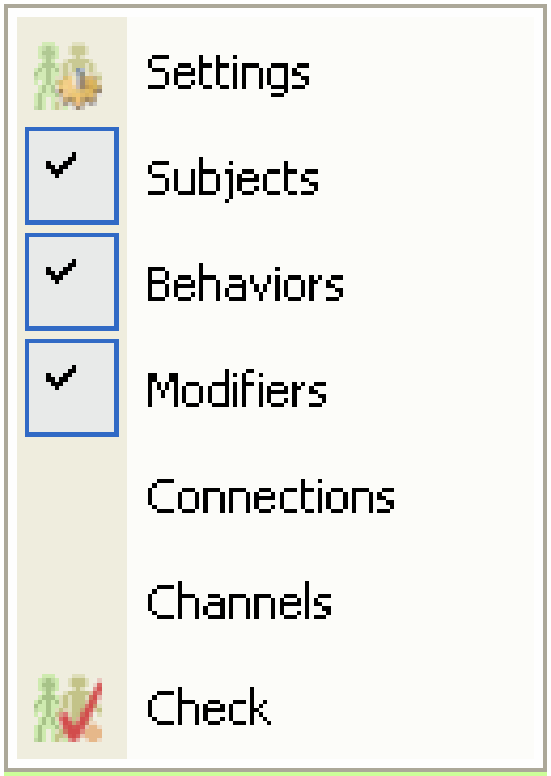
Configure all settings according to your needs.

What are we going to score (coding scheme)?

Coding scheme

Keys

- **Subjects** (names of subjects)
- **Behaviors** (actions that you want to observe)
- **Modifiers** (specify subjects and behaviors more precisely)
- **Check coding scheme**
- **Connections**
- **Independent variables**

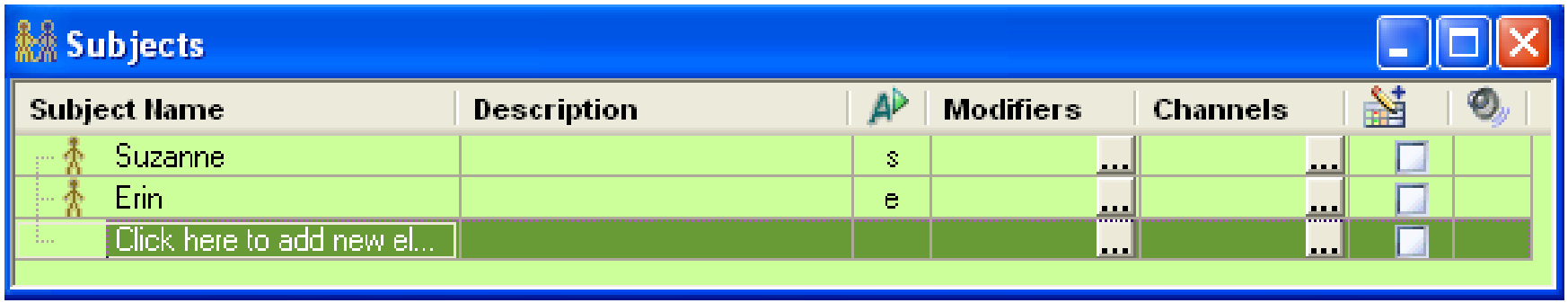


Subjects

Subjects are individuals in a project that can initiate a behavior

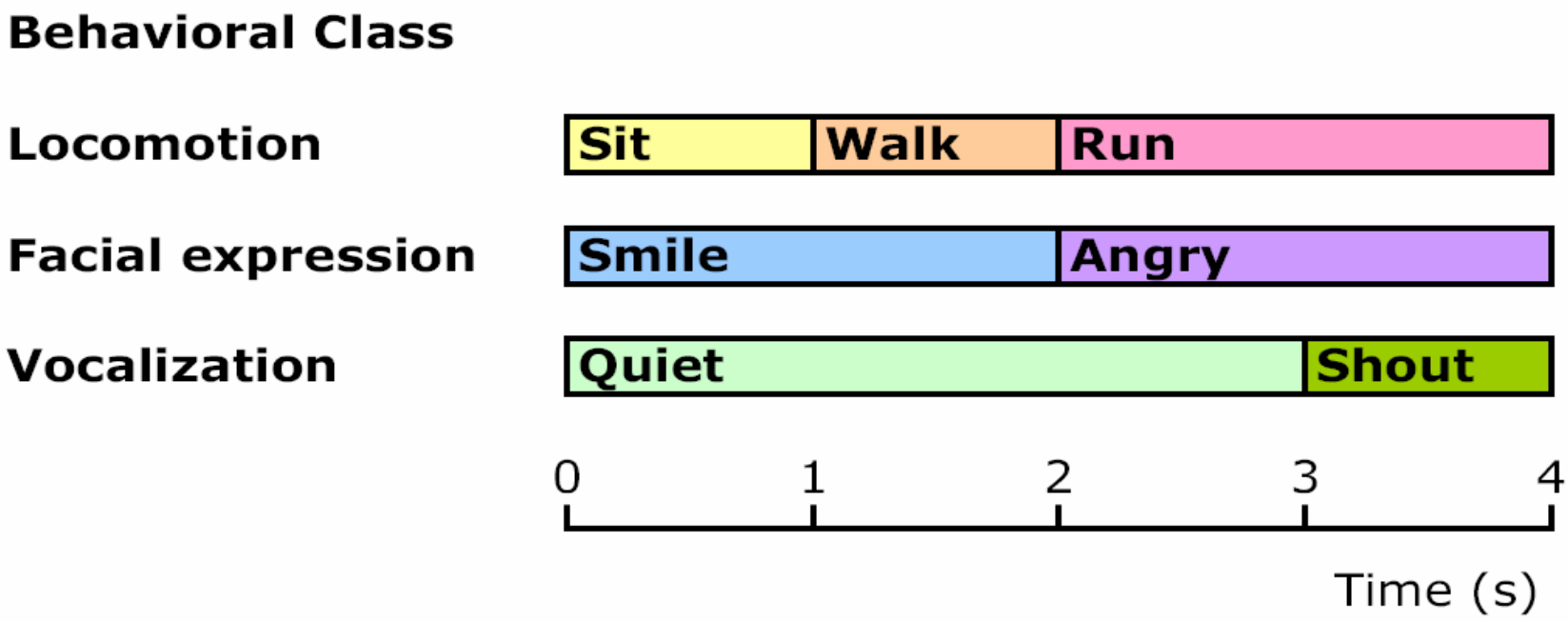
Example

- **Person performing the test**
- **Children at play**
- **Product/software giving 'response'**



Behavioral Class

- To score behaviors that occur simultaneously, you must define two or more behavioral groups
- All state behaviors in a behavioral class must be mutually exclusive and exhaustive



Modifiers

Score Modifier to:

- specify a behavior more precisely
- limit the number of behaviors

Examples:

- The part of the program the user is in
- The volume in which the person is talking

Simple coding scheme

Example: logging user remarks and problems encountered while working on a task

Task	Action	Communication
Task 1	Problem	Comment
Task 2	Error	Question
Task 3	Usability hit	Vocalization (sigh, etc.)
Task 4		
Task 5		
Task 6		

Complex coding scheme

Task intention coding (partial)
(Dzida et al.)

Prepare
Object to be treated
Suitable tools
Goal to be defined

Execute
Command
Data input

Mood
Positive
Negative
Neutral

Opportunism
Adapt result
Ad-hoc search
Prevent damage

Feedback
Offer interaction element
Visual guidance
Offer context
Present result
Prompt user

System action
Alert
Response

User evaluation
Check result
Stop
Comment
Retry
Stress

Example of Coding scheme Usability test

Behavioral Class: Action
Scroll
Typing
Reading
Mouse click
Other Action

Modifier Class: Location
Main screen
Address bar
Help menu

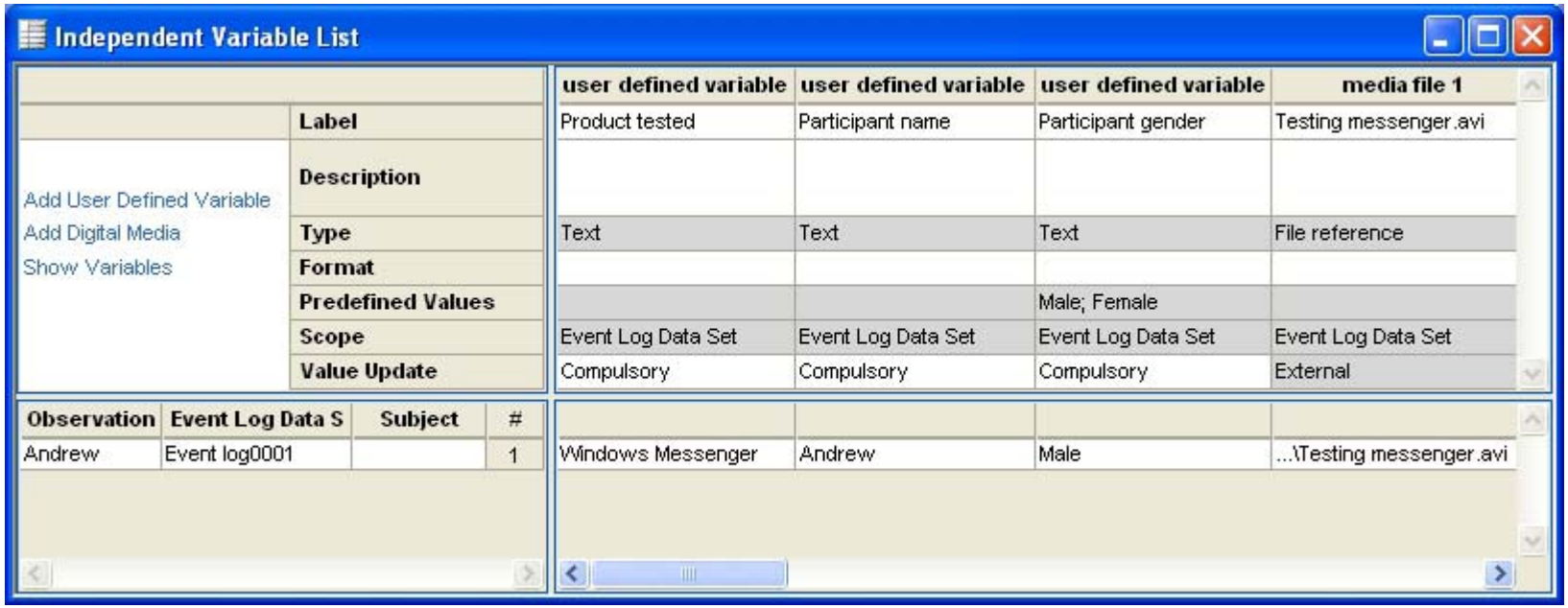
Modifier Class: Mouse Location
Back button
Close button
Undo Button
Other

Behavioral Class: Facial expression
Happy
Neutral
Confused
Other Facial

Behavioral Class: Events
Error
Usability hit

Independent Variable List

- **Independent or user-defined variables (age, gender, tested product, IT-experience)**
- **Media files**
- **External data files**
- **System variables (Start Time, Stop Time, Duration)**



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Score data and adjust the coding scheme

1 Choose Setup

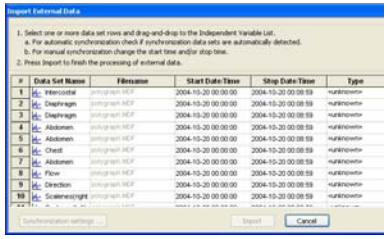
2 Define a Coding scheme

3 Collect Data

4 Import external data

5 Data Analysis and Output

Actions	c	c
Write	w	w
Phone	p	p
Other	o	o
Read	d	d
Type	t	t
Userstats	i	i
Problem	1	1
Error	f	f

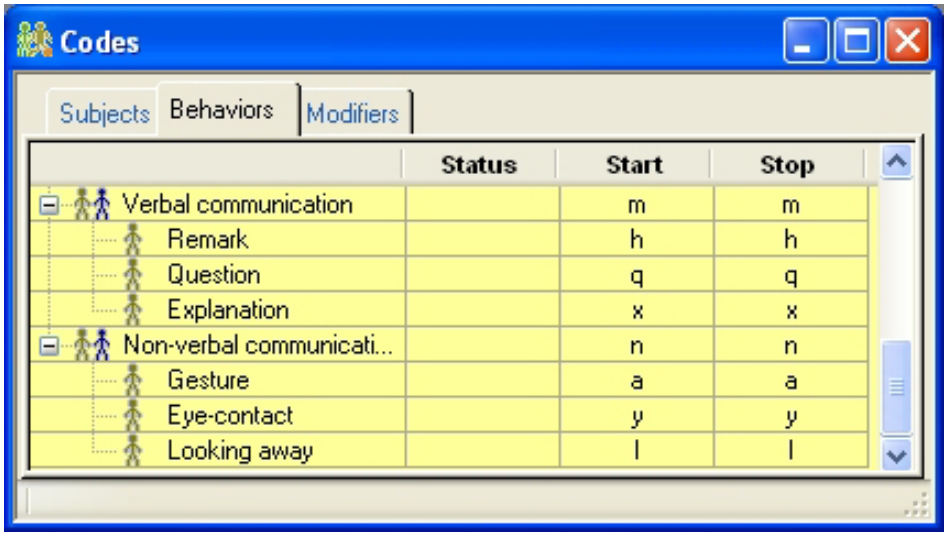


Step 3

How to use The Observer
STEP 3 - Collect Data

- Collect video material
- Encode digital video
- **Create an Observation**
- **Watch video and score data**
- Adjust coding scheme

Scoring Behaviors



- Press keys on the keyboard for subjects, their behavior and modifiers
- Use the mouse to select codes from the Codes window

Scoring from video

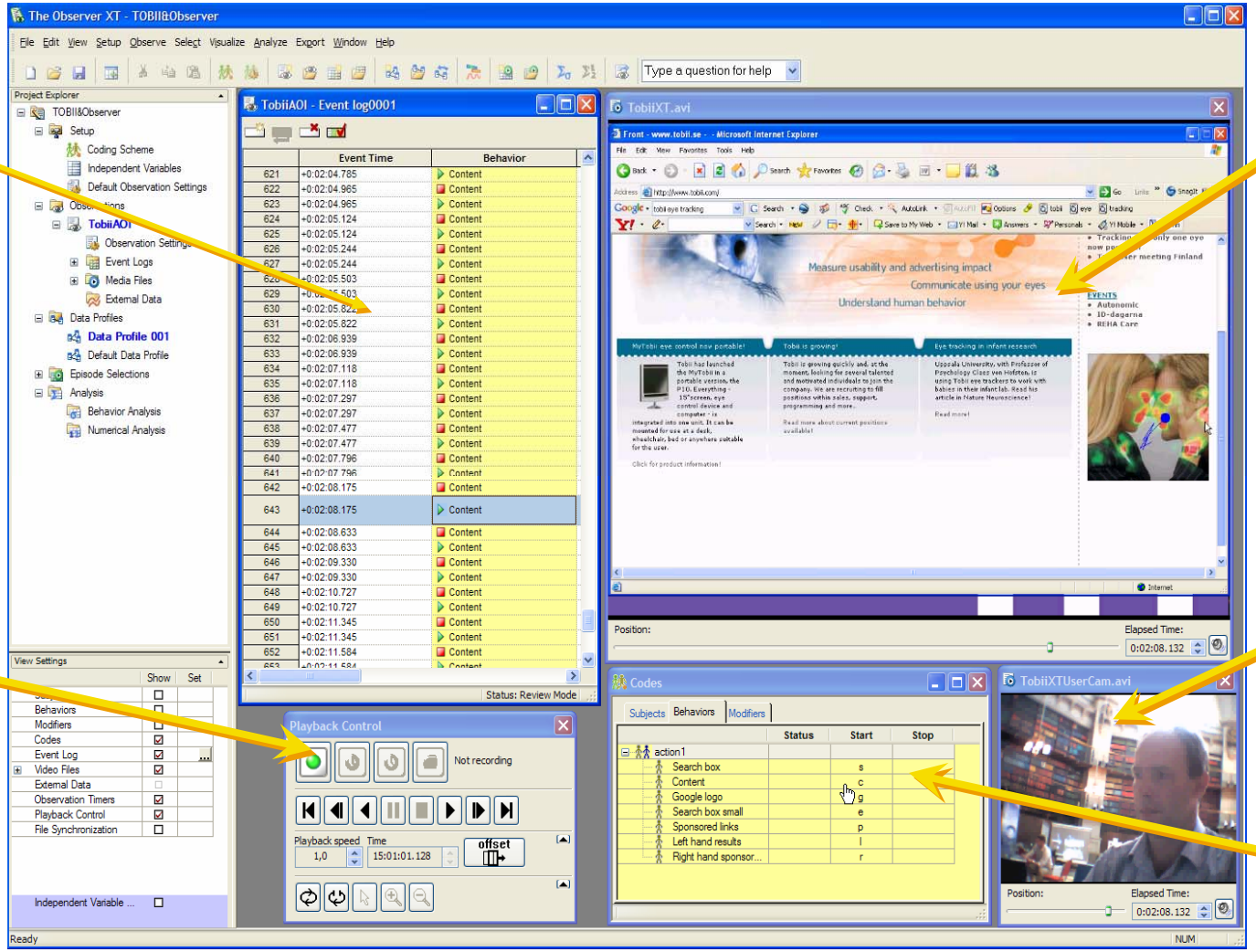
Event Log window

Monitor Window UI test

Video Control

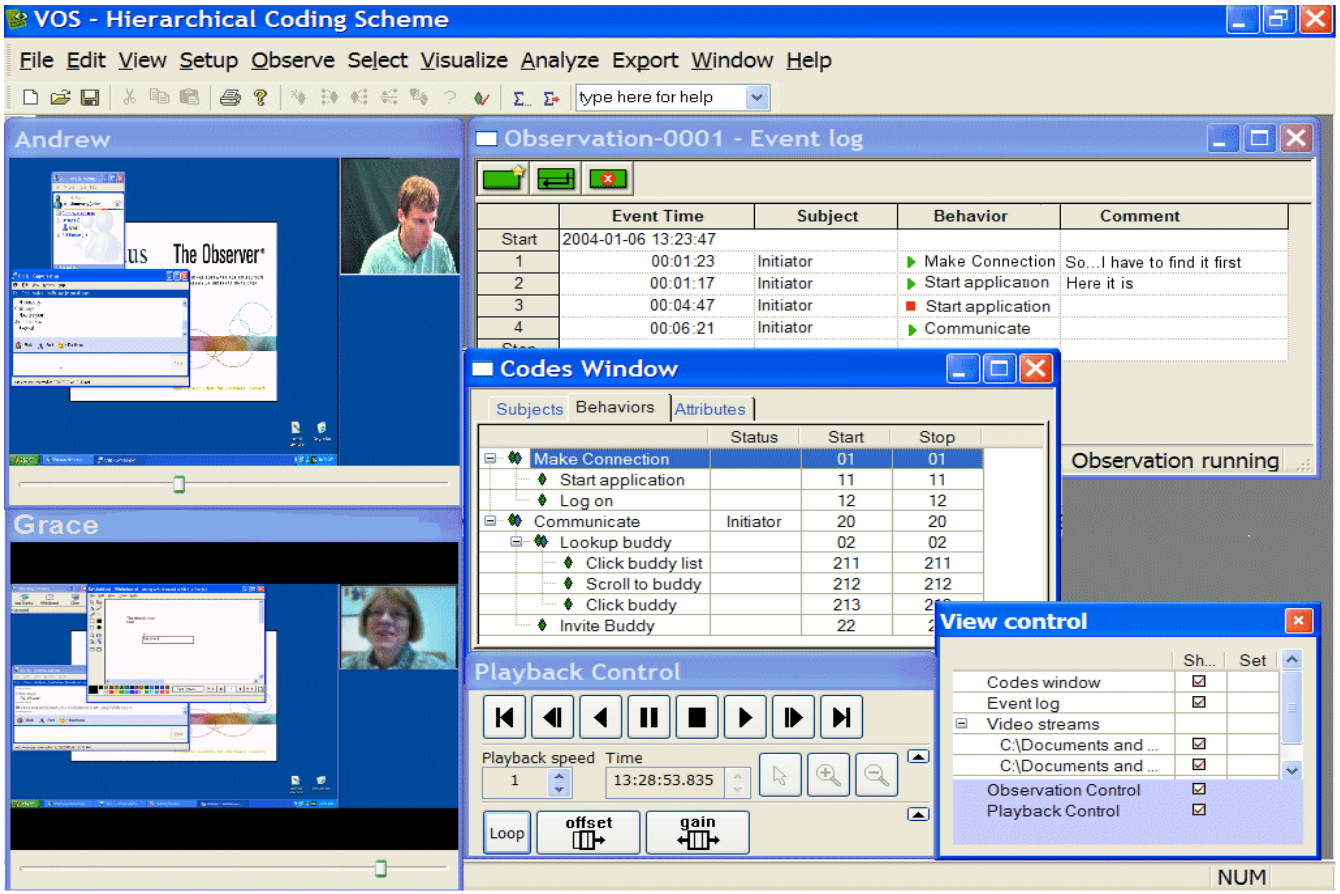
Monitor Window user

Codes window



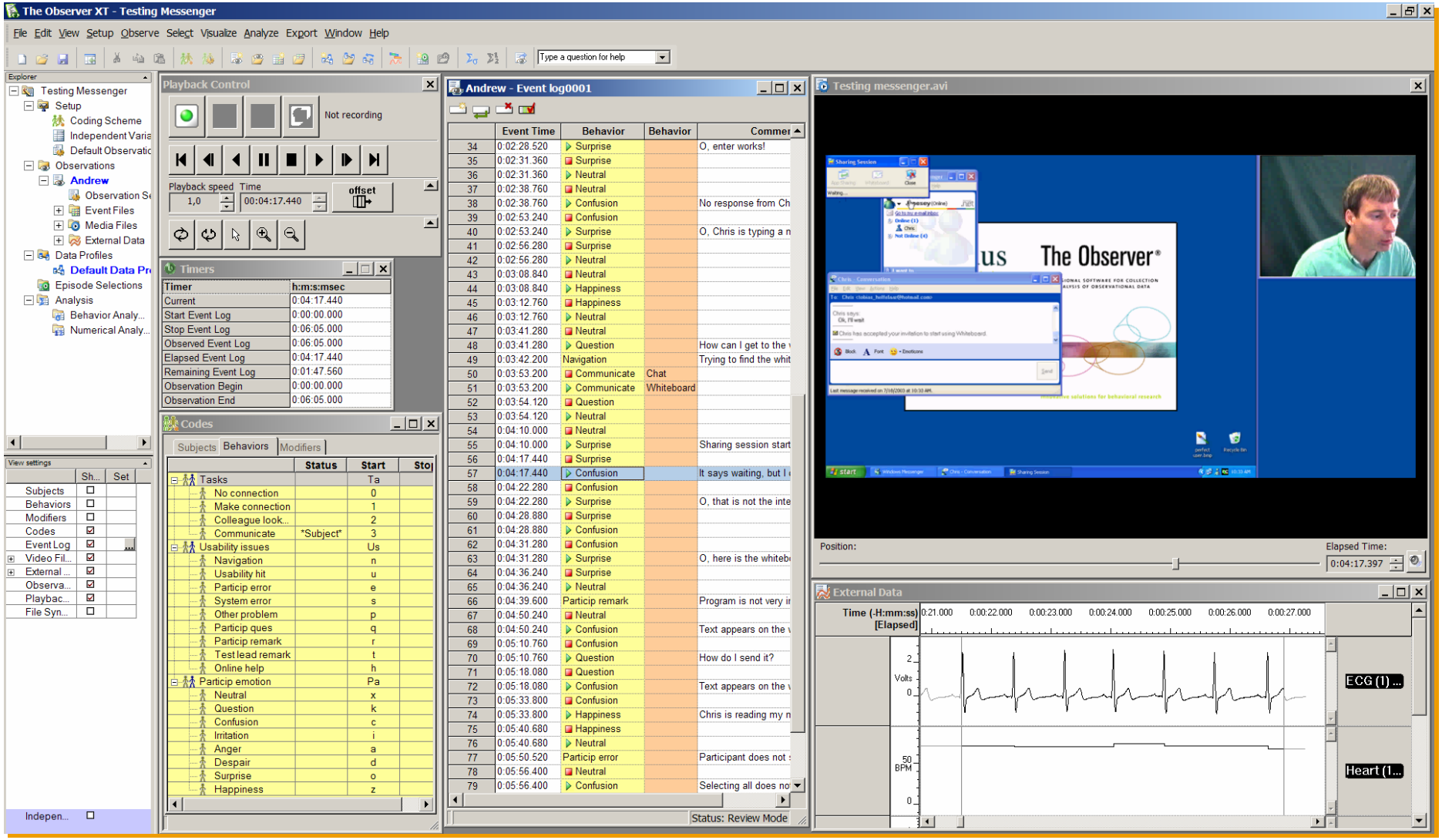
Step 3

Coding two participants



The Observer XT

- Screen size becomes limiting factor
- Requires large screen or dual-display setup



Step 3

Testing Messenger

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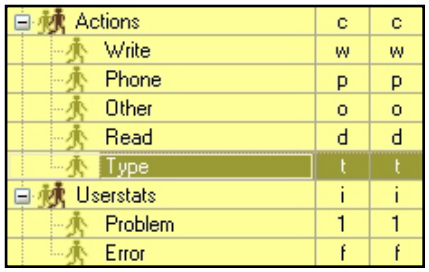
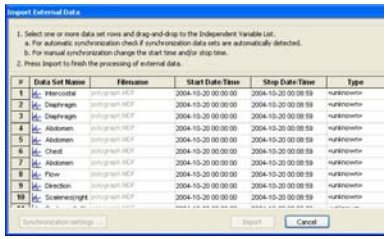
Score data and adjust the coding scheme

Import/Synchronization

1	2	3	4	5
Choose Setup	Define a Coding scheme	Collect Data	Import external data	Data Analysis and Output

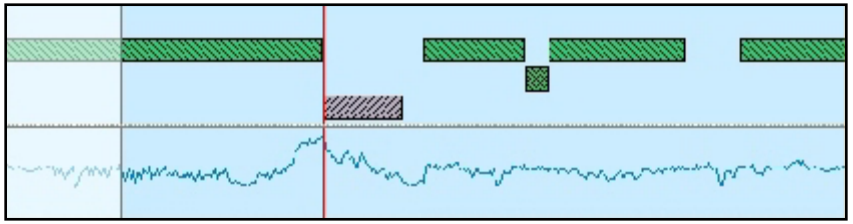




Step 3

Why do I need synchronization?

- **Synchronization enables you to examine external (physiological) data in relation to the associated logged events and video**



What happens when heart rate increases?

What can I do with external data?

- **Import** external data into The Observer XT
- **Synchronize** logged events and video with your external data
- **Visualize, select, calculate** and **export** logged events and external data

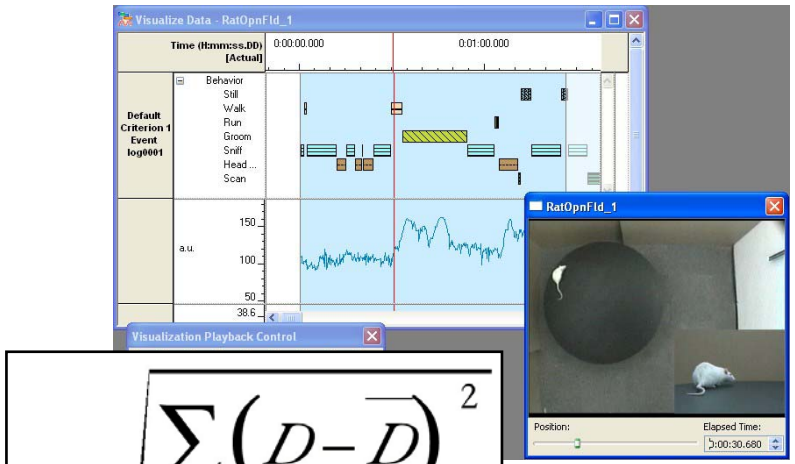
Data Analysis and Output

Data selection

- Choose the Data you want to analyze

Visualize and Analyze Data

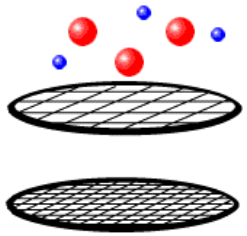
- Visualize scored data
- Make a list of scored behaviors and durations
- Create highlights video
- Calculate statistics
- Export any of the above



$$s = \sqrt{\frac{\sum (D - \overline{D})^2}{N - 1}}$$

Step 5

Why select data?



You want to select data in two cases:

- Analyze some elements, not others

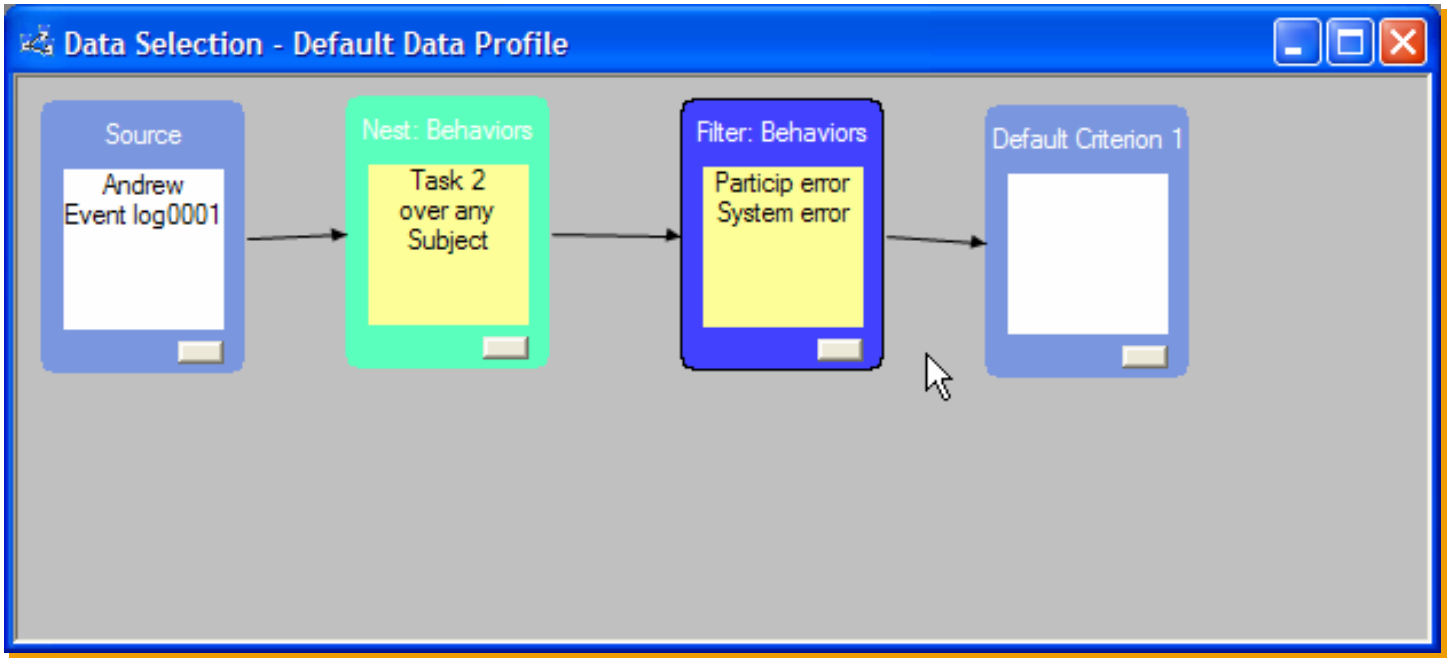
- **Solution: Filter data**
- **Example: Calculate statistics of the behavior *Errors*, not *Smile***

- Analyze events occurring when a condition is true

- **Solution: Nest over data**
- **Example: calculate statistics of the behavior *User error* during *Task 2***

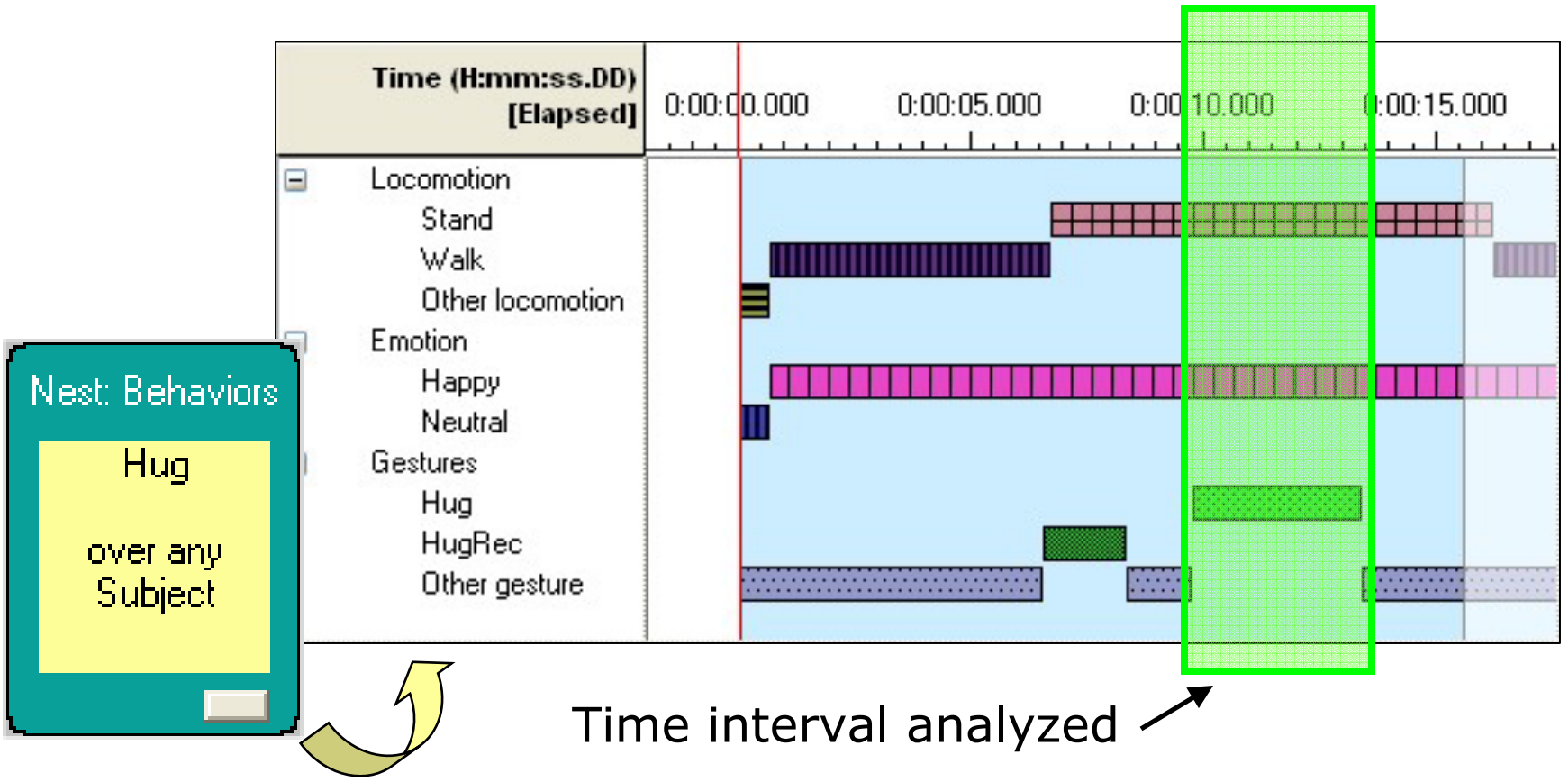
Data selection

- Selection based on behaviors, subjects, modifiers, observations, independent variables
- Filter and Nest
- Any combination, AND/OR criteria
- One intuitive selection mechanism for all output



Select Data - Nesting

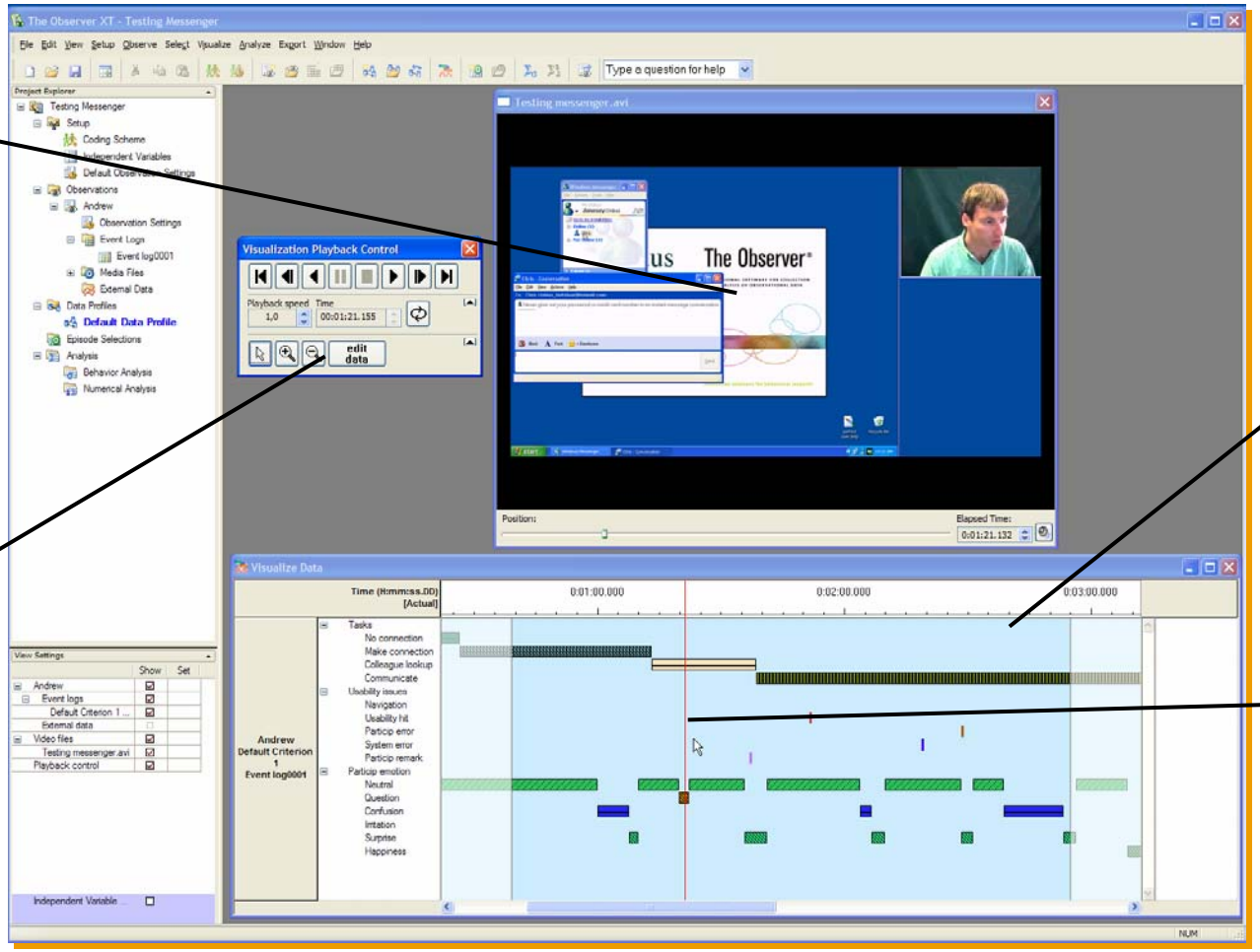
The consequences of Nesting over data



Visualization

Up to four synced videos

Video control



Time event plot

Hairline: 'You are here'

One overview of all data

Accurate and visual quality assessment

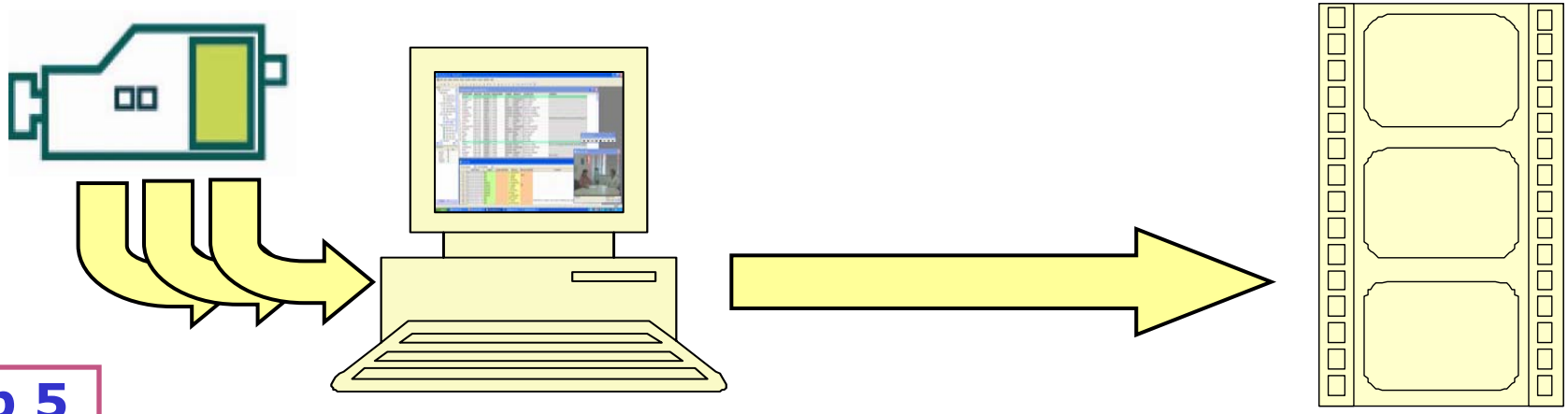
Step 5

Video Highlights

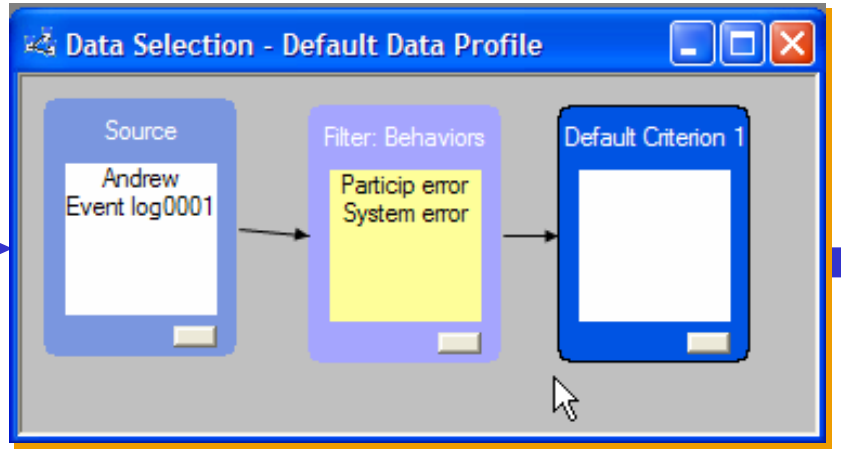
Make a media file with interesting episodes, based on the Episode list

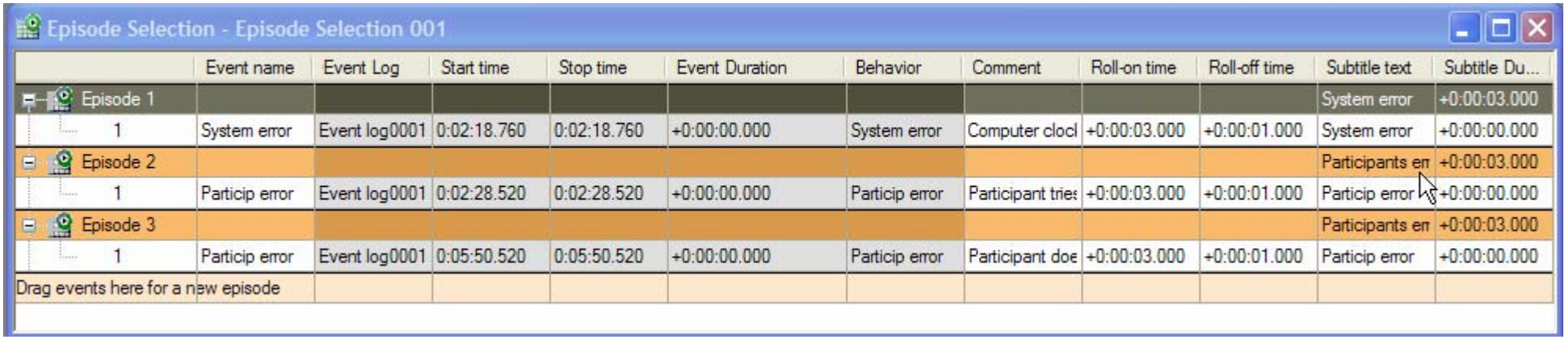
Create subtitles and transitions

One clip can be based on multiple observations and videos

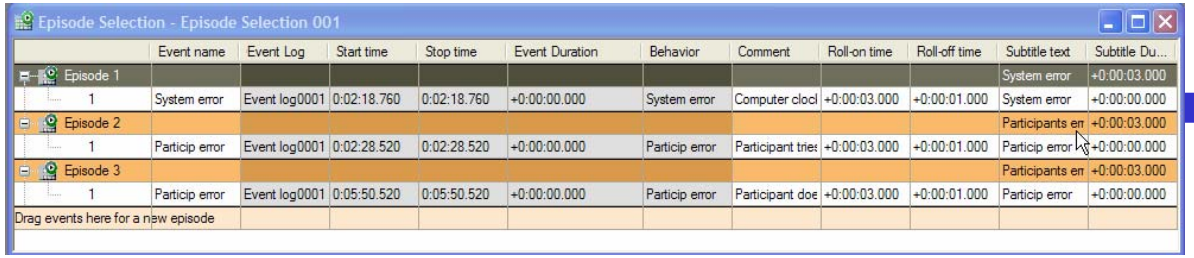


Visualize Data – Create an Episode Selection



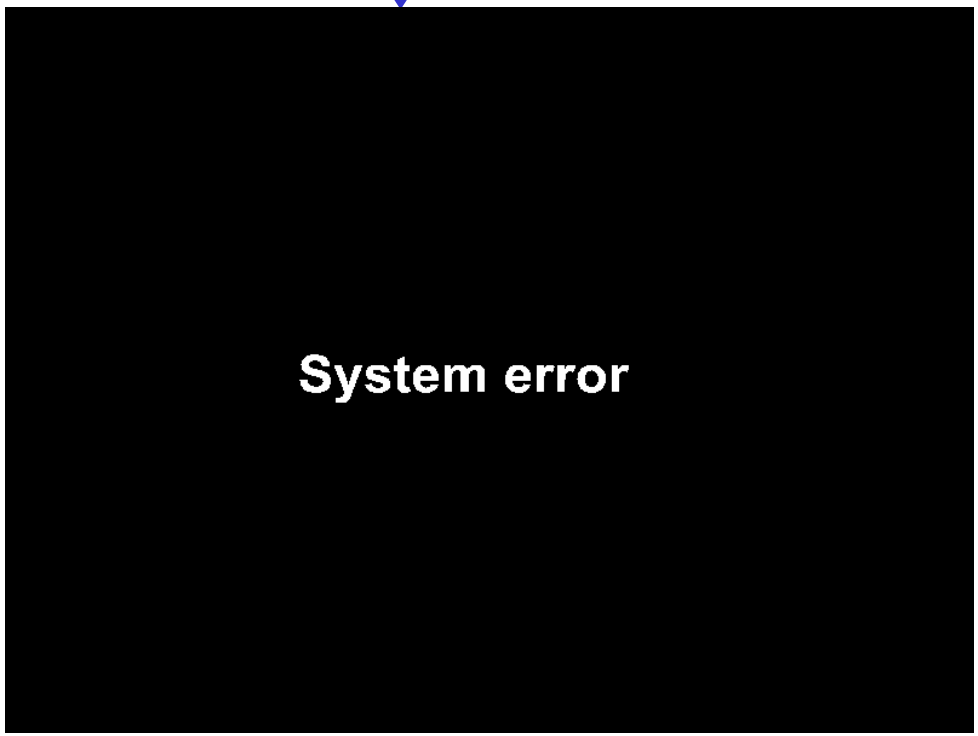


Create an Episode Selection



Generate mediafile with highlights:

- **in any codec**
- **incl subtitles**
- **For report and presentation etc.**



Calculate Statistics

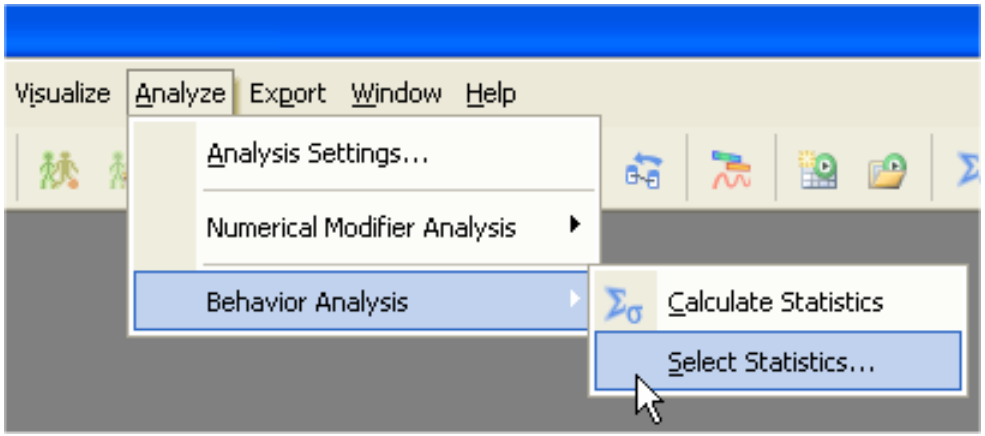
Two Types of Analysis:

Behavior Analysis

- **Example: Calculate the total time on task for different types users**

- **Numerical Modifier Analysis**
  - **Example: Calculate the average speed of the numerical modifier 'walking speed'**

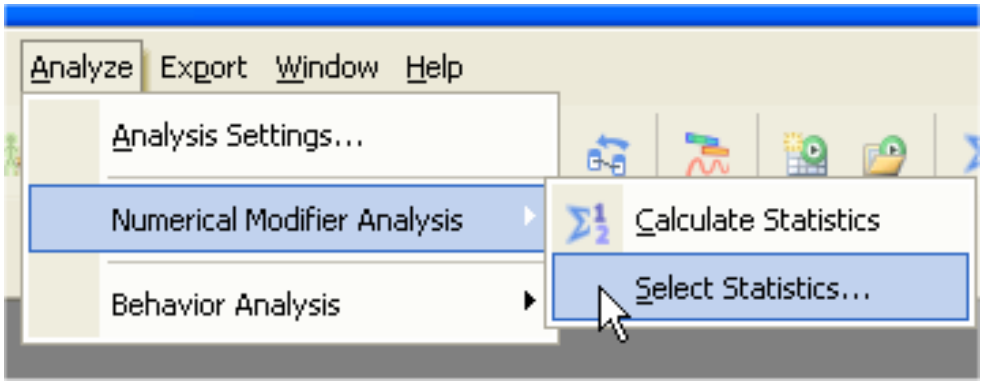
Statistics available



For Behavior Analysis:

- **Minimum duration**
- **Maximum duration**
- **Total duration**
- **Total number**
- **Mean duration**
- **Standard deviation of duration**
- **Standard error of duration**
- **Rate per minute**

Statistics available



For Numerical Modifiers Analysis:

- **Minimum**
- **Maximum**
- **Mean**
- **Total duration**
- **Total value**
- **Mean (per minute)**

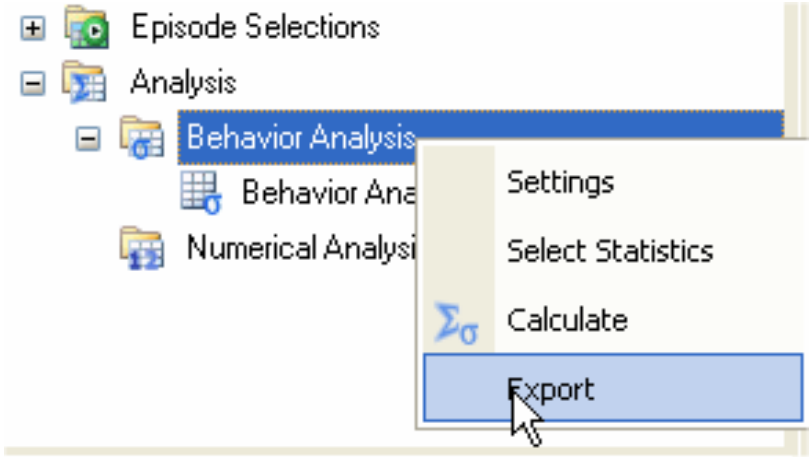
Statistics Result

Behavior Analysis Results

	Criteria	Observations	Event Log Dat	Statistics	Variables											
Subject																
Modifier																
Behavio						Particip emot	Neutral	Question	Confusion	Irritation	Anger	Despair	Surprise	Happiness	<Missing Beh	<Any Behavio
Modifier																
	Default Criterion 1	Andrew	Event log0001	Minimum		-	0:00:04,36	0:00:02,44	0:00:02,40	0:05:13,20	-	-	0:00:02,24	0:00:03,92	-	0:00:02,24
				Maximum		-	0:00:51,80	0:00:12,84	0:00:20,52	0:05:13,20	-	-	0:00:07,44	0:00:06,88	-	0:05:13,20
				Total Duration		-	0:03:34,76	0:00:22,60	0:01:12,88	0:05:13,20	-	-	0:00:35,72	0:00:10,80	-	0:17:14,96
				Total number		-	12	3	8	1	-	-	8	2	-	46
				Mean		-	0:00:17,90	0:00:07,53	0:00:09,11	0:05:13,20	-	-	0:00:04,46	0:00:05,40	-	0:00:22,50
				Std. deviation		-	0:00:12,48	0:00:05,20	0:00:06,86	0:00:00,00	-	-	0:00:01,91	0:00:02,09	-	0:00:51,82
				Standard error		-	0:00:03,60	0:00:03,00	0:00:02,43	0:00:00,00	-	-	0:00:00,68	0:00:01,48	-	0:00:07,64
				Rate per minut		-	1,97	0,49	1,32	0,16	-	-	1,32	0,33	-	7,56
					Start Time	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00
					Stop Time	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00	2004-12-30 00
					Duration	0:06:05,00	0:06:05,00	0:06:05,00	0:06:05,00	0:06:05,00	0:06:05,00	0:06:05,00	0:06:05,00	0:06:05,00	0:06:05,00	0:06:05,00
					Product tested	Windows Mes	Windows Mes	Windows Mes	Windows Mes	Windows Mes	Windows Mes	Windows Mes	Windows Mes	Windows Mes	Windows Mes	Windows Mes
					Participant na	Andrew	Andrew	Andrew	Andrew	Andrew	Andrew	Andrew	Andrew	Andrew	Andrew	Andrew
					Participant gen	Male	Male	Male	Male	Male	Male	Male	Male	Male	Male	Male
					Participant co	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced	Advanced
					Participant pro	0	0	0	0	0	0	0	0	0	0	0
					Test leader	Tobias	Tobias	Tobias	Tobias	Tobias	Tobias	Tobias	Tobias	Tobias	Tobias	Tobias

Step 4

Export the Analysis Results



Use these files in Databases, Statistics packages, Graphics programs

The Observer XT

Concluding: main advantages

- **Observing is quick, easy and in detail if you want**
- **Integration with externally acquired data (e.g. Data Acquisition systems)**
- **Follow coding scheme: so more objective and consequent data**
- **Analysis in the same software so easy comparison**
- **Support of various video-formats and handheld computers, so adaptable to any circumstance**

Overview

- Introduction
- Why The Observer XT?
- How to use The Observer XT
  1. Choose research/observation set-up
  2. Prepare The Observer XT
  3. Data Collection
  4. Synchronize Data
  5. Data Analysis and Output
- Live demonstration & applications

- Question time

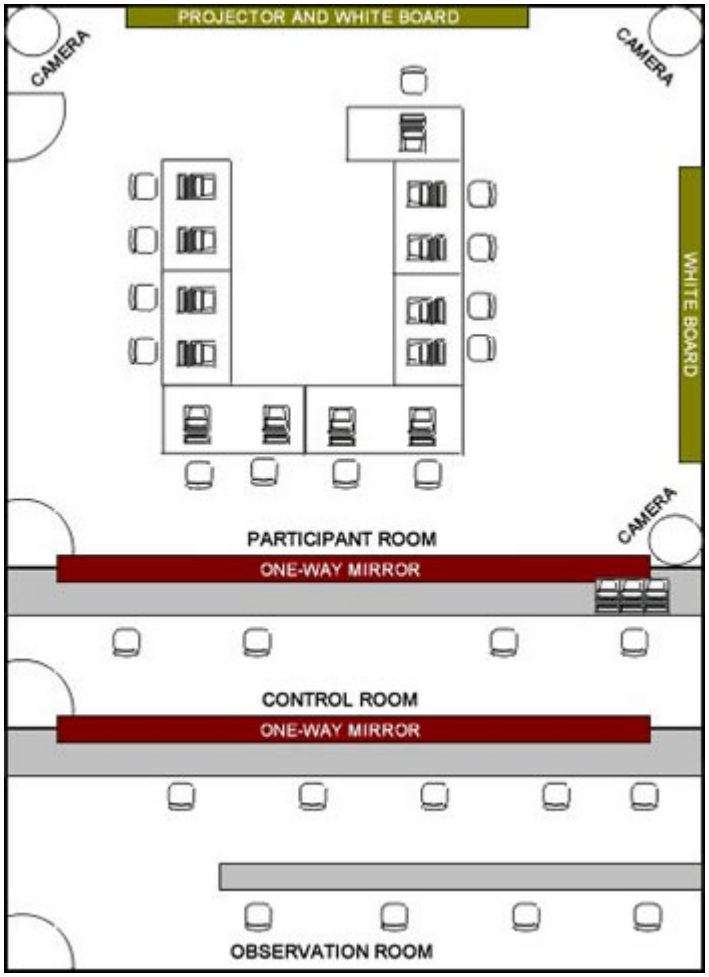
Applications; Integrated Solutions

Tailor-made observational labs and systems

System configurations

- Stationary Lab
- Portable Lab
- Pocket Observer
- Mobile device testing
- uLog
- Screen Capture Module
- Eye Trackers & alternatives
- External data, multi-modal research
- Automobile testing

Usability lab



Peoplesoft Inc. U.S.A.

Usability lab

EvaLab, Lille, France

Usability lab

Cordys R&D, India

Usability labs

University Leuven, Belgium

CURE, Vienna, Austria

LUTIN, Paris, France

ICT&S Center, University of Salzburg

"Home lab"

Usability testing of:

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



Philips Research

Eindhoven University of Technology

TNO Human Factors

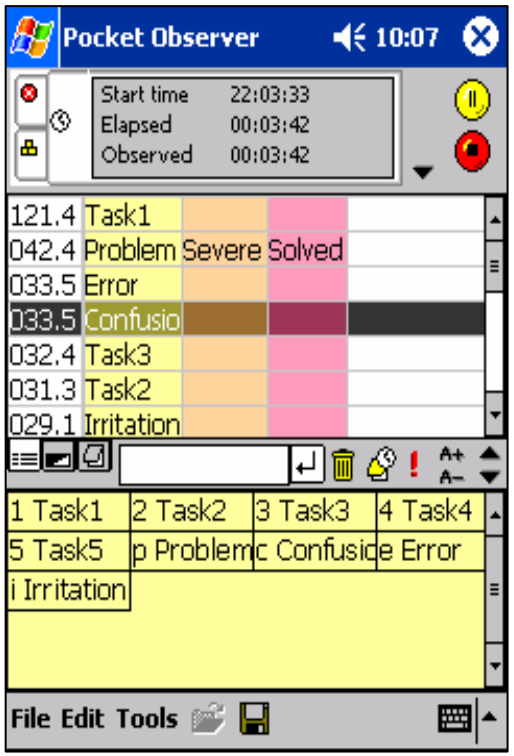
Portable lab

School of Computing, UNISA, South Africa

Pocket PC event logger

Coding observed events

- Tapping / writing/ soft keyboard
- Clip-on keyboard



Options

- Rugged models available
- Auditory feedback: logging software speaks coded event into earphone

Mobile Device Testing

Or via Bluetooth & Screen Capture…

Mobile Device Camera

Wireless camera for usability testing of mobile devices and applications

uLog

Event logger for automatic logging of user activity

Two versions

- **Lite (standalone)**
- **Pro (with Observer XT)**

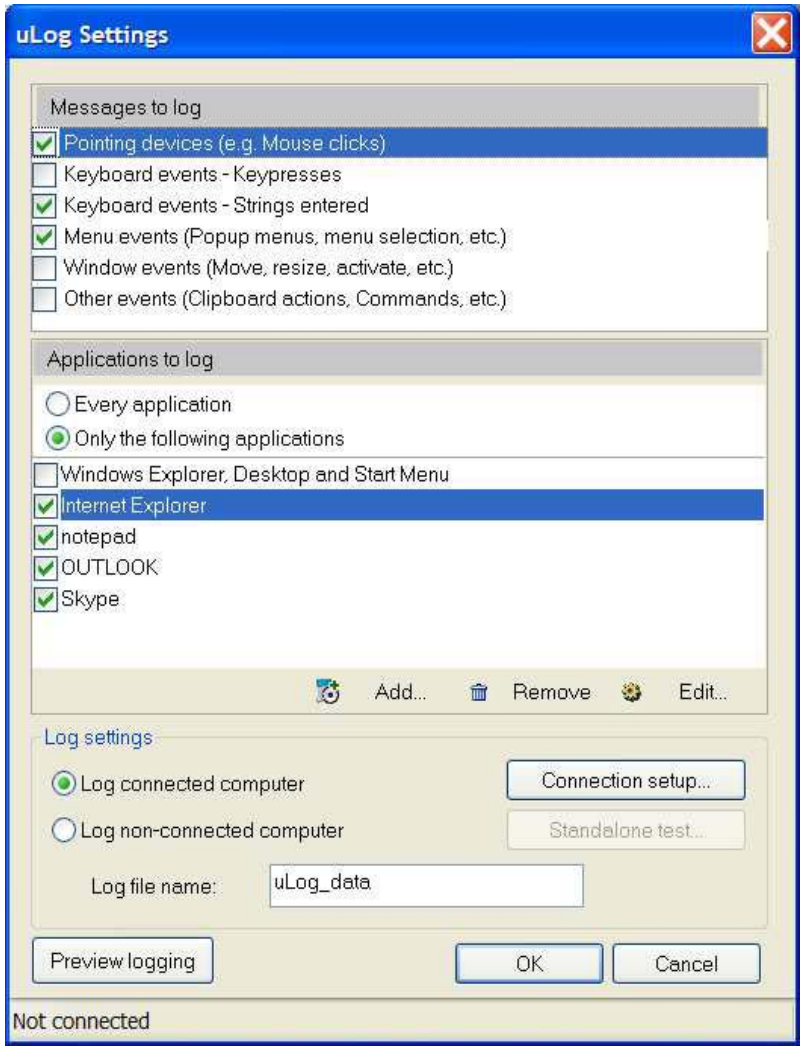
Three set-ups

- **Lite: standalone**
- **Pro: connected**
- **Pro: visitor (standalone)**

What is uLog: Lite and Pro

	Lite	Pro
Mouse	Clicks, double clicks, mouse wheel action	
Keyboard	Individual keystrokes	Individual keystrokes and strings
Menu events	No	Yes (application, standard menu, window, dialog, pop-up)
Windows events	No	Max/min/restore Window Move/Resize
Other actions	No	Scrolling; Cut/copy/paste Window titles (incl. pages loaded in web browsers) Calculate mouse distance
Data format	csv	Observer XT

What is uLog Pro: configuration



What is uLog: set-ups

Set-up 1: uLog Pro – connected computers

Test PC

Observer PC

Set-up 2: uLog Pro – not connected ('visitor')

Test PC

Observer PC

Set-up 3: uLog Lite – single computer (Test PC)

Test demonstration

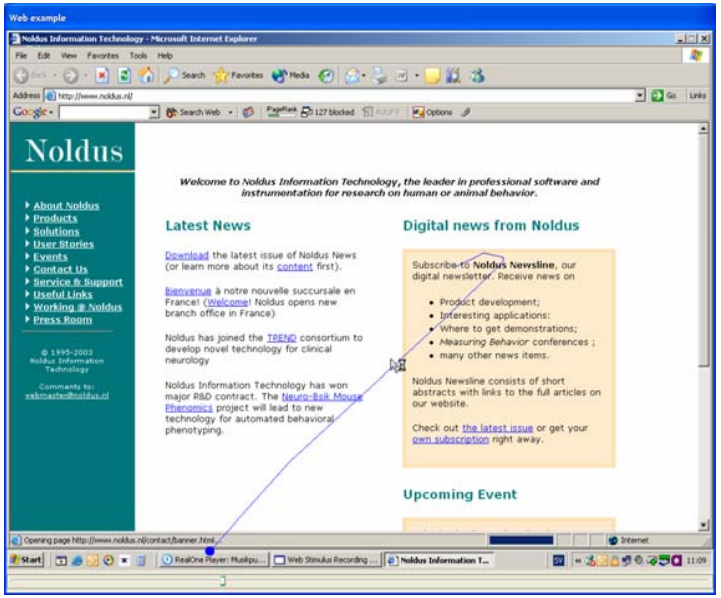
quick on-site usability test:

- uLog & webcam

- Screen Capture Module

Eye tracking & alternatives

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



Tobii Technology

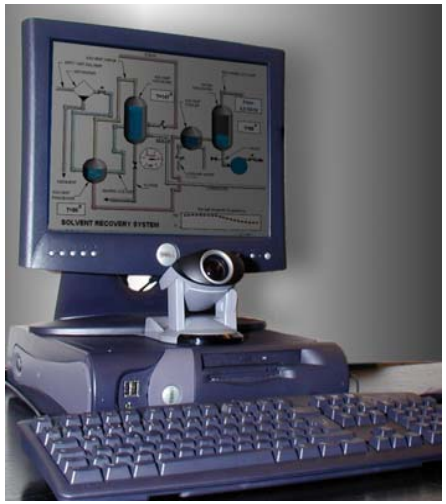
Measuring eye gaze

- Tool: eye tracking system, head-mounted or contact-free

- Measures:
  - where the subject looks
  - how long and often they look at something
  - path the eyes follow between predefined areas of interest
  - pupil diameter (measure of cognitive load)

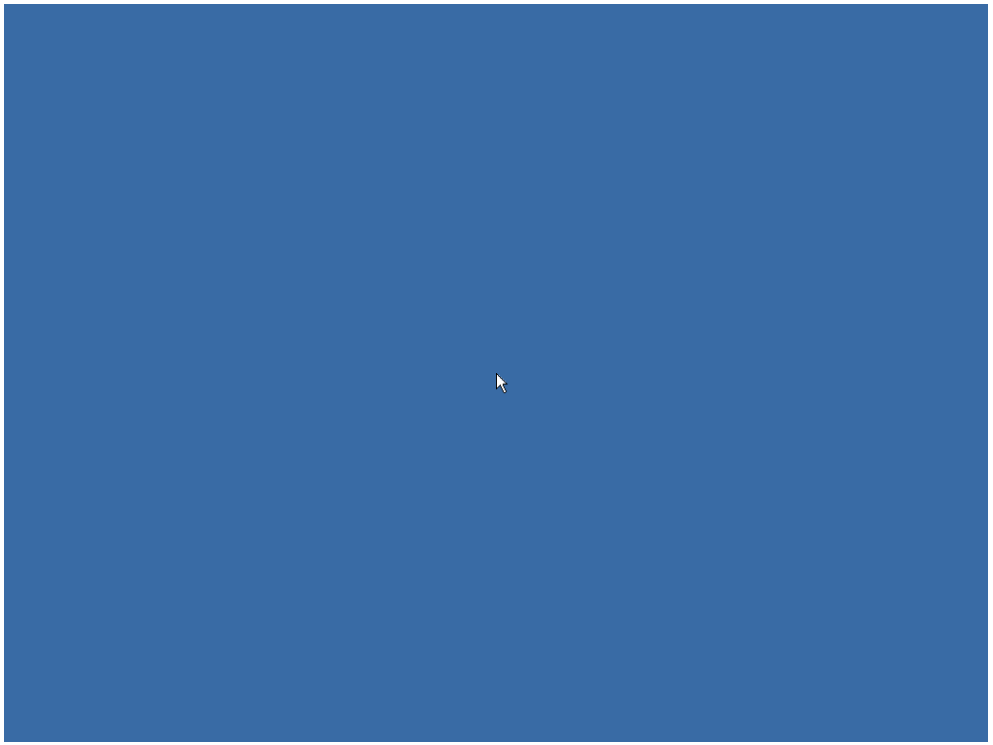
- Complement observational methods, e.g. find co-occurrence of "confusion" and "fixate"

Head-mounted system



Contact-free system

Measuring eye gaze



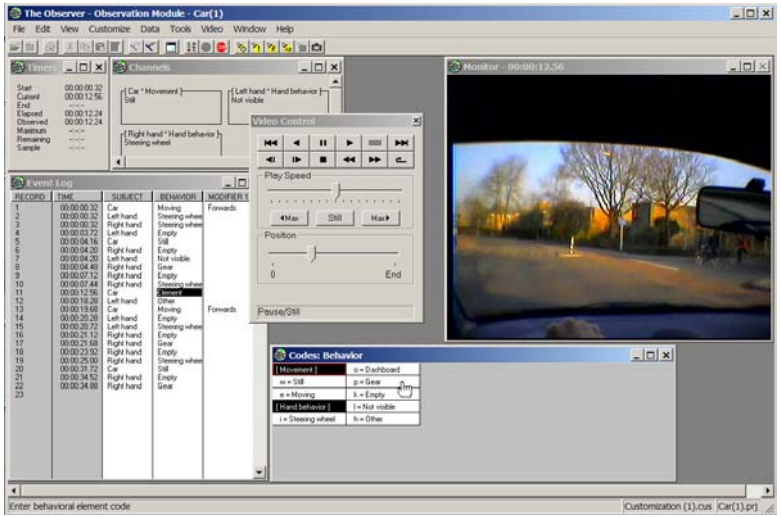
Contact-free system

Head-mounted system

Alternative for eye-tracking

Spectacles camera

In a car



Only gaze & head movement, not actual eyetracker !

Multimodal data collection

Measuring multiple modalities of user-system interaction

Behavioral

- Task performance
- Keyboard activity
- Mouse activity
- Body posture
- Facial expression
- Eye movement
- Gestures
- Verbal comments

Physiological

Emotional state

- Galvanic skin resistance

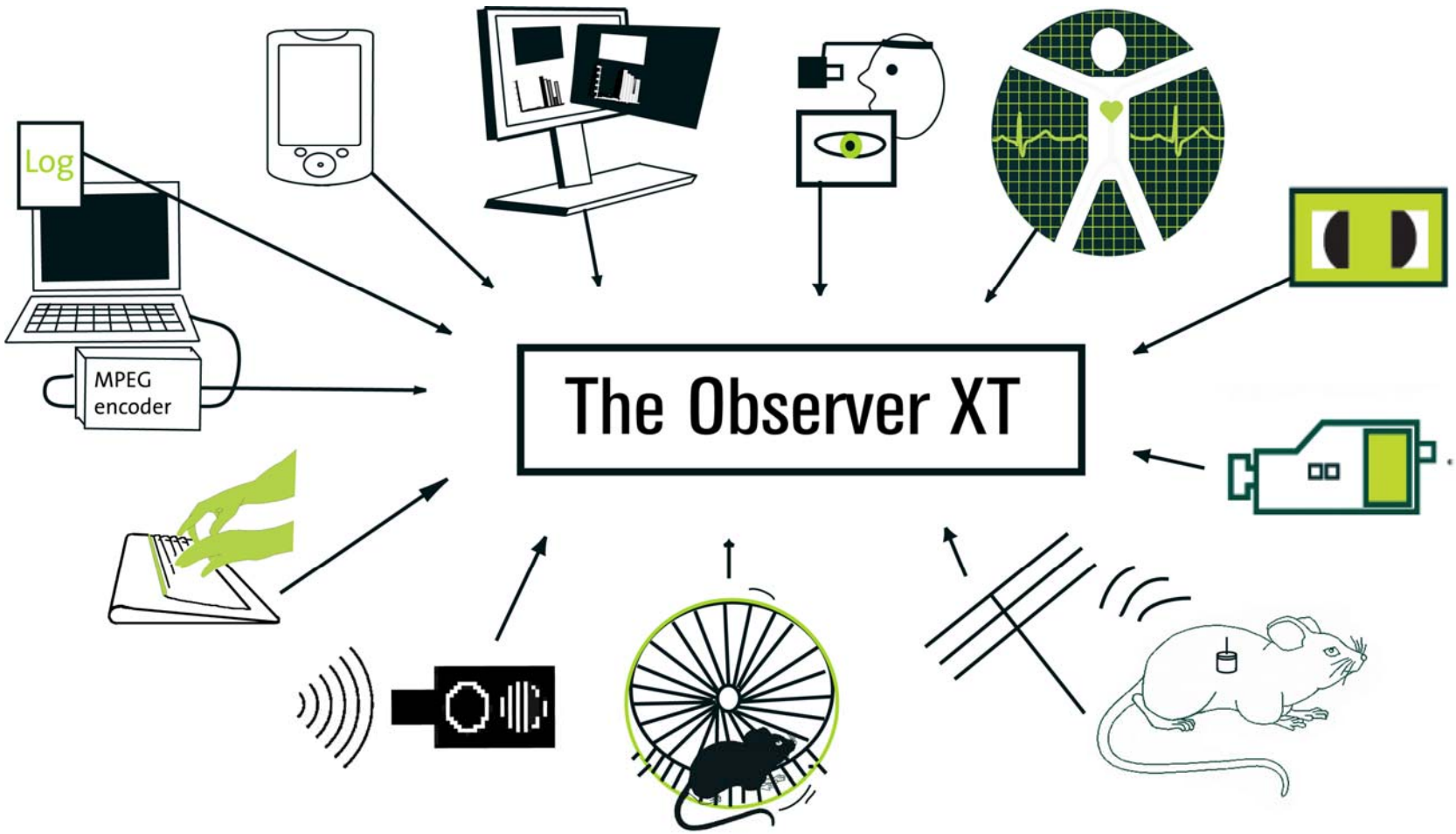
Mental load

- Pupil diameter
- Heart rate variability
- Respiration

Physical load

- Electromyogram
- Grip force

External data co-acquisition



"Lab on wheels"

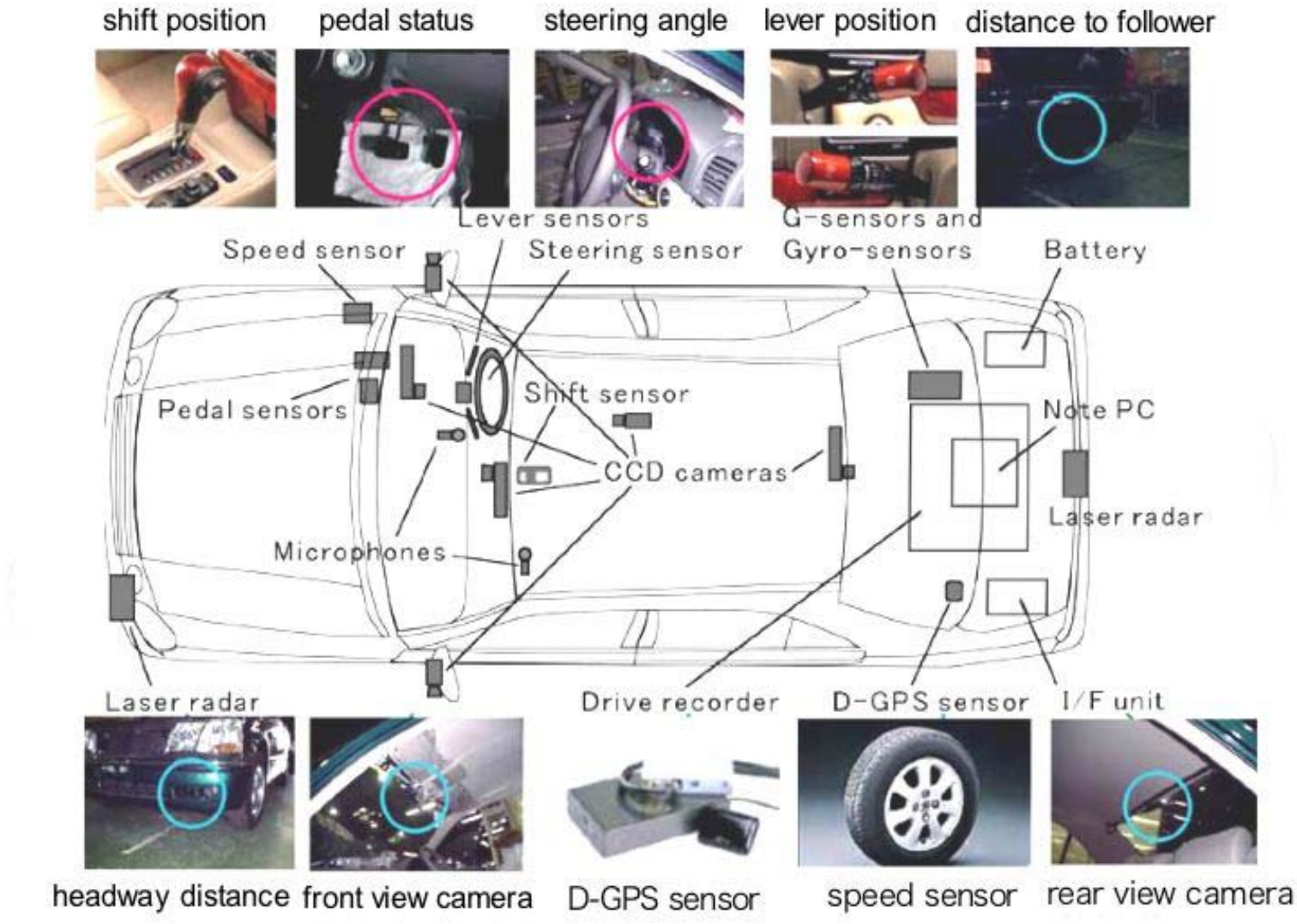
Usability testing of:
- Dashboard design
- Navigation systems
- Audio equipment

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

SensoMotoric Instruments

AIST, Tsukuba, Japan

Instrumented car



AIST, Tsukuba, Japan

Automobile research

Noldus

Information Technology

Questions ?

Noldus Information Technology

http://www.noldus.com

Maurits@noldus.nl