Ergoneers
Ergonomic Engineers

Dikablis Glasses & D-Lab Eye-Tracking

Ergoneers
Ergonomic Engineers

1. Overview D-Lab Measurement & Analysis Solution
2. Dikablis Glasses
3. D-Lab Eye-Tracking Software
4. Outlook

Ergoneers
Ergonomic Engineers

1. Overview

Overview

Ergoneers
Ergonomic Engineers

Sensors

DataStream:
- Network
- CAN
- Fieldbus

Videos:
- PAL
- IP
- IP PTZ
- DVI

Eye-Tracking:
- Head-Mounted
- HMD

Audio

Physiology

Motion

Process Software

D-Lab

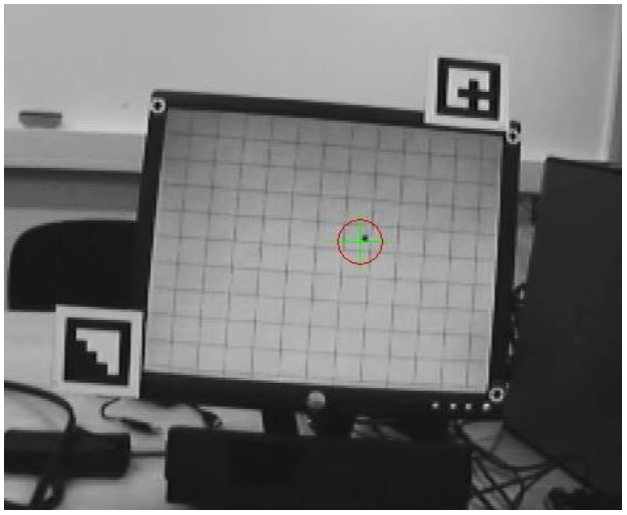
Plan → Measure → Analyze

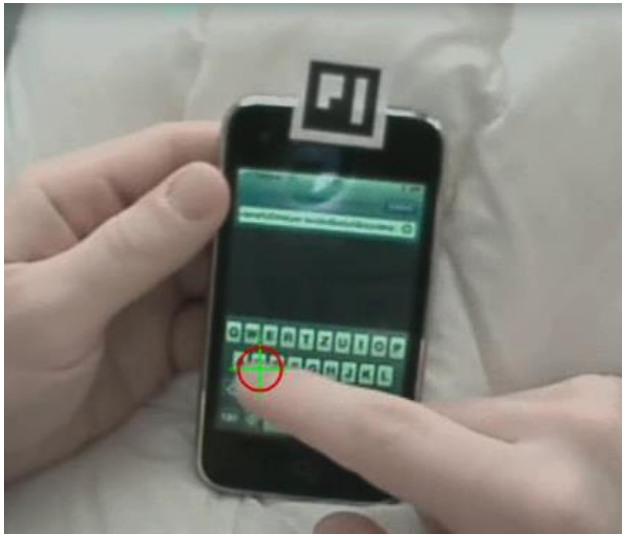
Ergoneers
Ergonomic Engineers

2. Dikablis Glasses

Dikablis Glasses

- Dikablis Glasses
  - Cable
  - Mobile
  - Wireless
- Tracking frequency: 50Hz
- Weight: 69g
- Accuracy:
  - Pupil detection: 0,1°
  - Glance direction: 0,3° – 0,5°
- Camera viewing angle: 45° - 120°
- Portable with:
  - Normal glasses
  - Shutter glasses
  - Polarized glasses





Dikablis Glasses

Ergoneers
Ergonomic Engineers

- Dikablis Glasses
  - Cable
  - Mobile
  - Wireless
- Tracking frequency: 50Hz
- Weight: 69g
- Accuracy:
  - Pupil detection: 0,1°
  - Glance direction: 0,3° – 0,5°
- Camera viewing angle: 45° - 120°
- Portable with:
  - Normal glasses
  - Shutter glasses
  - Polarized glasses
- Hardware Development Kit covers all other cases (e.g. HMD integration)

Dikablis Glasses - Versions

Ergoneers
Ergonomic Engineers

Dikablis Cable

- Mobility: 50m
- Data-Transmission via Cable
- Live View & Real-time & Offline access to data

Dikablis Mobile

- Mobility: unlimited
- Data is recorded on 11” laptop
- Real-time & Offline access to data
- Battery life: 3h

Dikablis Wireless

- Mobility: up to 500m
- Data-Transmission via wireless digital radio communications
- Live View & Real-time & Offline access to data
- Battery life: 2,5h

Ergoneers
Ergonomic Engineers

3. D-Lab Eye-Tracking Software

Changing Lighting Conditions

Hardware:

- 11mm thick bandpass filter in front of eye-camera
- Perfect adjustment between:
  - Band of the bandpass filter
  - IR illumination
  - Sensitivity of eye-camera chip

Software:

- Blending Mode
- All raw data is stored (videos of field-camera and eye-camera)
- Allows:
  - Control of pupil detection
  - Offline pupil detection

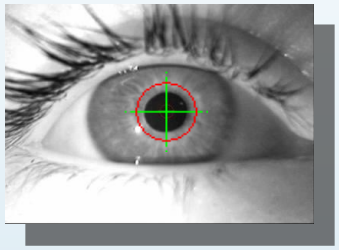
Result:

- Data can always be analyzed under all kinds of conditions
- No data has to be thrown away

Coordinate Systems

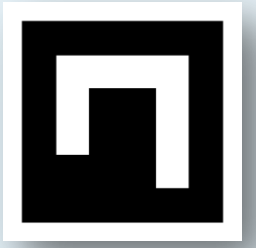
Ergoneers
Ergonomic Engineers

Pupil detection – eye-cam coordinates

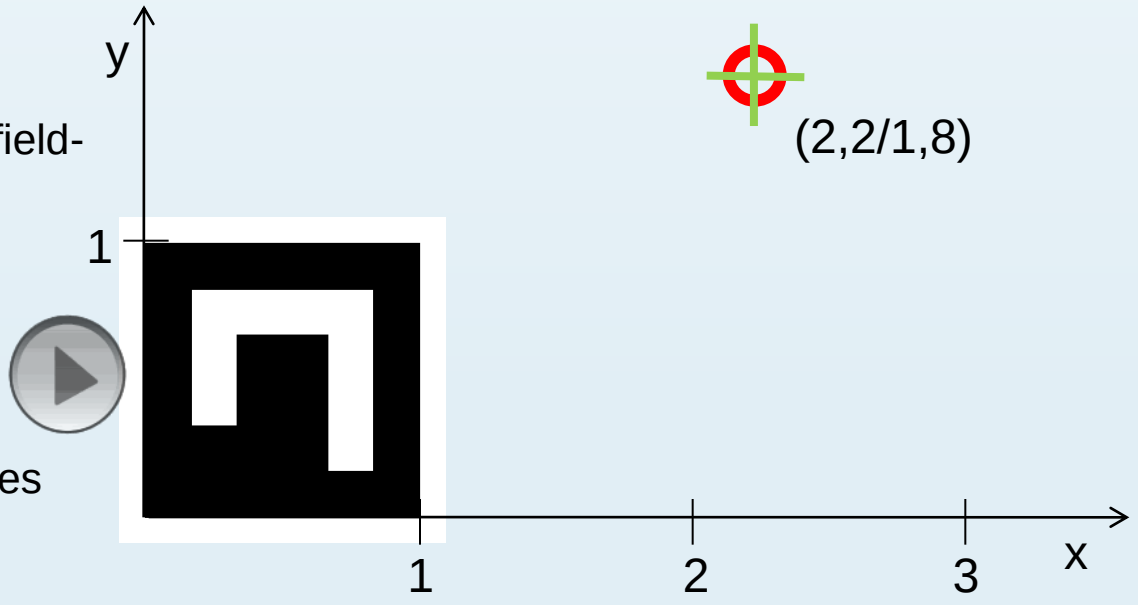


Fixations in field-cam coordinates

Marker detection

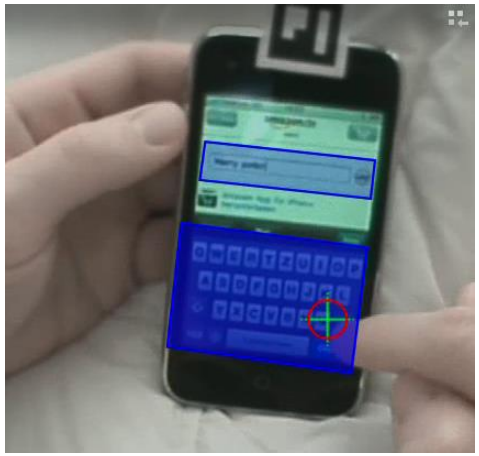


- Transformation from fixations in field-cam coordinates in marker coordinates
- Fixation in all marker coordinate systems
- Allows design of eye-controlled interaction with any kind of devices



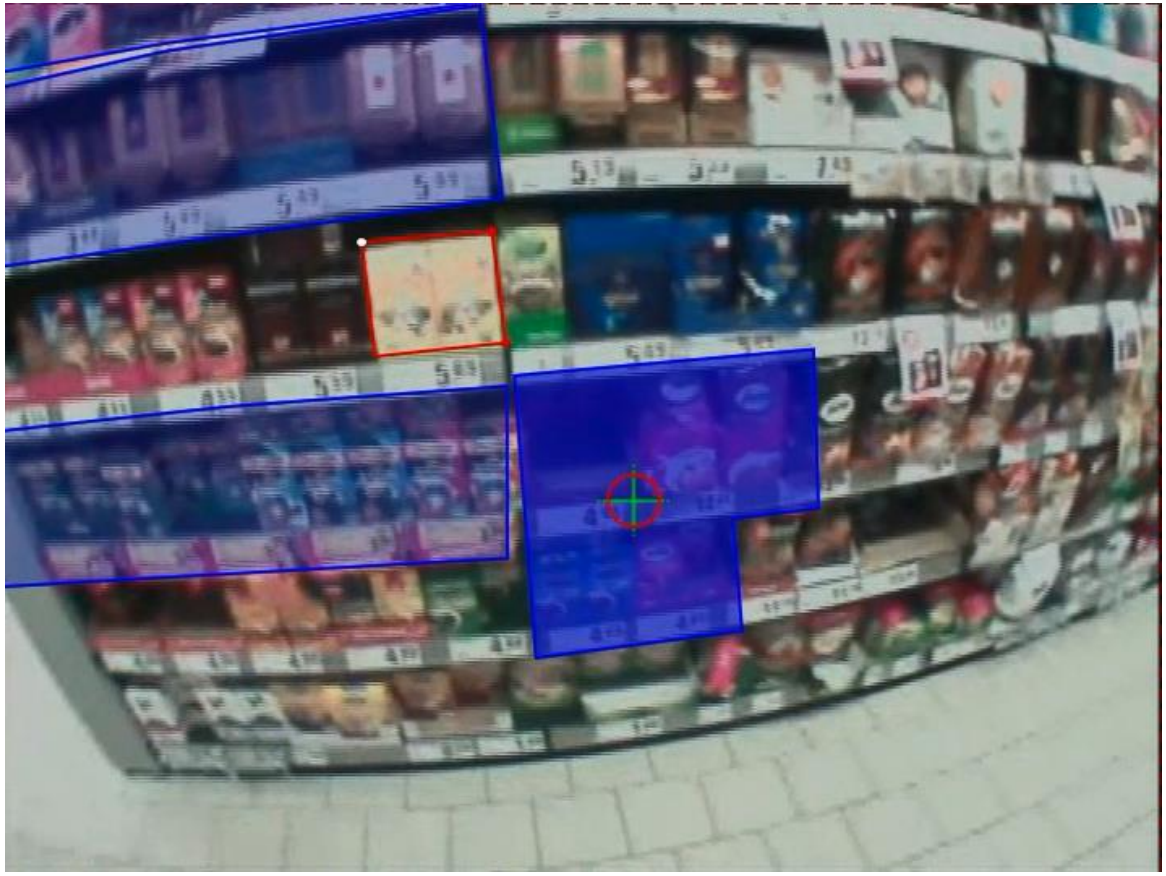
Data Analysis – Marker-based

- D-Lab detects markers and uses them as a reference
- Markers can be attached in the environment (static) or at dynamically moving AOIs
- One can define an unlimited number of AOIs of any shape per Marker
- D-Lab analyzes automatically glances towards defined AOIs



Data Analysis – SmartTrack

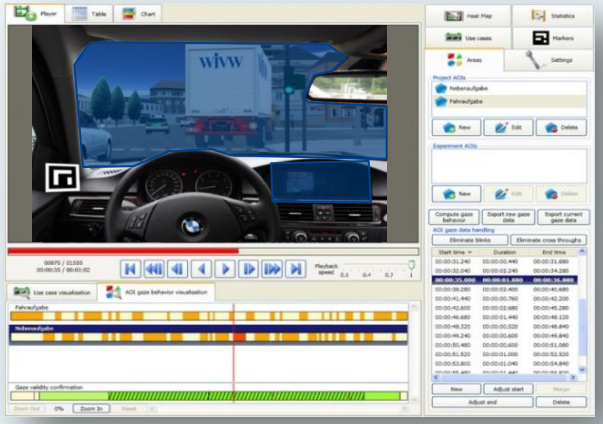
- D-Lab detects natural objects (static or dynamic) and uses them as markers
- AOIs can be defined relative to these markers (by drawing polygones)
- D-Lab analyzes automatically glances towards defined AOIs



Data Analysis – Workflow and Metrics

AOI Definition and calculation of glance durations

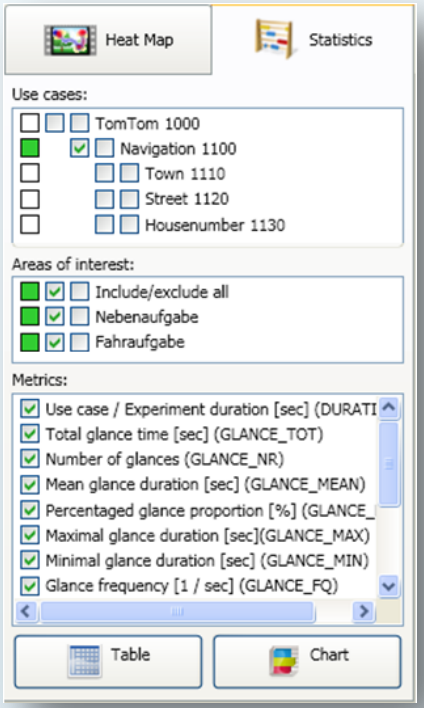
- AOIs of any shape can be defined
- Glance durations are calculated automatically
- Glance durations are visualized as timeline bars and in a list



Statistical Analysis

Define rules for the Calculation of Glance Metrics:

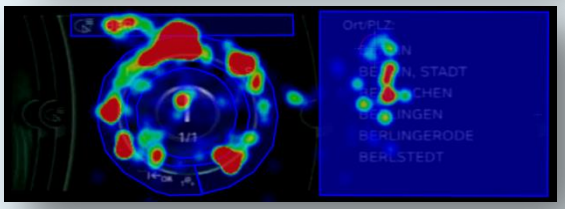
- Select Task Intervals
- Select Areas of Interest
- Select Metrics (glance based and pupil based)

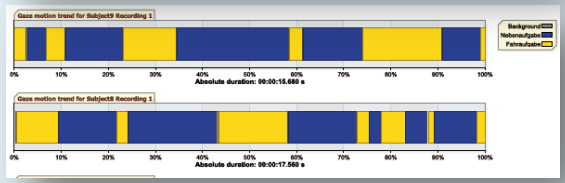


Visualization of Results

- Tables with Metrics and Descriptive Statistics are automatically created
- Graphical visualization as GazeFlow Diagrams and HeatMaps

TEST_PERSON	1100_DURATION	1100_NEBENAUFGABE_GLANCE_TOT	1100_NEBENAUFGABE_GLANCE_NR	1100_NEBEN
Subject9_Recording	56.64	32.64	23	1.419
Subject8_Recording	49.28	33.72	22	1.533
Subject7_Recording	65.96	46.96	28	1.677
Subject6_Recording	91.8	46.8	30	1.56
Subject5_Recording	78.36	42.64	27	1.579
Subject4_Recording	79.08	38.08	27	1.41
Subject3_Recording	84.4	51.36	31	1.657
Subject2_Recording	55.44	35.16	22	1.598
Subject12_Recording	84.4	55.56	39	1.425
Subject11_Recording	57.68	34.12	20	1.706
Subject10_Recording	60.64	40.28	27	1.492
Subject1_Recording	140.12	87	47	1.851
Sum	903.8	544.32	343	18.907
Mean	75.317	45.36	28.583	1.576
Max	140.12	87	47	1.851
Min	49.28	32.64	20	1.41
StDev	24.671	15.053	7.716	0.133
Var	608.675	226.585	59.538	0.018





4. Outlook

Outlook

Dikablis Glasses

- New Dikablis SmartGlasses in January 2014:
  - New Design in Google Glasses Style
  - HD FieldCamera
  - Monocular/Binocular Eye-Tracking with 120Hz
- New Dikablis HRGlasses in July 2014:
  - FullHD FieldCamera
  - Binocular 250Hz

D-Lab Software:

- Continued integration of 3rd Party sensors and related methods
  (e.g. Remote Eye-Tracker, GPS,
  Motion Capturing, Physiology, etc.)
- Scripting language (realtime and offline)

Thank you!

Ergoneers
Ergonomic Engineers