

Eye-Controlled Interaction Using the Dikablis Eye-Tracker

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1. Motivation

Motivation

Tetraplegia

- Palsy of feet and hand
- Caused by Locked-In Syndrom and Accidents

Figures

- 6.000 cases in Germany
- Approx. 72.000 cases all over Europe

Idea

- Enable those people to control devices in the environment directly using their eyes





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2. Dikablis Eye-Tracking System

Dikablis Eye-Tracking System

Head-Unit

- Weight: 69g
- Can be worn with normal glasses
- No limitation in head- and body movement

Versions

- Cable: 50m
- Wireless: 500m
- Wireless Plus: 5000m





Dikablis Eye-Tracking System

Head-Unit

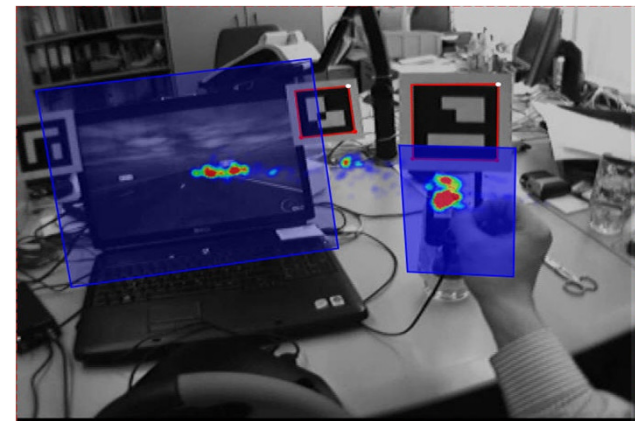
- Weight: 69g
- Can be worn with normal glasses
- No limitation in head- and body movement

Versions

- Cable: 50m
- Wireless: 500m
- Wireless Plus: 5000m

Software

- Dikablis Recording Software:
 - Live View
 - Realtime Interface
- D-Lab Analysis Software
 - Automated gaze data analysis due to marker-based head-position measurement
 - Automated Area of Interest based analysis





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3. Technical Realisation



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Marker – References in the environment

Patient with Dikablis Head-Unit
(Field of View and Eye Video)

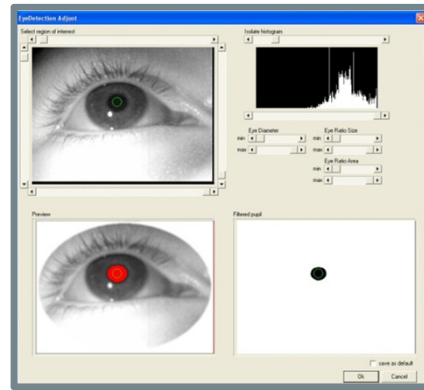
Digital Transmitter

Dikablis Recording Laptop





Eye-Camera



Pupil
Detection

eye_y



eye_x

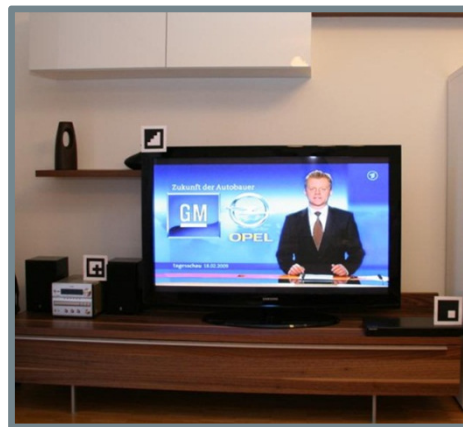
Calibration

field_y

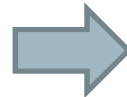


field_x

Field-Camera



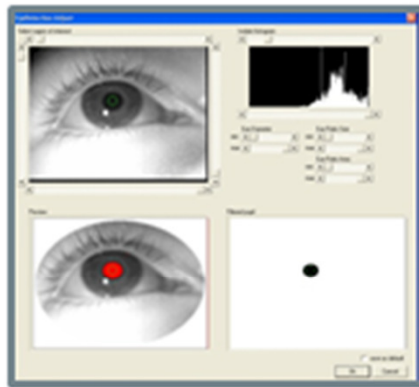
Marker
Detection



x- and y-coordinates of
the corners of the
markers in the
coordinate system of
the field-camera



Eye-Camera



Pupil
Detection



eye_y



eye_x

Calibration



field_y



field_x

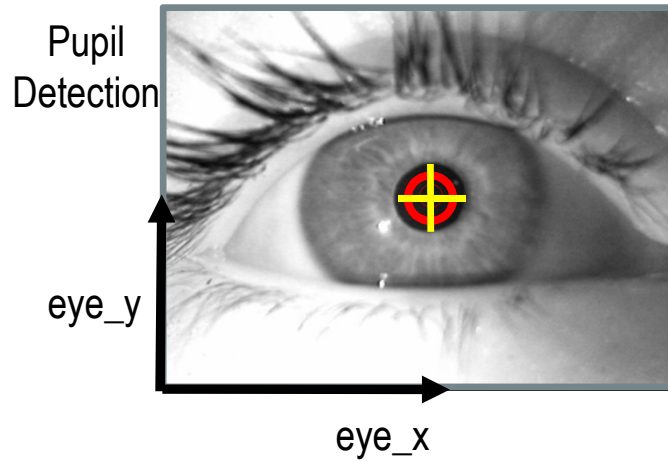
Field-Camera



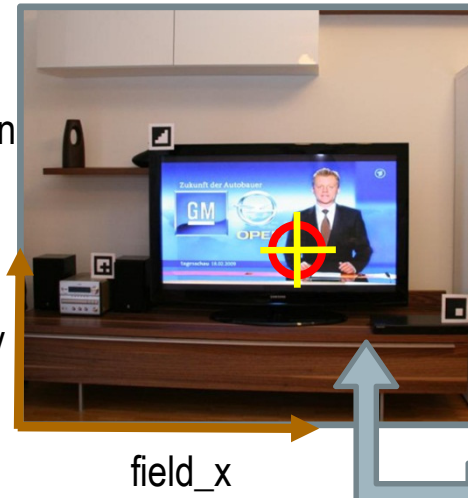
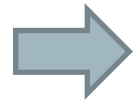
Marker
Detection



x- and y-coordinates of
the corners of the
markers in the
coordinate system of
the field-camera



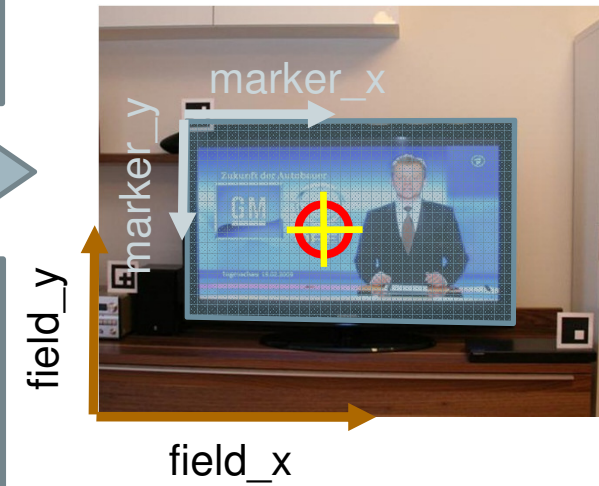
Calibration



Marker Detection

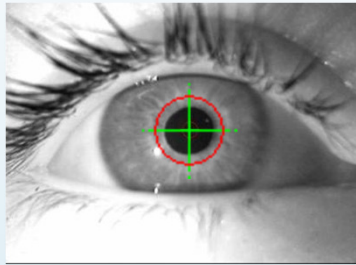


x- and y-coordinates of the corners of the markers in the coordinate system of the field-camera





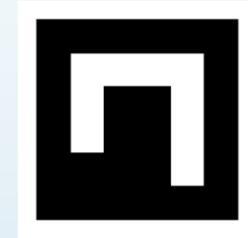
Pupil detection



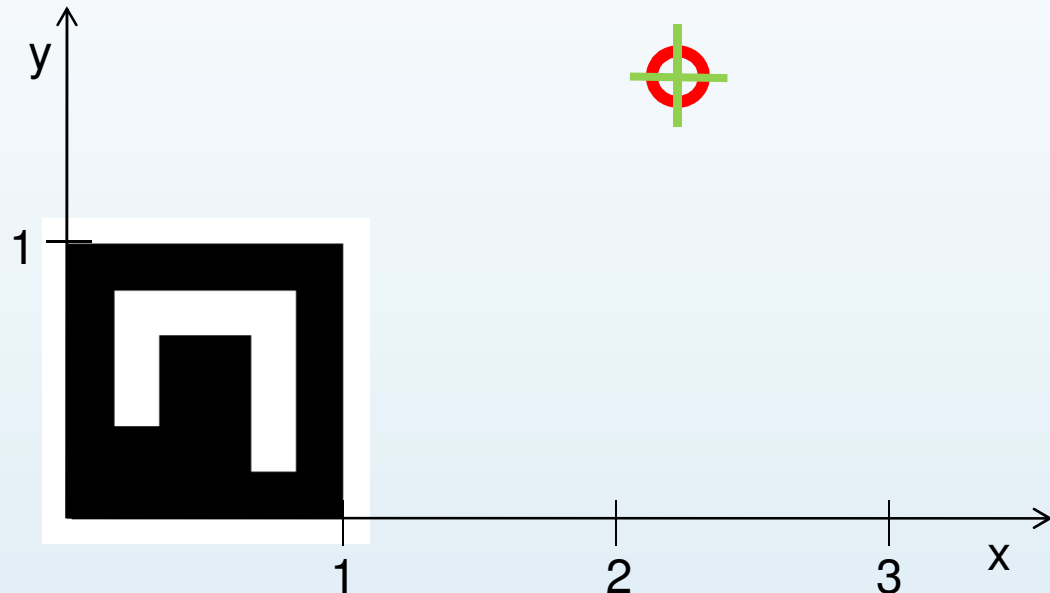
Fixations in field-cam coordinates



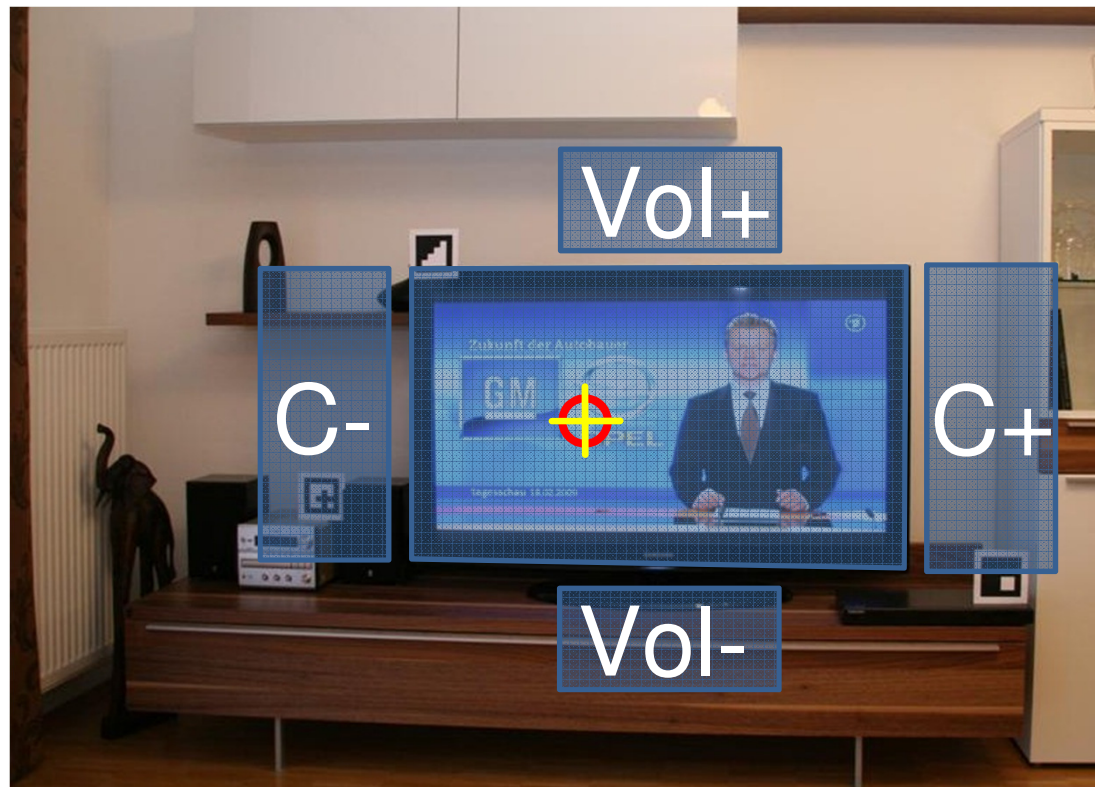
Marker detection



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



Digitalisation of the Environment – Interaction Areas



4. Demo Video



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5. Applications

Applications

- Eye-Control for any kind of devices
- Interaction solutions for disabled people and hands free operation
- Development of multimodal interaction strategies
- Integration of subjects' behavior into experimental design
- Head-Position measurement in any environment
- User-based execution of events





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...Discussion



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