EYECONTROL

Natural Pursuit Calibration: Using Motion Trajectories for Unobtrusive Calibration of Mobile Eye Trackers

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SMOOTH PURSUIT CALIBRATION WITHOUT TARGET ANNOTATION

Calibration is required for accurate gaze estimation

Challenges
- Eye tracker calibration in real world context
- Without any digital user interface
- Without artificial annotation of the environment
- Single person calibration, implicit or explicit
- Turning calibration into an on-going background task
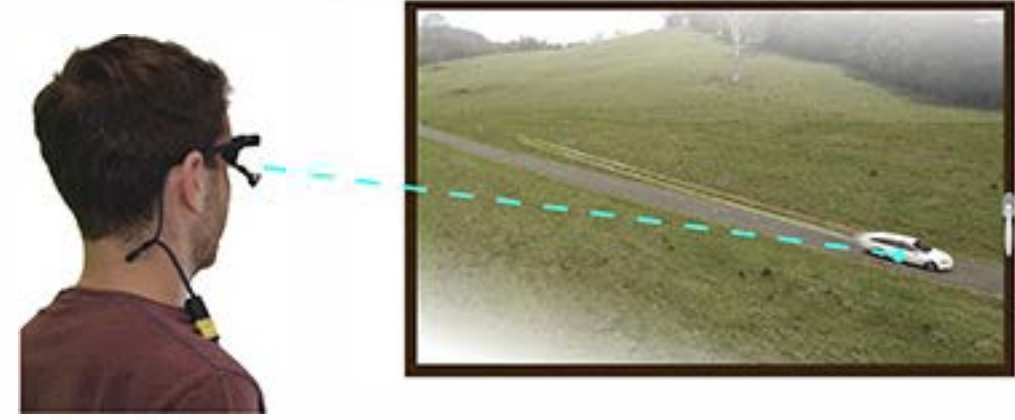
➜ Extract any motion trajectory out of the egocentric video stream and correlate it to the user's eye movement

MOTION PATH EXTRACTION AND MATCHING

Motion Path Extraction
- Track points of interest over a number of frames
- Identify paths caused by motion noise, using filters and hierarchical clustering
- Represent tracked features as a time series of x,y coordinates

Motion Path Matching
- Extract time series out of the eye data stream
- Correlate time series to motion trajectory using dynamic time warping and apply threshold
- Sanity check, based on dispersion and simultaneity
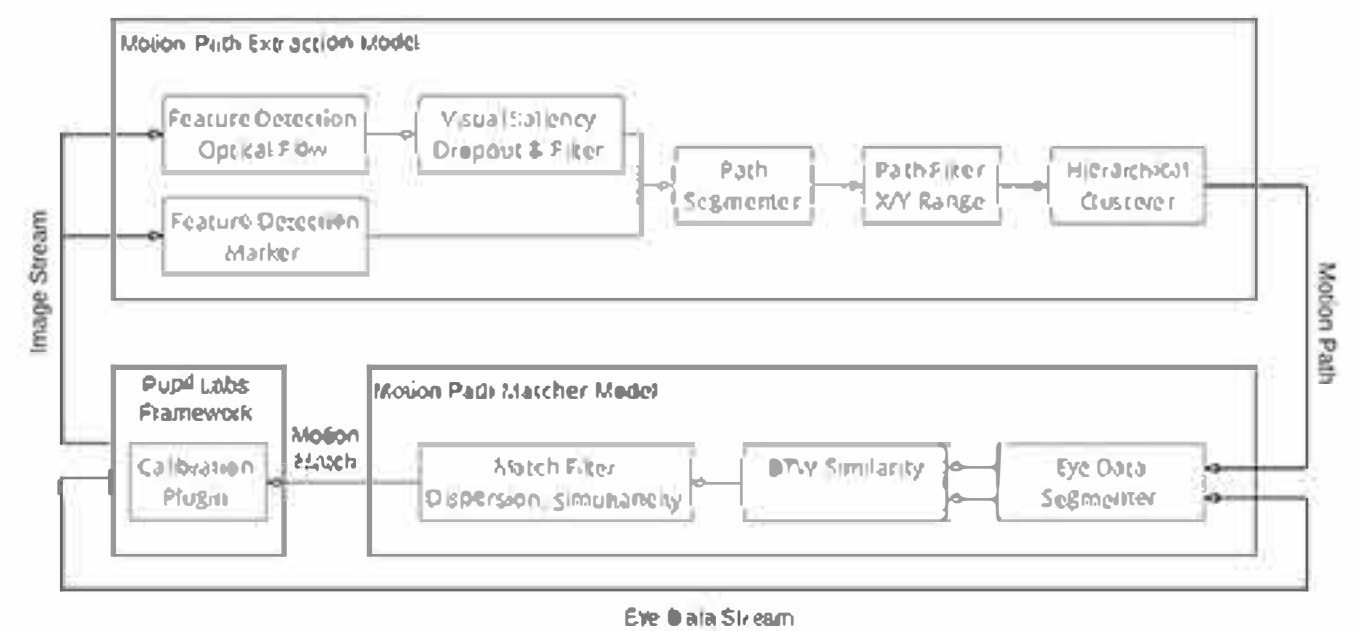
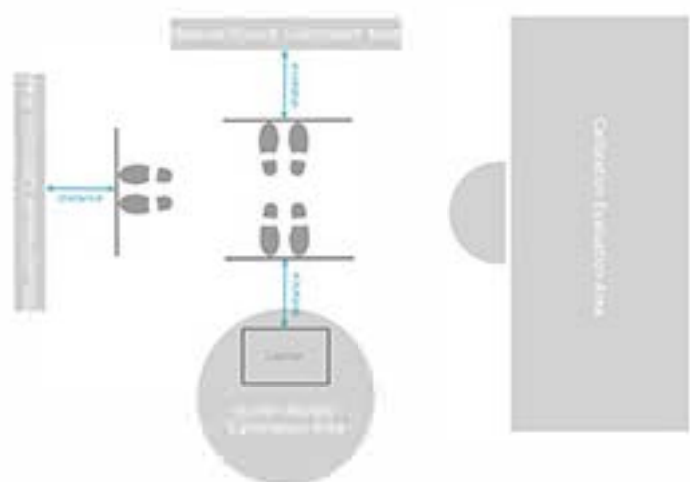## CALIBRATION OF AN EYE TRACKER USING THE FINGER

- Explicit Natural Pursuit Calibration, by generating motion trajectory with own finger

- Two different forms of NPC, applying optical flow feature as well as visual marker tracking
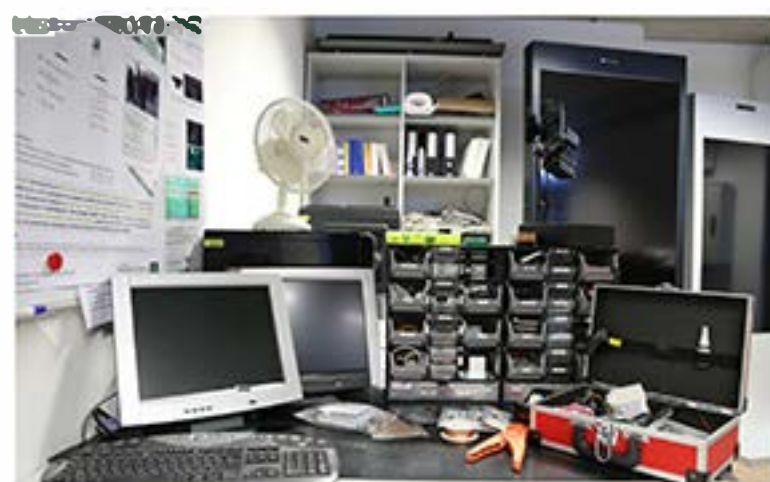- Comparison with two different types of prevailing n-point calibration

System evaluation setup

Common evaluation area
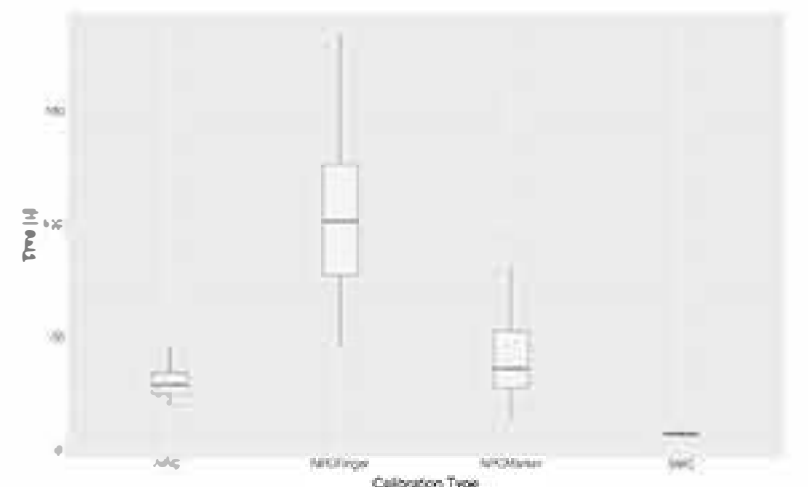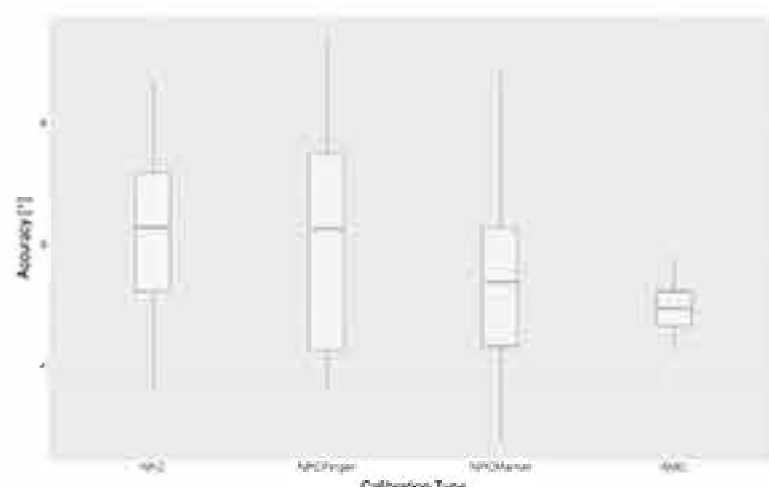

Screen Marker Calibration

NPC: Marker tracking

Natural Feature Calibration

NPC: Feature tracking

Results
- Calibration accuracy comparable
- Analysis of variance suggests no significant effect of calibration type on the calibration accuracy
- Calibration time identified as major drawback

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