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AUSILI MEDICALI

EYE TRACKING SYSTEM

Deye




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Each person, regardless of the degree of disability, has the right to influence, through communication, the conditions of their own life.

**National Joint Committee for the Communication Needs of Persons with Severe Disabilities, 1992.*

Introduction and intended use

Deye is an eye-tracking mouse emulator that utilizes both Dark Pupil and Bright Pupil technology. It is equipped with two high-resolution CMOS and CCD cameras, along with three sets of infrared illuminators: one aligned with the optical axis (close to the camera) for Bright Pupil technology, and two off-axis (left and right) for Dark Pupil technology.

Deye enables individuals with neuromotor impairments or conditions such as ALS, SMA, or quadriplegia to communicate. It is also suitable for users with speech or writing difficulties.



Description

Deye is a USB-powered hardware device that ensures high pointing precision and accuracy through binocular gaze direction detection.

It also supports **single-eye detection**, making it suitable for users with eye conditions that impair tracking in one eye.

Key features

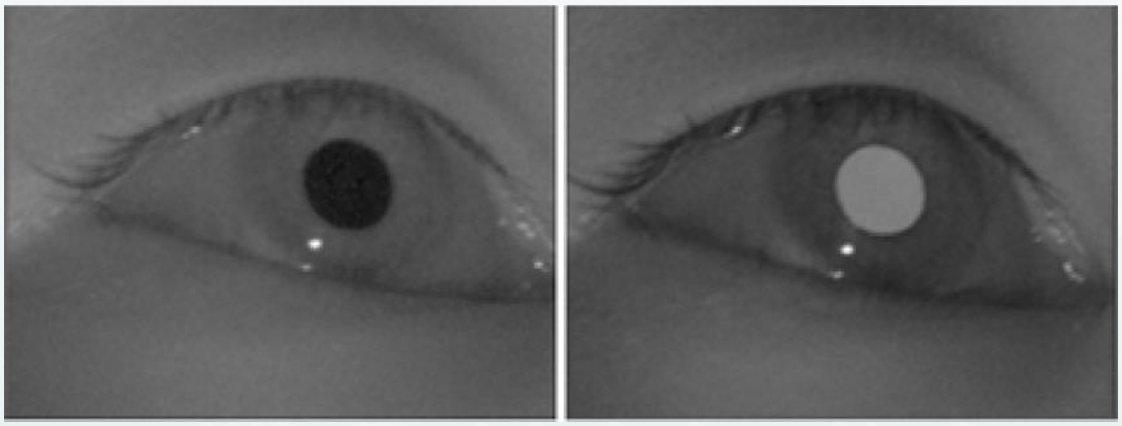
- Requires only a **single**, **simple calibration**.
- **High sampling rate**: allows effective use with glasses and/or contact lenses.
- **Dual eye-detection technologies**: Dark and Bright Pupil.
- **Selectable tracking modes**:
    - Binocular: the system automatically identifies the dominant and most reliable eye, leveraging input from the other eye to enhance tracking accuracy,
    - Right monocular,
    - Left monocular.
- **Dynamic compensation** for voluntary and involuntary head movements: optimized for ALS and adaptable to other similar conditions.

Dark and Bright Pupil Technology

Deye is one of the few eye trackers on the market that employs both Dark Pupil and Bright Pupil detection technologies.

In **Bright Pupil** mode, the eye acts as a retroreflector: infrared light is reflected toward the camera, making the pupil appear as a bright white circle.

In **Dark Pupil** mode, the light reflection is directed away from the camera, making the pupil appear significantly darker than under standard lighting conditions, which improves detection reliability.

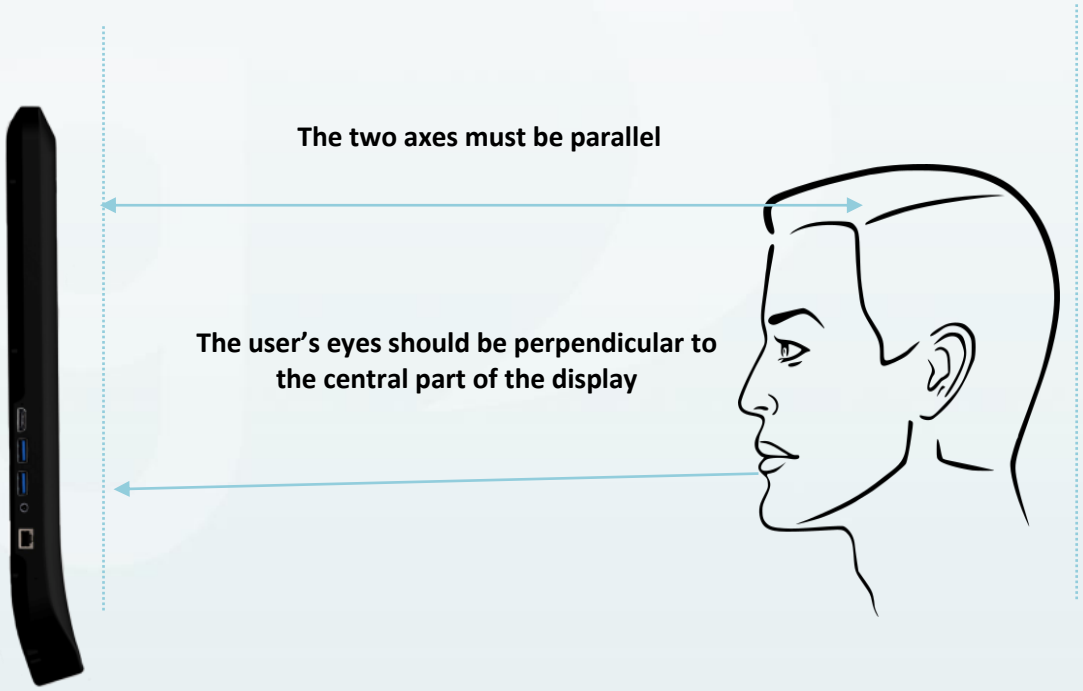


Positioning

Proper positioning is crucial during the initial setup of any eye-tracking system. As shown in the illustration below, the Deye's placement must be carefully aligned, followed by a successful calibration.

An alignment indicator helps ensure **correct positioning**.

Only one accurate calibration is required. Once completed, the system is immediately ready for use.



All calibrations are stored chronologically within the software, allowing the operator to freely select any previous configuration.

Technical Specifications

- **Tracking technology**: Dark and Bright Pupil
- **Cameras**: 2 (CMOS and CCD)
- **Head movement tolerance**: >15%
- **Sampling frequency**: 40Hz to 200Hz
- **Recommended user distance**: 40–80 cm
- **Detection range**: 40 cm to 2 meters
- **Accuracy**: ≤ 0.4°, typically around 0.3°
- **Spatial resolution**: typically, 0.25 cm, max 0.5 cm
- **USB port**: USB A 3.1 – Type C
- **Width**: 27.6 cm
- **Height**:
  - 4 cm (edges)
  - 4.6 cm (center)
- **Depth (top view)**:
  - 2.2 cm (edges)
  - 5.2 cm (center)
- **Weight**: 0.40 Kg

Minimum System Requirements

To operate the Deye eye tracker, the host device must meet the following minimum requirements:

- **Processor**: Quad-Core Intel i3 – 2.3 GHz
- **RAM**: 8 GB DDR4 – 1633 MHz
- **Storage**: SSD or HDD – 256 GB

Deye Tool

The **Deye Tool software**, included with the device, allows users to configure system settings, calibrate the tracker, and adjust operational parameters.

Additional features include:

- Minimizing the toolbar
- Gaze-magnification window
- Returning to the main menu
- Selecting between Dark and Bright Pupil tracking to accurately interpret eye movements and convert them into cursor motion

The Deye Tool ensures compatibility with third-party communication software other than Matrix AAC.



Matrix AAC

Deye is fully integrated into the **Matrix AAC communication software**. All functionalities, including calibration, are managed directly within the program, ensuring seamless user experience.



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