IntelliGaze™
Installation & Service Manual

DocVersion: 4.1

alea technologies

Security Advice

We would like to remind you that the contents of this operating manual do not constitute part of any previous or existing agreement, commitment or legal relationship, or an alteration thereof. All obligations of alea technologies gmbh result from the respective contract of sale, which also includes the complete and exclusively applicable warranty regulations. These contractual warranty regulations are neither extended nor limited by the information contained in this operating manual. Should you require further information on this device, or encounter specific problems that are not discussed in sufficient detail in the operating manual, please contact your specialized dealer or system installer.

The device may be connected, operated and maintained only by appropriately qualified personnel. The error-free and safe operation of this device can only be ensured if it is properly transported, stored, sited and assembled, and operated and maintained with due care.

Operating Environment

Please observe the proper use of this product. Failure to do so will render the warranty void. Do not subject this product to direct sunlight, moisture or shock. The following environmental conditions are required:

Ambient temperature: 10°C ... 35°C (50°F ... 95°F)

Storage temperature: -20°C ... 60°C (-4°F ... 140°F)

THE INTELLIGAZE SYSTEM IS NOT INTENDED FOR USE IN THE OPERATION OF NUCLEAR FACILITIES, AIRCRAFT NAVIGATION OR COMMUNICATION SYSTEMS, AIR TRAFFIC CONTROL SYSTEMS, LIFE SUPPORT MACHINES OR OTHER EQUIPMENT IN WHICH THE FAILURE OF THE INTELLIGAZE SYSTEM COULD LEAD TO DEATH, PERSONAL INJURY, OR SEVERE PHYSICAL OR ENVIRONMENTAL DAMAGE.

Installation and Maintenance

The installation, testing, maintenance and extension of, and any necessary repairs to the system may be performed only by authorized personnel.

Trademarks

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4.0	2024-01	11.1	CAM30NT / CAM30OEM / CAM30NXT
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Table of Contents

1 Introduction

This manual targets system integrators and support personnel who require in-depth knowledge regarding the IntelliGaze™ software and hardware. It is meant to accompany an on-site training session.
It covers system specifications and general hardware setup aspects as well as software installation instructions.
The software reference documents all settings of the IntelliGaze™ software and provides the default (installation) values for reference.
3rd-party software integration is explained and several cases are documented with their recommended parameters.
Typical troubleshooting cases are mentioned in the last part of this manual.
Please feel very welcome to contact alea technologies with any request or suggestion that has not been covered in this manual.

For programming references regarding the IntelliGaze™ API, please refer to the *'IntelliGaze™ API Documentation'* which is available for registered developers.

2 Technical Specification

2.1 Tracking System - IG-30NT

Tracking Technology	Hybrid infrared video eye- & head-tracking. Binocular & monocular tracking
Working Volume centered at 620 mm distance	320 x 200 x 250 mm³ [WxHxD]
Accuracy, static	0.5° typ.
Accuracy, over full working volume	1° typ.
Sampling Rate	40 / 30 / 20 Hz
Recovery-time after tracking loss (head moved to quickly or was out of range)	150 ms typ.
System Dimensions	285 x 44 x 38 mm³ [WxHxD]
Mounting Options	on monitor via VESA-adapter on Tablet-PC via customized interfaces
System Weight	ca. 280g
Interface	Full-Speed USB2
Power-Supply	Single USB cable, up to 1m (optional aux. power supply for special setups)
Power consumption (40 Hz full tracking mode)	< 2,5W avg.

2.2 Tracking System - IG-30NXT

Tracking Technology	Hybrid infrared video eye- & head-tracking. Binocular & monocular tracking
Working Volume	320 x 200 x 350 mm³ [WxHxD] centered at 68 cm distance.
Working Distance	50 - 85 cm [20 - 34 in.]
Accuracy, static	0.5° typ.
Accuracy, over full working volume	1° typ.
Sampling rate	60 Hz
Recovery-time after tracking loss (head moved to quickly or was out of range)	17ms
System Dimensions	275 x 26 x 27 mm³ [WxHxD]
Monitor Dimensions	12” – 24” , recommended: 12-19” [like with all eye trackers, larger monitor may reduce the individual accuracy over the screen area]
Mounting Options	On monitor VESA-adapter or magnetic adapter for the frame Tablet-PC via customized interfaces, e.g. IG.com
System Weight	ca. 105g
Interface	USB3
Power consumption (60 Hz full tracking mode)	< 2,5W avg.

Operating Environment

Please observe the proper use of this product. Failure to do so will render the warranty void. Do not subject this product to direct sunlight, moisture or shock. The following environmental conditions are required:

Ambient temperature: 0°C ... 35°C (32°F ... 113°F)
Storage temperature: -20°C ... 60°C (-4°F ... 140°F)

THE INTELLIGAZE SYSTEM IS NOT INTENDED FOR USE IN THE OPERATION OF NUCLEAR FACILITIES, AIRCRAFT NAVIGATION OR COMMUNICATION SYSTEMS, AIR TRAFFIC CONTROL SYSTEMS, LIFE SUPPORT MACHINES OR OTHER EQUIPMENT IN WHICH THE FAILURE OF THE INTELLIGAZE SYSTEM COULD LEAD TO DEATH, PERSONAL INJURY, OR SEVERE PHYSICAL OR ENVIRONMENTAL DAMAGE.

3 Safety & Compliance

The IntelliGaze™ IG30NT, IG30NXT systems have been certified for general office use as in the class of information and telecommunication devices. The system will meet or exceed the required standard according to the CE certification below.

3.1 Safety of the Infrared Illumination

The Cam30NT and Cam30NXT camera system contains LED sources that emit light in the near infrared (NIR) spectrum for the purpose of eye image recording.
The light emission levels have been measured and calculated to comply with the European standard for biological safety of lamps and lamp systems [EN62471-2009] under the defined working conditions.

3.2 Magnetic Field Hazard

CAM30NT and some mounting adapters contain magnets. Magnetic fields may interfere with the function of cardiac pacemakers and implantable defibrillators. As a general rule, please maintain a minimum distance of 10 cm (4 inches) between the frontal part of the device and any implanted, electronic device.

3.3 Epilepsia / Photosensitive Seizure Warning

A very small percentage of people may experience a seizure when exposed to certain visual images, including flashing lights or patterns that may appear in video games. Even people who have no history of seizures or epilepsy may have an undiagnosed condition that can cause these photosensitive epileptic seizures while using a gaze interaction device on a computer screen.
These seizures may have a variety of symptoms, including lightheadedness, altered vision, eye or face twitching, jerking or shaking of arms or legs, disorientation, confusion, or momentary loss of awareness. Seizures may also cause loss of consciousness or convulsions that can lead to injury from falling down or striking nearby objects.
Immediately stop while using a gaze interaction device on a computer screen and consult a doctor if you experience any of these symptoms. Parents should watch for or ask their children about the above symptoms - children and teenagers are more likely than adults to experience these seizures.
The risk of photosensitive epileptic seizures may be reduced by taking the following precautions:

- Using a gaze interaction device on a computer screen only in a well-lit room.
- Do not use a gaze interaction device on a computer screen if you are drowsy or fatigued.

If you or any of your relatives have a history of seizures or epilepsy, consult a doctor before playing.

3.4 Declaration of Conformity - CE

Declaration of Conformity

We, **alea technologies gmbh ,** Potsdamer Str. 18a, 14513 Teltow, Germany

declare under our sole responsibility, that the product

IntelliGaze™ IG-30NT, IG30NXT
using the Cam30NT or Cam30NXT camera units

to which this declaration relates is in conformity with the following standards or other normative documents:

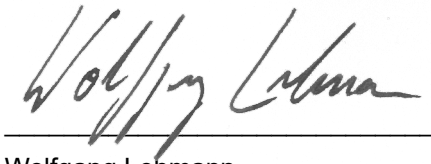
EN 55032:2015	/ A11:2020	*EMC, of multimedia equipment, emission*
EN 55016-2-1 2014-12 *EN 55016-2-2 2011-09*		
EN 55035. 2017 /A11:2020		*EMC, of multimedia equipment, susceptibility*
EN 61000-3-2: 2015-03 *EN 61000-3-3: 2014-03*		
EN62471-2009		*Photo Biological Safety of Lamps and Lamp Systems*
2015/863/EU (RoHS III)		*Restriction of Hazardous Substances Directive*

The following, foreign standards are met:

FCC 47 subpart 15 B	Class B digital device. (USA)
ICES-003, issue 7	Information technology Equipment (Canada)

The IntelliGaze™ system serves a gaze-controlled computer input device.

Teltow, August 10th , 2023



Wolfgang Lehmann
Managing Director, alea technologies gmbh

3.5 FCC

IntelliGaze™ CAM30NT, CAM30NXT camera system

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

alea technologies is not responsible for any radio or television interference caused by cables and connectors other than those recommended by or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

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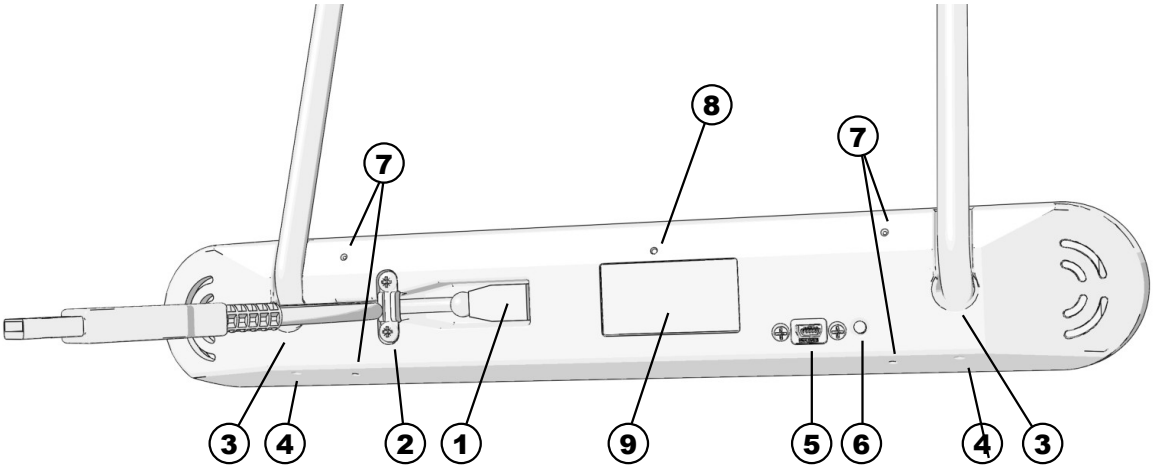
4 Setup

4.1 CAM30NT Camera Unit



1	USB2 connector (mini-USB)
2	Cable lock
3	Standard CAM30(NT) mount D:8mm → Max. depth: 35mm.
4	Std. Mount lock screws. → Please, only tighten hand-tight!
5	Optional auxiliary power-supply connector. (mini-USB) → Only required with very long main USB cable, adds to P.1 → Do only use manufacturer supplied power-supplies.
6	System status LED (see below)
7	Aux. camera mounting threads (M3, max. length 8mm)
8	Internal camera status LED (see below)
9	Camera label, warranty seal.

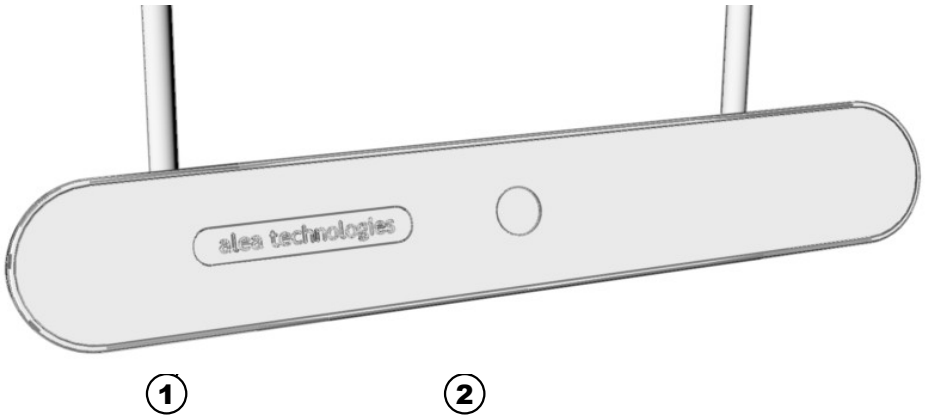
System Status LED [6]

green	IntelliGaze is running and camera functional.
yellow	IntelliGaze is running but camera functions are constricted*.
red	Camera stopped working because of a critical error* Device requires service, contact your distributor.

Internal Camera Status LED [8]

orange	Camera driver is properly installed.
off	Camera driver is not loaded, check the Windows device

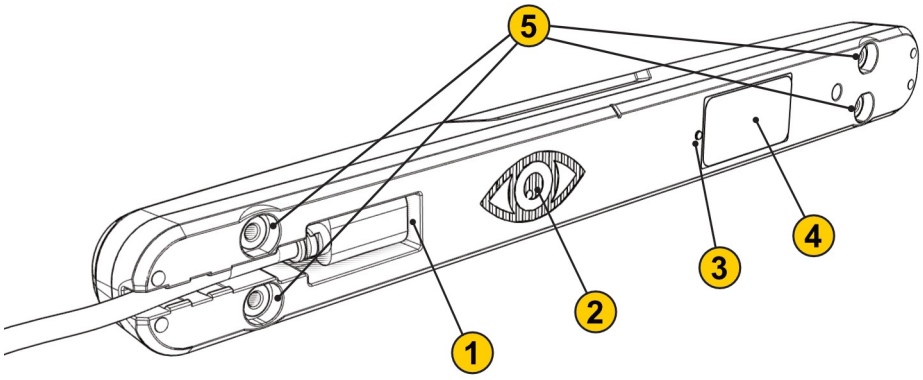
	manager and reinstall driver or plug camera into a different USB port.



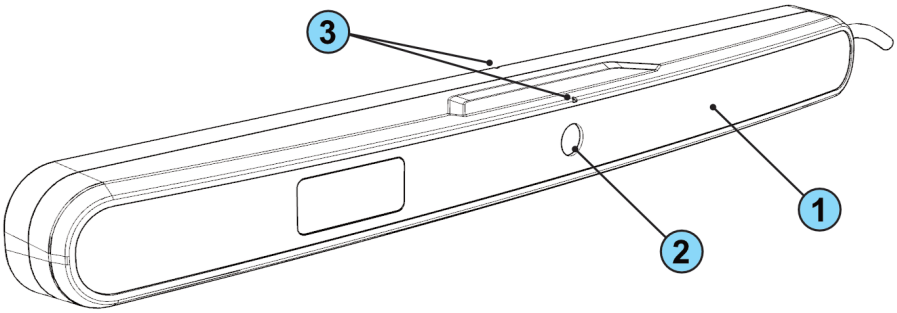
1	Front plate. IR-transmissive acrylic glass. → use only soft cloth, i.e. microfiber and avoid harsh cleaners.
2	IR-glass lens. → Please keep the lens clean. Dirt may be removed with glass cleaner or better isopropanol. The use of a cotton swab is recommended.

⚠ **The camera unit does not contain any adjustable or serviceable parts.**
Please do not open the housing!

4.2 CAM30NXT Camera Unit



1	USB3.1 Type-C Connector
2	Ventilation, passive Camera-LED, Green: OK
3	Status-LED, Green: OK
4	Device Label, Serial Number
5	Mounting Points Magnetic target, steel. 4x M4 threads - Max. 5mm screw-in depth!



1	Front plate. IR-transmissive acrylic glass.
2	IR-glass filter. → Please keep the filter clean. Dirt may be removed with glass cleaner or better isopropanol. The use of a cotton swab is recommended DO NOT PRESS TOO HARD, THIN GLASS!
3	Center-Marks, reference for mounting

4.2.1. Connection & Cable

The camera is usually shipped with a 0,5m USB3 cable, assuming a Type-A connector on the PC side. Other cable options might be available on request.

The common specification of the cable:

USB 3.1, Type-C connector [camera], >= 5Gbps. , 0,3...1m length
(longer cables require testing)

Attention should also be paid to the shape of the Type-C housing and the diameter of the cable, as the camera housing sets certain limitations.
While many USB cables or hubs might work, detailed testing is recommended for stable long term operation. Disconnects or reduced frame-rates can occur with incompatible cables.
It is highly recommended to use pre-tested cables and USB-hubs for guaranteed performance.

4.2.2. Operating Temperature

The Cam30NXT device, as a high-performance USB3 camera system, produces a certain amount of heat, which makes it appear warm to the touch.
The Cam30NXT device tracker has been tested at normal operating conditions during a 24 hours period with an ambient temperature of 25 degrees. After about 30 min. of use the device reaches a stable temperature which is maintained until the tracker is turned off. The maximum temperature on the outside of the device was ca. 40°C during the test.
This temperature is not harmful to the user, even if the device is handled during or directly after use.
The Cam30NXT is designed to operate at a max. ambient temperature of 35°C. Neither the function nor the lifespan of the product is adversely affected.
The small ventilation openings on the backside of the camera should not be completely covered, as they can help maintaining a stable temperature under extreme conditions.
Attention should also be paid to the mounting location, as some monitors or tablet PCs might be uncommonly warm already, before mounting the camera.
The camera is designed for use under common office conditions.

4.2.3. Cleaning

Please clean the acrylic front plate with a soft microfiber cloth and avoid harsh cleaning liquids.
The IR-transmissive filter (‘mirror’) can be carefully cleaned using Isopropanol on a cotton swab.

Materials

Housing:	ABS/PC
Front:	PMMA (Acrylic Glass)
Front-Filter:	Glass

⚠ **Please avoid excessive pressure on the thin glass filter, it might break!**

4.2.4. Maintenance

The camera does not contain any serviceable parts. Opening the camera housing voids the warranty.

4.3 HW-Requirements

4.3.1. PC-Platform

While every current notebook, tablet or desktop PC should be powerful enough to run IntelliGaze™ in the background, we specify the minimum requirements as follows:

CPU:	Intel Core i5, 8th gen or newer, quad-core recommended AMD equivalent
RAM:	8 GB, minimum 16GB recommended for desktop applications and media
Graphics	Integrated Intel / AMD or discreet GPU. Min. resolution: 1280 x 720.
Ports:	Cam30NT: min. Full-Speed USB2 port. [or USB3] Cam30NXT: Super-Speed USB3 port.
OS:	Windows 10/11 home/pro [IntelliGaze 11]

⚠ **IntelliGaze on Windows 10 / 11 IOT (LTSC) might work in some configurations but the function and performance cannot be generally guaranteed!**
alea technologies offers assistance in testing such configurations prior to roll-out.

☞ *Other attached USB devices may negatively influence the gaze tracking performance.*
Please consider this carefully and whenever possible, test the compatibility in advance.
We highly recommend connecting the camera system to a dedicated USB port on the computer rather then through a USB-Hub.
Wherever hubs or adapters should be used, prior consulting and testing is highly recommended.

☞ *Prefer a custom, long cable over extensions, as the connectors might negatively influence the stability.*

4.3.2. Monitor

Technical Requirements

Screen size: TFT monitors 12” to 24”wide-screen.
While (even) larger monitors might work with many people, the precision and the likelihood of a successful calibration for some users might be reduced. Typically a monitor size of 12-18” is ideal for gaze control.
While IG11 will generally work on monitors smaller then 12”, graphical artifacts might be noticeable, because the eye controlled desktop interface is scaled to a fixed, physical size.

Two factors can help to successfully use large monitors:

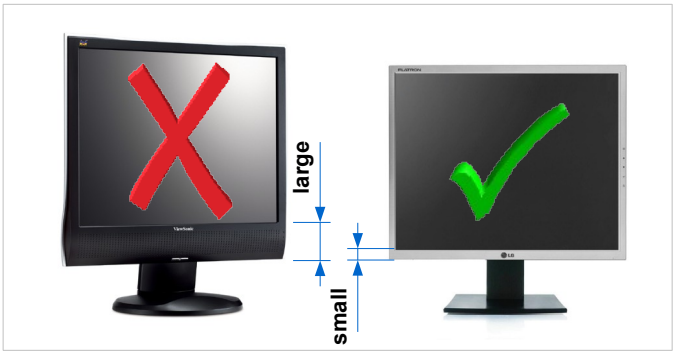
a. mount the camera as close to the screen area as possible.
b. try to use the far end of the camera working range to reduce the gaze angles

Both aspects are particularly improved with Cam30NXT.

4.4 Mounting

In most cases it is highly recommended to use a flexible , commercially available mounting solution, e.g. from Rehadapt or Daessy.
The ability to adjust the monitor and camera position exactly to the individual user requirements will often provide better calibration and tracking results as well as an improved long-term user experience.
General concept: The tablet PC or monitor should provide general mounting option, e.g. VESA 75/100. While Rehadapt / Daessy provide adapters from there, alea technologies offers various camera holders, that also fit VESA 75/100.
Cam30NXT can generally be mounted more flexibly, as explained below.

In general most monitors that comply with the requirements above should work with the IG-30NT system.
One issue to consider when selecting a monitor is the width of the bottom screen-border (→ see sketch below). A large border, which forces the camera unit further away from the active screen region, might prevent accurate tracking on the upper parts of the screen. For the above reason screens with speakers integrated at the bottom should be avoided.
This limitation has been largely overcome with Cam30NXT, providing more mounting options.

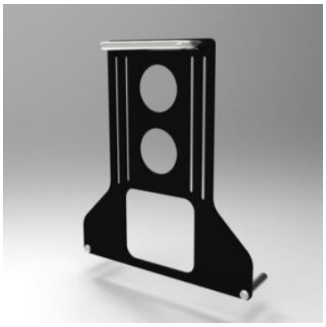


4.4.1. Mounting Cam30NT

The preferred mounting option on Cam30NT is via 8mm steel bolts, that fit through the back, hold the camera can can be screw locked.

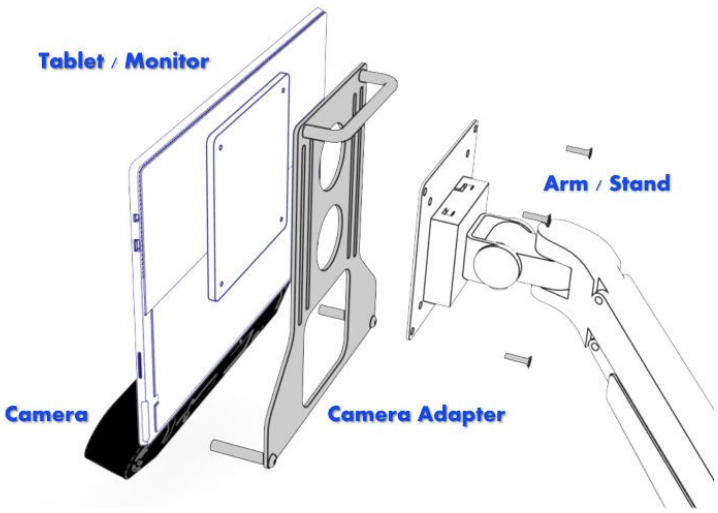
Alternatively a set of M3 threads is provided. Being a significantly weaker option, this should only be used with care.
Typically alea technologies will provide a mounting adapter that fits the platform, or a partner will create a custom solution.
Two adjustable camera mounting adapters, based on VESA 75/100 :

No.3SH (typ. 11-15”)



No.3LX (typ. 15-17”)

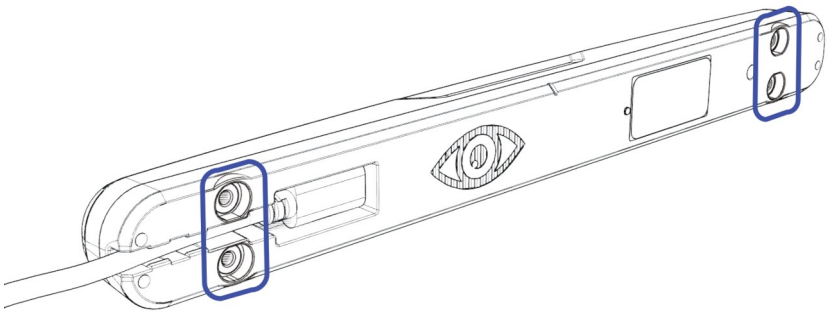
Assembly – here: Tablet PC with VESA and VESA-based monitor arm.



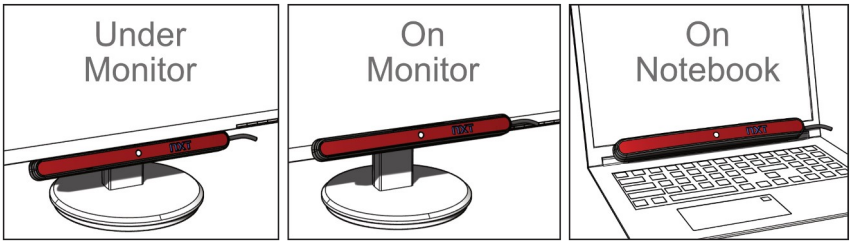
Please check the alea technologies website for a more complete overview about available options and do not hesitate contacting us directly with any arising integration challenge.

4.4.2. Mounting CAM30NXT

Cam30NXT provides four mounting points on the backside in a rectangular pattern. Each point is implemented by a sunken M4 threaded steel insert, that also serves as target for an optional magnetic mount (recommended 8mm diam. neodymium magnets).
The camera device should always be mounted centrally under the screen, tilted about 20° upwards. The angle will be covered by the initial monitor calibration process, but angle and position should be stable over time.
Cam30NXT Backside, Mounting points highlighted:



While the former models mainly needed to be mounted from the backside, under a device, the slim design of the camera model opens new integration options.

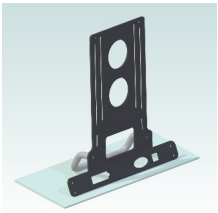


A growing list of adapters is readily available.

M5 – 8mm bolt adapter - Adapt legacy Cam30NT mounts

M5/8mm Bolt Adapter, Stand [*Magnet & Screw*] → IG.com	**M5/8mm Bolt Adapter, Slim** [*Magnet & Screw*] → No.3SH, custom, etc.
	
`IG-AM5-xxx-xx`	`IG-AM5-xxx-xx`

Sliding VESA75/100 adapter for 12-15” / 15-17” devices

Std. VESA-Adapter, 'No.1 NX' *div., 12-15” TFT* [*Screw*]	**Long VESA Adapter ‘No.3 LNX’** *div., 15-17” TFT* [*Screw*]
	
IG-AVS-xxx-xx	IG-AVL-xxx-xx

Magnetic mount for monitor or notebook frames.

- steel plate with adhesive tape
- dual-magnetic wedge to hold the camera

Monitor Front Magn. Adapter [*Magnet*]

IG-AMF-xxx-xx

Custom Adapter for SB Gridpad 12 / 15.IG.com SP8 – A plug&play solution for Surface Pro 8 / 9 tablets

Tablet holder for Surface pro 8 / 9 tablets.

- Coated aluminum.
- Protects tablet & connectors.
- Integrated VESA 75/100 and Daessy mounting options.
- Back-side handle and static stand.
- Optional: attached USB3 Hub, corner protectors and more.

Please check the alea technologies website for a more complete overview about available options and do not hesitate contacting us directly with any arising integration challenge.

4.5 Software

4.5.1. Platform Prerequisites

IntelliGaze™ is designed to work on recent Microsoft Windows platforms. The following operating system and software package requirements must be fulfilled.

Windows IoT (Internet of Things) is supported by IntelliGaze under some circumstances (check test below)

You may perform a quick check of compatibility with the too CamCheck which is located here. ***C:\Program Files (x86)\alea technologies\IntelliGaze\bin***
Run it from the command line (cmd) and check that the measured FPS matches the target FPS. Contact alea technologies if this test fails to obtain a solution.

When using Windows IoT a third party software package must be downloaded and installed.
https://developer.microsoft.com/en-us/microsoft-edge/webview2/

	IG v4.2	IG v5.0 and v5.5	IG v11 and newer
Win 7 SP 1	KB3033929	KB3033929, KB401990	Not supported
Win 8	Supported	Not Supported	Not Supported
Win 8.1	Supported	Supported	Not supported
Win 10 22H2 or newer	Supported	Supported	Supported
Win 11	Supported	Supported	Supported

.Net8 (will be automatically installed by the IntelliGaze™ installer 11)

.

Carefully consider that mobile computers tend to throttle the CPU in idle times and under battery power. Under these conditions, the hardware might no longer meet the above minimum requirements!
It is highly recommended to turn most power-saving functions off.

3rd party software that sometimes uses excessive hardware resources while operating in the background, like some virus scanners or similar, can increase the minimum hardware requirements significantly.

IntelliGaze was tested with Antivirus Tool Windows Defender / Security Essentials. Other tools such as AVG, Antivir, McAfee or Kaspersky can cause unpredictable behavior. Use them without support at your own risk.

Cam30NXT requires IntelliGaze v11 or newer

4.5.2. IntelliGaze™ Software Installation

The latest version of IntelliGaze™ can be downloaded here.

http://download.intelligaze.com

⚠ Do not connect the camera to the PC before IntelliGaze™ is installed!

☞ *You will need administrator rights to install IntelliGaze™ however the operation does not require them.*

1. Launch the download executable file. There is just one installer for all supported languages.
2. Accept the license agreement.
3. By default the camera driver is automatically installed.
4. After installation there is now a desktop icon and shortcuts in the program menu.
5. Distributors may customize the splash screen with their own image. Put an image (recommend size 960x300) at the following location.

   ```
   %localappdata%\alea_technologies_gmbh\IntelliGaze\splashscreen\overlay.png
   ```

6. If the *monitor off* in the home menu is deactivated, make sure to disable “connected standby” using the following registry key

   ```
   [HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Power]
   "PlatformAoAcOverride"=dword:00000000
   ```

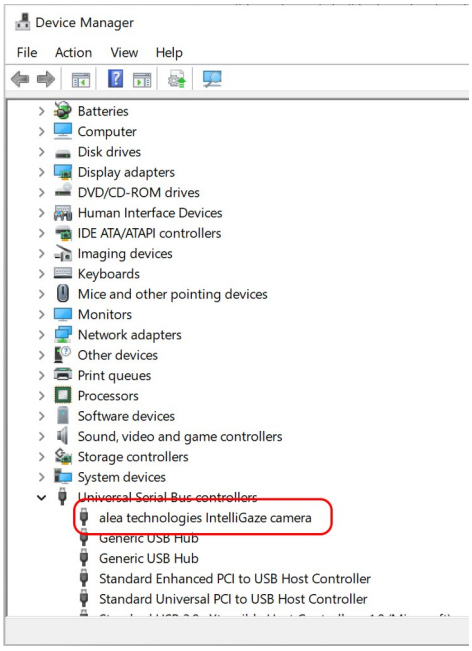
   Alternatively install the registry key from this location.

   ```
   c:\Program Files (x86)\alea technologies\IntelliGaze\tools\
   DisableModernStandby.reg
   ```

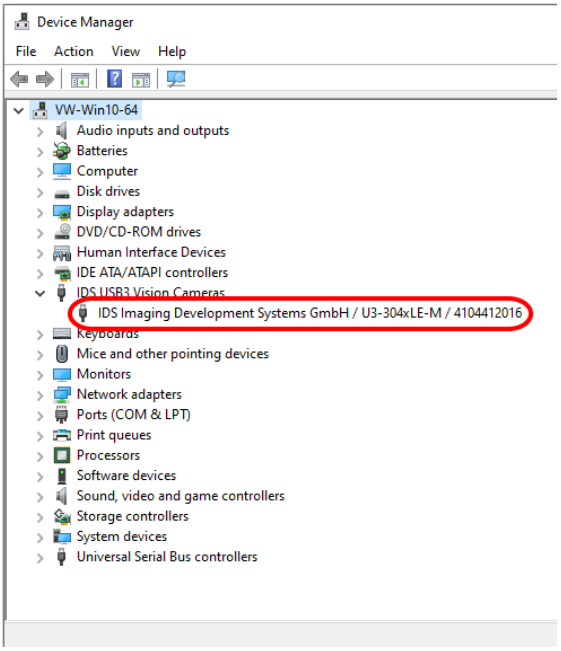
4.5.3. Camera Driver

The driver will be automatically installed with the IntelliGaze™ software. After the installation of IntelliGaze™ you may connect the camera to a USB 3.1 port of your PC.

Cam30 / Cam30NT



Cam30NXT



4.5.4. Licensing

IntelliGaze V11 will run in trial mode without proper license. All IntelliGaze V5 systems upgraded to V11 will start in trial mode. Trial mode allowing access the full functionality, but showing some upgrade reminders. A demo license is available for reference systems.
The license is handled by the camera system hardware
Please refer to the chapter ' License' on page 57 for more information.

4.6 PC Setup Checklist

Each alea camera is delivered with a checklist and a sticker which can be attached to the PC if the following actions are taken to prepare the computer.

Attach the provided sticker at the back of the pc after completion of the checklist

No	Action	Description
1	Windows updated	Make sure Windows is always updated to the latest version. Use an offline cumulative update pack for Windows to safe time with Windows updates.
2	Latest IntelliGaze version installed	http://download.intelligaze.com
3	Monitor Calibrated	The monitor calibration requires a metric ruler of about 40 cm. For further details please refer to chapter 4.7.1.Monitor Calibration

4	Hibernation disabled	Goto the advanced settings of the power options. Search the section “sleep” and make sure that the option “hibernate after” is set to never. Hibernation would turn the PC off after N minutes. Which is in most cases not desired.
5	User password removed	When using the IntelliGaze “Monitor Sleep” function you want the prevent the lock screen because the user can’t enter a password with the eyes.
6	Hardware buttons activated	Some tablet computers have hardware buttons. It’s very beneficial to put functions like “calibrate” Ctrl+F5 on hardware buttons.
7	IntelliGaze autostart activated (optional)	IntelliGaze can put in the autostart of Windows. This option can be enabled in the IntelliGaze options

4.7 First Start

This step will make sure that all components have been installed correctly and the system is working according to specification.
It assumes all setup-steps above have been completed successfully.

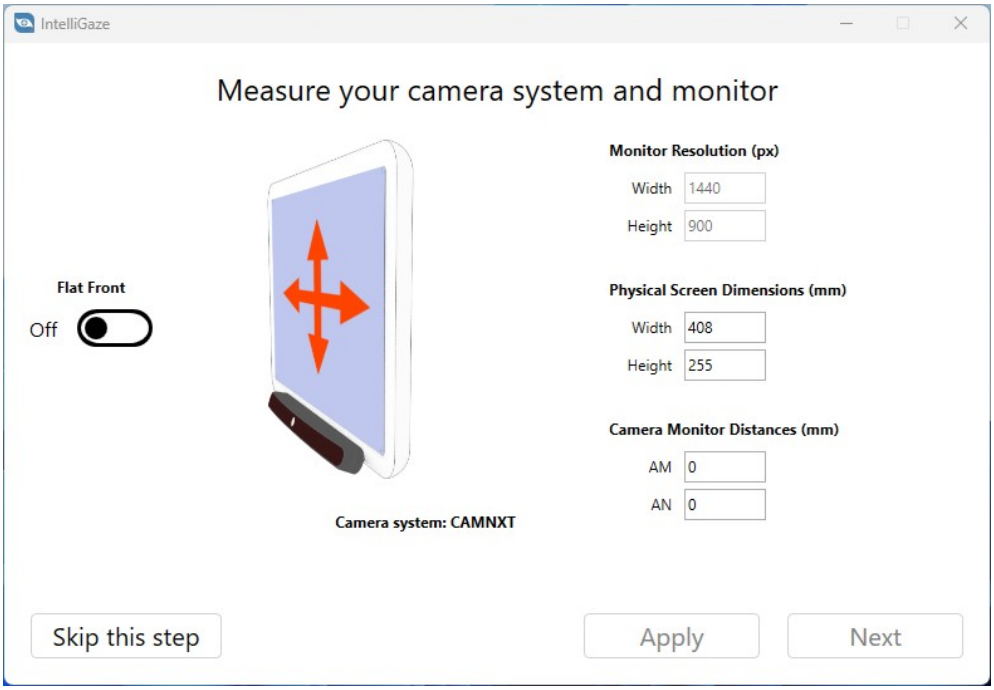
1. Connect all cables. The LED of the CAM30NT and CAM30NXT shows the green LED when IntelliGaze is started.
2. Turn-on the PC and boot Windows.
3. Start IntelliGaze™, if not included in 'Autostart'

Upon first start IntelliGaze will guide you through some required steps to ensure proper operation.

Resetting all settings with the tool ResetIntelliGaze.exe will restart this procedure.

4.7.1. Monitor Calibration

In order to ensure the highest gaze accuracy over the large working range, the physical setup of the system needs to be calibrated when the system is being integrated.



*Integrated cameras don't have to be measured. Integrated cameras are using fixed pre-configured values **Hidrex Neos13, Smartbox Gridpads** are such a devices with integrated camera.*

A failure to measure the monitor-camera parameters correctly will cause high gaze location errors under head-motion.

1. Follow the instructions in the calibration tool and enter the following parameters:
   - The screen-resolution of the monitor.
   - The physical dimensions of the panel without the monitor frame.
   - Two or three measured distances between the camera and the monitor. Please check the monitor sketch for detailed reference..

In a dual monitor setup make sure the camera is attached to the primary monitor. The resolution of the primary monitor will be auto detected by the tool.

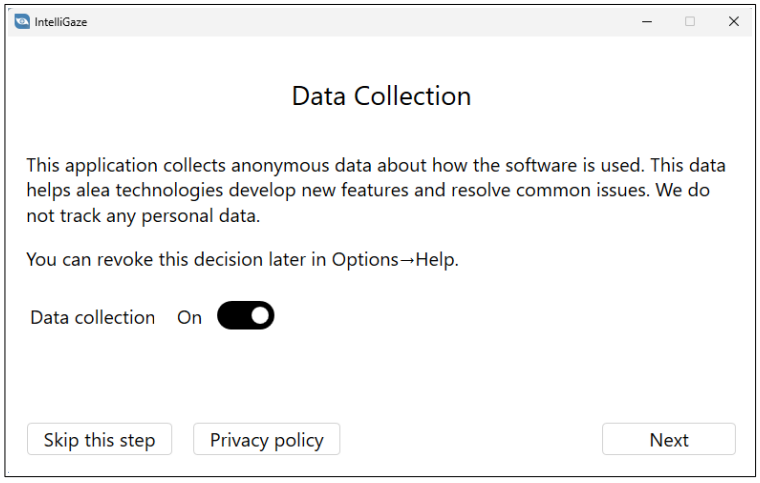
The monitor resolution should be kept constant during the whole operation. The system will notify the user when the entered value does not match the actual monitor resolution when a calibration is started. IntelliGaze™ will try to adopt the gaze-cursor coordinates to possibly changing resolutions during the operation of the system e.g. in games. Nevertheless, the system should be validated carefully in such cases.

You will have to repeat this measurement whenever the camera changes its position with respect to the monitor. Use the tool *Monitor Calibration* to re-enter the values.
The values are saved in a xml settings file which is located in the folder:

\\Current User\Local Settings\Application Data\alea_technologies_gmbh\IntelliGaze\planes.settings

4.7.2. Data Collection

IntelliGaze is able to collect anonymous data which is automatically uploaded to alea technologies servers to help to develop new features and resolve common issues.
The consent to collect data can be revoked or granted later in the IntelliGaze options.



4.8 System Validation

After completing 4.7.First Start you should see the following:

- Dark red shining outer LEDs, the illumination will go to a standby mode if no head was detected for a while. In standby mode, the outer LEDs will flash only about once a second. (CAM30NT)
- The status window in the *home* menu is showing a green or yellow head symbol when the head is within the working range
- Ctrl + F5 starts a calibration or press the calibration button in the *home* menu
- If the system is calibrated you should see the cursor following your gaze if the gaze dot is shown. Alternatively verify the accuracy with the *home/calibration/verify* tool after calibration.

5 Using IntelliGaze™

5.1 Principle of operation

The IntelliGaze™ system allows the user to control specialized, e.g. AAC, applications as well as many standard Windows applications through eye-movements.

A camera and illumination system mounted underneath the monitor receives images of the users face under invisible near-infrared illumination. A background PC program analyzes the images in real-time and extracts face and eye locations. High resolution image processing algorithms calculate the gaze angle of the user. By calculating the intersection point of these gaze-vectors with the monitor, the system can determine the gaze location on the screen. Heuristics and configurable filtering are applied to synchronize the mouse-cursor with the calculated gaze location. Mouse-clicks can be triggered by either dwelling on a certain region or blinking. The user may also use external switches or buttons to trigger the click.
A new user needs to be calibrated to the system, before the gaze control can be used. The gaze tracking and 'click' control can be adopted to the user requirements and the target application.

5.2 Environment

The IG-30NT has been designed for indoor use. The equipment should be used in an office-like environment. IG-30NXT greatly enhanced the outdoor performance with sunlight.

General Considerations

Provide

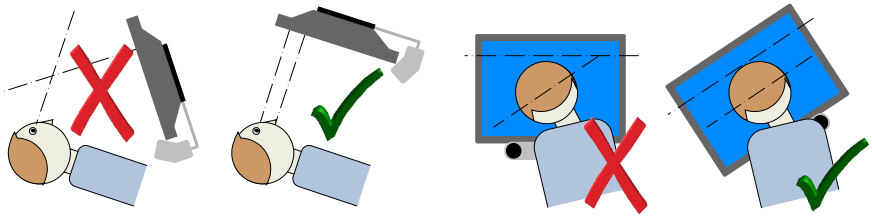
- Well lit, comfortable seating or bed-site condition.
- The subject should be comfortable and stably positioned.
- Ideally both eyes should be clearly visible from the camera position.
  If one eye is permanently covered, please refer to the monocular options in the calibration settings.
- The monitor-camera combination should have room and sufficient degrees of freedom to achieve a good position in-front of the user. We do highly recommend the use of monitor arms.
- Sunglasses or a cap helps users to deal with very bright outdoor environments.

Avoid

- Direct Sun-Light into the camera
- Direct exposure to secondary IR sources like halogen bulbs, etc.
- Complex prescription glasses like bi-focals, etc.

WARNING - If the IntelliGaze product is mounted in such a way to a monitor that it may fall and potentially harm the user, this is done solely at the user's own risk. alea technologies or any of its representatives do not take any responsibility and will not be liable for any damages or injuries arising from the product falling onto someone or something, even if the mounting has been made according to instructions.

As a general rule, the user should be centered in-front of the screen in a normal working position, whenever possible. If the system will be mounted above a bed, or the users head has been stabilized in a slightly tilted position, please adjust the monitor accordingly as pictured below.



5.3 Special Cases

IntelliGaze™ is designed to work out of the box for the majority of users without adjusting any parameter. Some parameters allow users to adopt the system to special cases. The following overview explains which parameters should be used in which situation.
In case a user can't be tracked at all please run the video recording and send the data to alea technologies for further investigation.
Please refer to chapter 10.2.Tracking Problems for details.

5.3.1. Glasses

Most glasses do not interfere with the system, but bifocals and multifocals can be problematic.
If calibrating a subject wearing glasses continuously gives you an inaccurate calibration, you should first try to change the camera position and repeat the calibration. Very often some disturbance reflection on the glasses will disappear if you change the system geometry. The eye video window will help you to find good positions for the camera. Ctrl + F10 toggles the head status window into an eye video.
In rare cases, the accuracy will be decreased when using IntelliGaze™ with glasses. You should increase the cell size of your communication software in this case.
Sometimes when working with glasses, a limited area of the screen cannot be calibrated and used. Try to change the calibration area (center, bottom, full) and avoid putting AAC input functions in the problematic area.
Try using the glasses mode which can be enabled in *options/system.* This modes enhances performance with glasses in most cases. This mode is also active when a third party application such as Grid is used.

5.3.2. Monocular Operation

When just one eye of the subject is visible you should select "left or right eye calibration" and "track just one eye". When just one properly moving eye is available because the other eye is a glass eye or is visually impaired, you should select "left or right eye calibration" and "track both eyes". Both eyes are used for tracking but only the good one is used for calibration.
In monocular operation mode the accuracy can be decreased. Make sure that the cells of your communication software are large enough to cover this inaccuracy.

5.3.3. Calibration area

Sometimes cognitive weak or visually impaired users can't look into all corners of the monitor. When you experience a systematic calibration error in one of the corners, you should shrink or move the calibration area. The accuracy outside the calibration will be decreased. Make sure that buttons and cells are larger when you want to use that region for gaze interaction. Some users can only look vertically or horizontally. Choose the calibration area vertical or horizontal in this case. Make sure the buttons and cells of a communication package are placed vertically or horizontally.

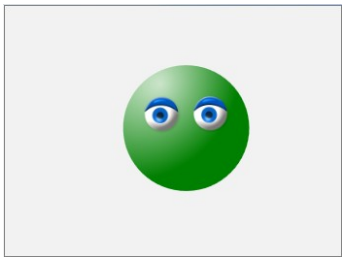
5.3.4. Cerebral Palsy

Cerebral Palsy users often move the head very fast. Make sure that the center of movement is also the center of the working range at 60cm. It is recommended to use a one point calibration and large buttons and cells in the communication software. A simple and fast calibration with quick success reduces the stress for the user.

The 16-point-calibration is designed for highest accuracy at the expense of a possibly lowered head movement range. Do not use this calibration method when the user moves his or her head a lot.

5.4 Tracking Status Indicator

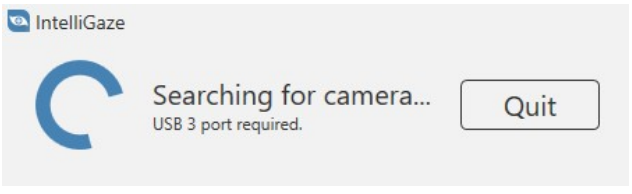
The Tracking Status Indicator supports the proper positioning of the system and subject and provides feedback about the eye-tracking status during operation of the system. It displays the 3D location of the head in the tracking volume (position & size) as well as the status of the head-tracking operation (green, yellow, red).
The status of the eye-tracking is displayed independently for each eye.



The Tracking Status Indicator is shown in the home menu. You may switch the status windows to camera view.
A distance indicator is also visible at the top of the 6.3.1.Operation Bar 

5.5 Info Box

The info box of IntelliGaze pops up when the system informs the user about warnings, info's or errors.



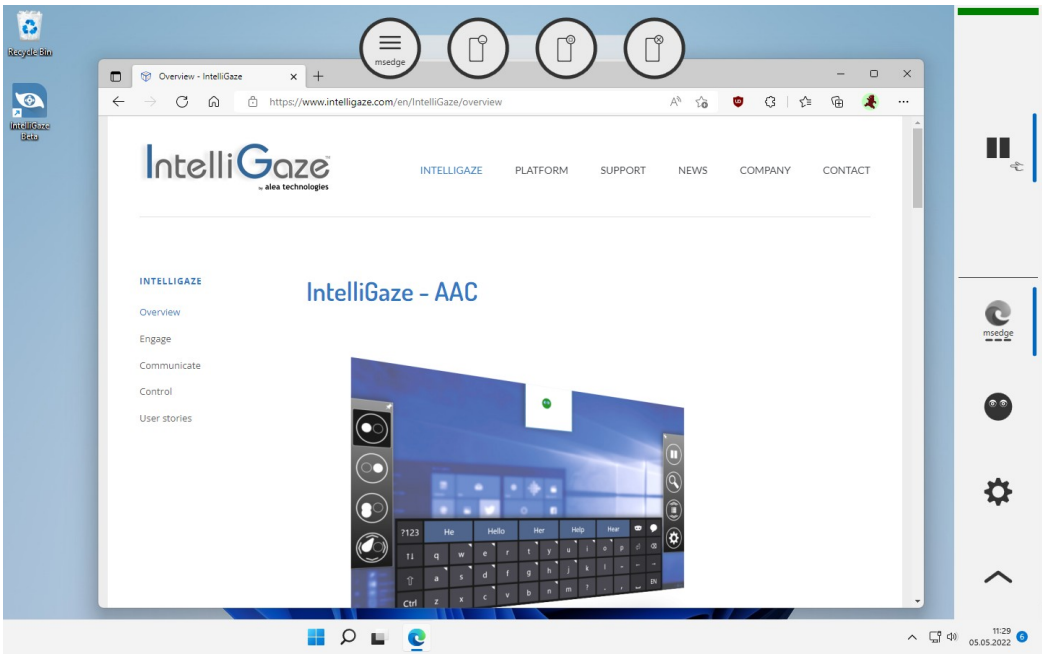
5.6 Operation Modes

IntelliGaze can be operated in three different modes. The modes determine the complexity of the tasks which can be performed with IntelliGaze. Additionally IntelliGaze adopts so that power users benefit from the availability of advanced options and a versatile user interface while inexperienced users and caretakers enjoy a simplified user interface and limited functionality.

The possible operation modes are determined by a switch in the options or by connecting IntelliGaze to a third party software

5.6.1. Full Access (default)

The Full Access offers the most flexibility for user which want to use any desktop application. The user interface offers control panels to interact with Windows apps as well as standard desktop applications such as Word, Firefox, Skype, Adobe Reader and many games. Applications are launched directly from the Windows start menu or desktop. IntelliGaze profiles will automatically adopt eye gaze controls to the active application.



5.6.2. Assisted Access

The assisted access is designed to work optimal in an environment where a users needs permanent assistance by a caretaker or teacher. Typical applications used in the context of the assisted access mode are “Look To Learn” or “Life Tools” or other learning software.
The IntelliGaze user interface is stripped down to the minimum set of functions to adjust user position, calibrate a user and click enable. When IntelliGaze is launched in Assisted Access gaze interaction is disabled until the caretaker un-pauses the device to give the caretaker time to start the learning software. A default calibration can be loaded with a single click to allow users gaze interaction even if they are not able to calibrate.

The Operation Bar in Assisted Access offers just an option for home, pause, click and hide bar. All functions can be accessed with keyboard shortcuts or touch. Escape will return to the previous dialog.

5.6.3. API Access

Several applications, mainly in the AAC area have been modified to access to gaze control functionality more directly providing a more seamless user experience. When such an application connects to Intelligaze, all desktop control functions are suspended. Among others are Grid3, MindExpress 5, OSC, DialoQ – Talk, Avaz AAC. User may switch between desktop control and the communication software.

5.7 Profiles

Application Profiles Profiles can provide a custom gaze control behavior on a per-application basis. Whenever a program is launched, IG automatically loads a matching application profile, if defined. The 6.3.4.Application Bar, providing custom, gaze accessible functions can be toggled by clicking on the profile [app name] button of the operation bar. A new profile can be created by clicking Settings on the App Bar. The location of the App Bar can toggled. The profile remains active even if the app bar is hidden until a new application is focused, shown on the Operation Bar. The list of application profiles can be managed through: Options > App Profiles
IntelliGaze comes with a set of pre-defined profiles.
Users may create their individual profiles using the setup button in the app bar.

5.8 General Use --> see Quickstart Guide

PDF version of the Quickstart Guide is installed with IntelliGaze or can be downloaded at www.intelligaze.com

6 IntelliGaze™ Reference

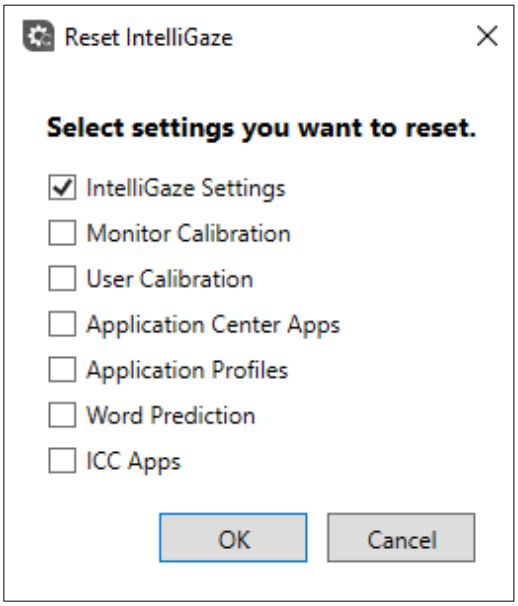
6.1 Overview

The IntelliGaze™ software package consists of several modules:

1) IntelliGaze™ — Main Application
2) Gaze Assistant — Application to evaluate user and system performance.
3) Tools — Reset IntelliGaze to factory defaults, configure environ mental control devices
4) Service — Tool to generate a service package and a Service Case with Ticket Number which will be automatically send to alea technologies

All IntelliGaze settings can be reset to installation state using the tool `ResetIntelliGaze.exe` which is located in the installation folder of IntelliGaze.

Personal data such as sentence history or cached website credentials in ICC apps can be erased if a device is given to another user.



6.2 System Hotkeys

The hotkeys can be disabled in the options. 6.5.8.Help

Hotkey (default)	Function	Comment
Ctrl- F5	Start Calibration	ESC will cancel
SPACE	Accept point during calibration	will trigger the overwrite mode during a binocular calibration
PAUSE	Dis-/Enable Cursor Control	Toggles Gaze<>Mouse
Ctrl- F1	Show Home Menu	
Ctrl- F11	Show Options	
Ctrl- D	Starts desktop screen video recording	The status monitor shows a record icon in the upper left corner File location: /My Documents/alea_technologies_gmbh/IntelliGaze
Ctrl- L	Load calibration profiles	
Ctrl- K	Save calibration profiles	
Ctrl - ⇩	Bring up the OSK	
Ctrl- Q	Quit IntelliGaze	

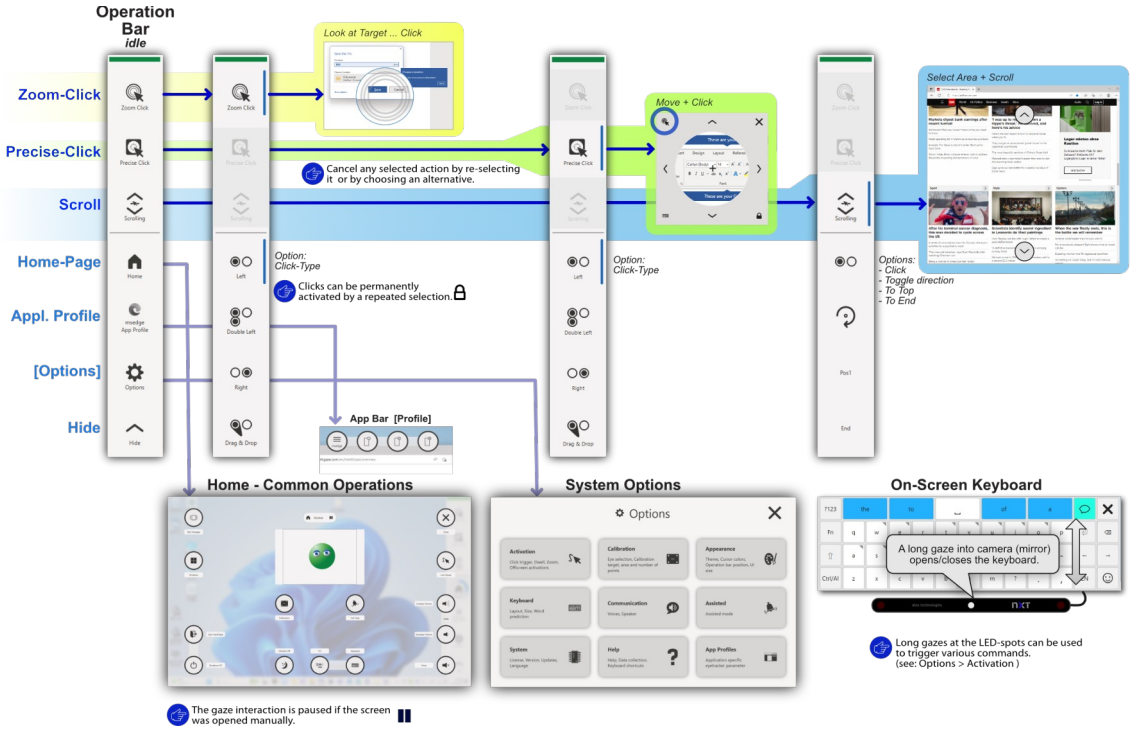
Service and Administration Hotkeys (not for client use)

Hotkey	Function	Comment
Ctrl- I	Snap Image to file	no feedback. Image is encrypted. File location: /My Documents/alea_technologies_gmbh/IntelliGaze/
Ctrl- R	Record Eye Video	The status monitor shows a record icon in the upper right corner. Video is encrypted. File location: /My Documents/alea_technologies_gmbh/IntelliGaze/
Ctrl-F10	Show eye image in status monitor	Visual feedback for reflections on glasses.

You can open a list with all available shortcuts in IntelliGaze Options/Help

6.3 Desktop Control

With the IntelliGaze desktop control the user can efficiently control the applications or Window Store Apps. IntelliGaze will automatically detect the environment and will switch the user interface to an appropriate style. Additionally IntelliGaze application profiles will make sure that the gaze interaction will automatically adopt to the needs of the active application.



By default no gaze interaction is active on the desktop unless an action such as perform click or scrolling is selected from the operation bar.

A live-mouse mode can be activated in the home menu or as a profile setting per application.

Caretakers may choose to pause the eye tracker by pressing the PAUSE key on the keyboard, pause the eye tracker in the live mouse mode or open the options with touch or keyboard

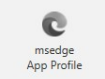
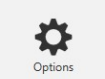
looking below the monitor in the camera mirror will open or close the integrated keyboard if not disable in an application profile.

The 6.3.1.Operation Bar can be put on the left or the right side of the screen. It is the main access point to eye gaze related controls, options and accessible windows functions. The operation bar can be hidden to utilize the full screen for some tasks such as video replay. There is an indicator which shows the status of the eye tracking. Green means the eyes are picked up and the user is in the right location. Red or no color require some attention to reposition the camera to a better suited location.

6.3.1. Operation Bar

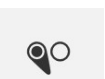
Special functions, mouse functions, scroll functions, app bar, options can be activated from operation bar.

Operation Bar - Default

	Perform a fast mouse click (left, right, drag n drop, double left)
	Open the precision clicker to perform pixel precise clicks (left, right, drag n drop, double left
	Open the scroll menu to vertically or horizontally scroll windows
	Open the home menu to access system commands such as task manager or calibrate eye gaze
	App profile, shows the currently active app. Clicking the icon will open/hide the app bar.
	Open the IntelliGaze options, if opened with touch, the eye tracker is paused in the options. This button can be customized. Either Options [default], ICC, Keyboard, Start Calibration or Live Mouse can be put on this spot.
	Hide the Operation Bar, release the reserved screen behind the bar.

Operation Bar - Mouse Click

Zoom Click and Precise Click will change the bottom 4 cells of the Operation Bar to select the mouse click action.

	Perform a left mouse click
	Perform a double left mouse click
	Perform a right mouse click
	Perform a drag and drop operation

Operation Bar - Scrolling

Scrolling will change the bottom 4 cells of the Operation to allow the user to select scroll options.

Perform a single mouse click without leaving the scroll mode. This is especially useful when reading web pages when users frequently switch between click and scroll

Toggle scroll mode between vertical and horizontal scrolling

Scroll to the beginning of the scroll element, if the page supports that operation

Scroll to the end of the scroll element, if the page supports that operation

6.3.2. Precise Clicker

The Precision Clicker serves as a tool for pixel-precise clicks or drags. Several options are provided while it is in operation. The actual click function can still be modified on the Operation Bar.

Perform the mouse click which is selected at the operation bar at the current location

Reposition the precise clicker

Close the precise click and cancel the operation

Lock the precise clicker, the tool remain open for repeated clicks

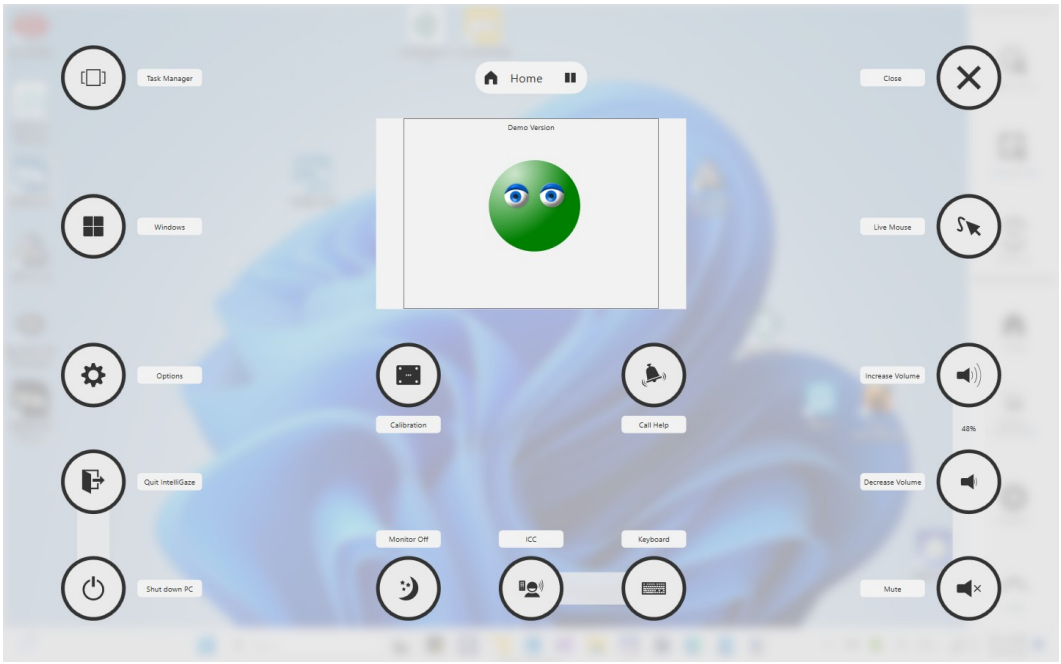
Extend the precise clicker to activate keyboard modifiers such as Ctrl, Alt or Shift

6.3.3. Home Menu

The home menu is the location where the user and the caretaker control the eye tracking parameters. The camera/monitor orientation is done with the status window. In cases, where tracking is hard to stabilize or environmental conditions are very challenging, go to the calibration page and enable the 'eye display'. After the camera is aligned the gaze is being calibrated. Calibration profiles can be loaded and saved on the calibration options page.

The home menu can be opened in two different ways. Press or look at the home menu button on the OP bar or press Ctrl-F1 on the keyboard.

When opening the home menu with touch no gaze input is available in the home menu



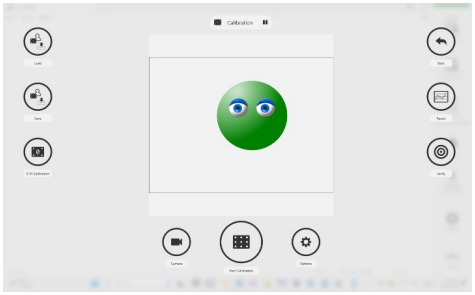
Home Menu

Button	Function	Comment
	Taskmanager	allows the user to quickly switch between active applications
	Windows Start Menu	Will exit the home menu and open the windows start menu
	Options	Open the IntelliGaze options
	Exit IntelliGaze	Close IntelliGaze, gaze interaction is not possible after exit
	Shutdown PC	Turns off the PC
	Calibrate	Calibrate eye gaze, load/save calibrations, verify accuracy
	Call Help	will activate a sound to call for assistance
	Monitor Off	Turns the monitor off, eye gaze remains active in the background. Fixate the camera to wake up the monitor. If this button is deactivated turn off connected standby on the tablet. 10.3.3.Monitor Sleep button is grayed
	ICC	Launch Integrated Communication & Control. A special license is required for full access.
	Keyboard	Opens the integrated keyboard with word prediction and quick communication
	Close	Close Home Menu
	Live Mouse	Toggle Live Mouse mode. In Live Mouse mode the Windows mouse cursor is directly controlled by gaze
	Increase Volume	System volume up by 10%
	Decrease Volume	System volume down by 10%
	Toggle Mute Volume	Turn Sound on/off

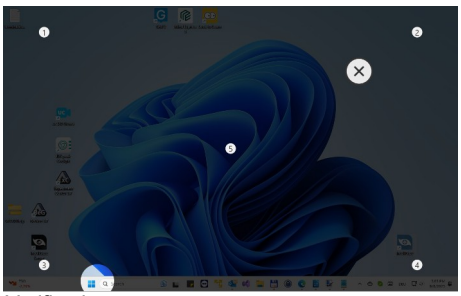
The call help can be very loud if the preference “maximize volume” is selected!

Calibration

The calibration page allows the user to calibrate the eye gaze.
After calibration the result can be verified with the build in verification tool.



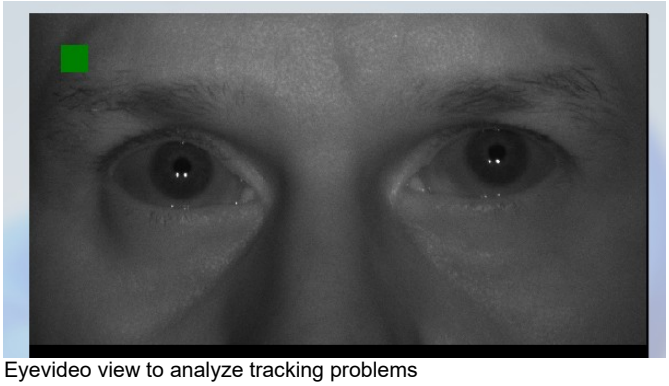
Calibration



Verification

Button	Function	Comment
	Start calibration	The user should follow the dot and keep the head still during the procedure.
	Perform a zero point calibration	If a user can't be calibrated you can load a zero point calibration which provides decent accuracy for most of the users
	Load calibration	Loads a previously saved calibration
	Save calibration	Save the current calibration
	Show last calibration result	Access the results per eye of the previous calibration
	Launch the accuracy verification	Caretakers may check the accuracy of the calibration
	Options	Quickly access the calibration options
	Toggle status windows	Switch to a camera view

switching status windows will toggle the view to a live video of the eyes. This video is especially useful to analyze problematic situations when working with glasses, contact lenses or other eye tracking relevant issues.



Eyevideo view to analyze tracking problems

If you experience tracking problems you may open the options/help and record a video which will be send to alea technologies for analysis any training of the eye gaze algorithms. Refer to 10.2.Tracking Problems for more information

6.3.4. Application Bar

The App Bar, providing custom, gaze accessible functions can be toggled by clicking on the profile [*app name*] button of the operation bar. The profile remains active even if the app bar is hidden until a new application is focused and shown on the Operation Bar.

Close the app

Maximize the app

Minimize the app

Open a menu of the app

Toggle the location of the app bar (top ↔ bottom)

Change the transparency of the app bar

Configure the profile of current app

The app bar can be extended with custom actions which can be configured on the profil settings of the current app

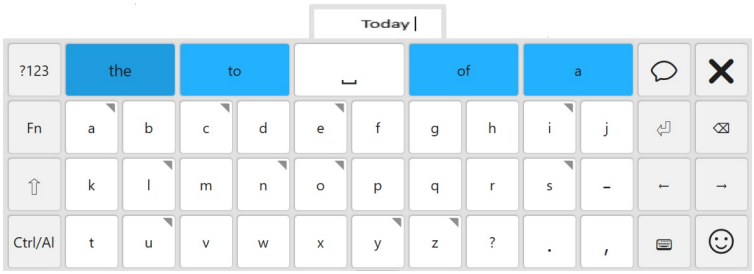
Profile configuration

For most profile options you can decide whether IntelliGaze should use the global setting or the one defined for the current profile. The current profile is active when the app receives the focus.

Function	Description
Cursor Smoothing	Choose if this application should use a fast or slower cursor for gaze interaction. Some real-time games are better controllable with a fast mouse cursor
Dwell Time	Choose a dwell time which is used in this app.
Off Screen Commands	Activate the off screen commands. There can't separate off screen commands per app.
Windows Menu	Decide if you want to have the minimize and maximize buttons in the app bar. If space is limited, remove these buttons and replace them with custom actions.
Dwell Feedback	Show a dwell feedback in this app. Some app have their own highlight if the cursor hovers over controls
Gaze Dot	Show the gaze dot where the user is looking
Hotkeys	You may define hotkeys here which extend the app bar with custom actions. Some applications such as a media player benefit from dedicated buttons for skip, play, pause. Check the keyboard shortcuts for the application.
Live Mouse Mode	Always switch to Live Mouse Mode if this application receives the focus. You may disable live mouse temporarily in the home menu, however, switching focus back and forth sets live mouse to this setting again
Hide Operation Bar	Always hide operation bar if this application receives the focus. You may show the operation bar temporarily, however, switch focus back and forth will set the operation bar status to this setting again

6.3.5. Integrated Keyboard

A click inside an edit box or a text field will automatically pop up a keyboard. It can also be opened or closed by a look into the mirror of camera.



Integrated keyboard with local text feedback, word prediction and emojis

Shown above is the integrated 'alea keyboard' in ABC layout. Buttons that are marked with a tiny triangle in the corner offer international variations of the letter when performing an immediate second fixation on the same button.

The preview area above the keyboard shows the content of the cursor even if the text field is hidden by the on screen keyboard. Its purpose is to provide quick feedback.

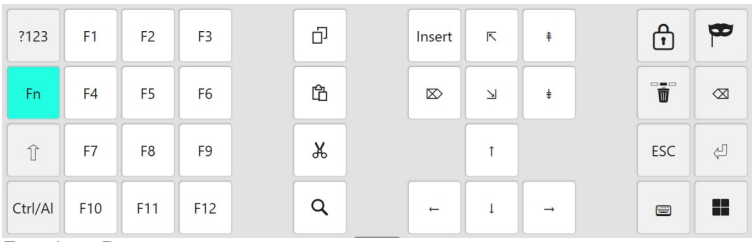
Several, language dependent keyboard layouts are available and can be enabled in IG preferences. If more than one has been enabled, the layout can be changed with the layout selection key on the keyboard. This will also automatically change the word prediction dictionary.

The keyboard can be used in 2 different sizes and a larger font can be selected for the key labels. Both options are accessible in the IntelliGaze Options. (Ctrl+F11)

Button	Function	Comment
the	Word prediction field, best prediction is on the left position.	The predictions can be disable in the preferences, i.e. for learning purposes.
	Open the quick communication	
?123	Opens the sub-page with numbers and special characters.	
Fn	Opens a sub-page with function keys	
	Switch the keyboard layout.	'IntelliGaze Preferences ' determine the available keyboard layouts.
	Switch to the emoji page	

6.3.6. Functions Page

The functions page contains the functions keys, the cursor keys and some special keys to lock the keyboard or delete words from the dictionary.

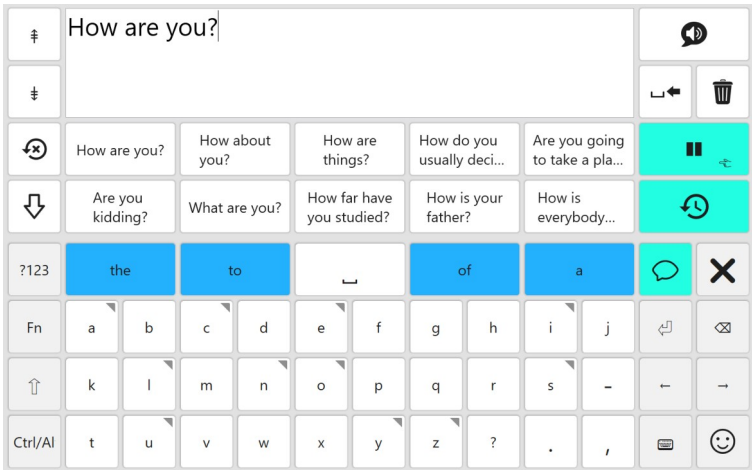


Functions Page

Button	Function	Comment
	Lock the keyboard open	The locked keyboard does not disappear when looking below the monitor.
	Delete word from the dictionary	Current predictions from the personal dictionary will be shown and can be deleted.
	Clipboard - Copy	
	Clipboard - Paste	Paste text into the Communication Page text box.
	Clipboard - Cut	

6.3.7. Communication Page

The communication page offers a quick way to talks a few words or sentences.



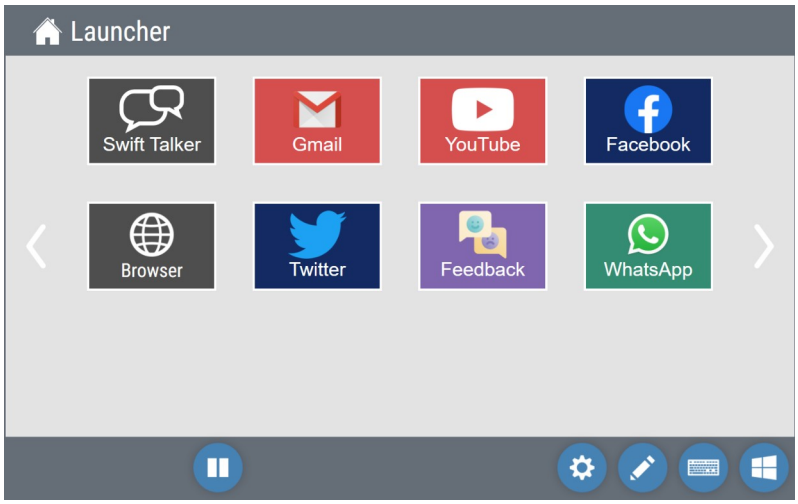
Communication page.

The Communication Page uses standard Windows voices, which are installed with the Windows language packs, or any other available SAPI5 voice.
An individual configuration is available in IntelliGaze preferences.

Button	Function	Comment
	Speaks the content of the text box.	Press the button a second time to stop the voice output.
	Delete last word.	
	Clear the whole text box.	
	Delete selected sentence from history	
	Scroll down sentences	
	Toggle between message banking and sentence history	
<M0>	Storage for up to 10 text blocks.	
	Load the content of a text memory [Mx] into the text box.	Text box content will be replaced!
	Save the content of the text box into a memory location [Mx].	Save an empty text box to delete memory content.

6.4 Communication & Control Extension

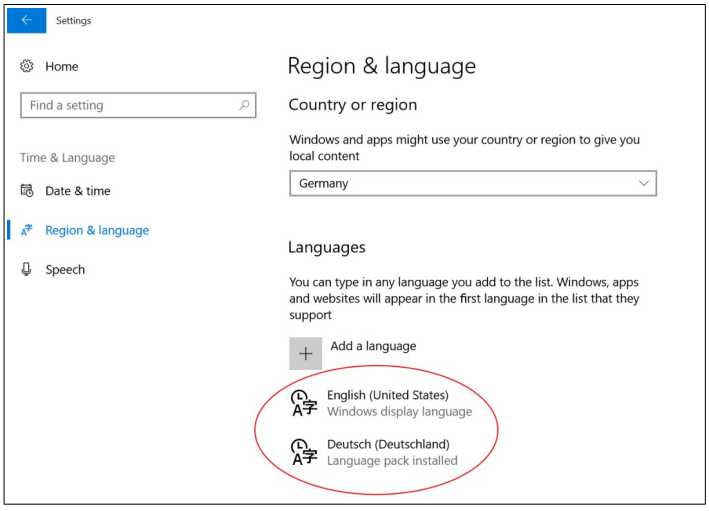
The IntelliGaze communication & control extension offers the possibility to create apps to communicate or to interact with web services such as WhatApp, Gmail, Youtube, Facebook, X / Twitter. Refer to the user manual ICC apps for further information.



6.4.1. ICC set-up

Voices

At least one language must be installed to use the voice output of ICC. Windows 10/11 comes a pre-installed voice as part of the default language pack. To operate ICC bi-lingual a secondary language pack must be installed.



You may install other SAPI5 voices such IVONA or NUANCE voices.

The installed voices have to be selected in the IntelliGaze preferences. If no choice is made IntelliGaze will use the default Windows voice as primary voice.
Voices for ICC are configured in the IntelliGaze/Options 6.5.5.Communication

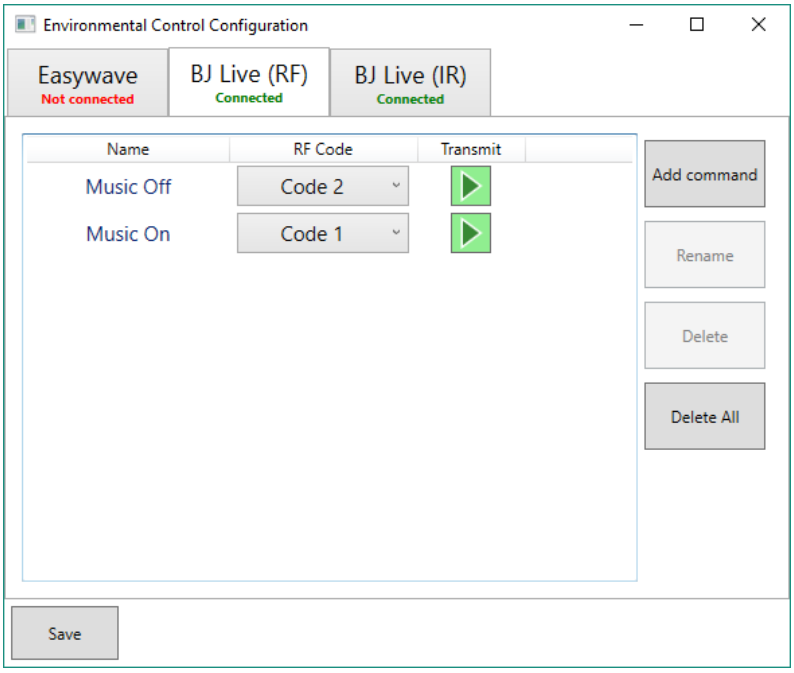
6.4.2. Environmental Control

The following Environmental Control system are supported by IntelliGaze. Refer to the manual of the manufacturer for installation instructions.

Manufacturer	Download	Comment
BJ Live **BJ-254 Control USB**	http://www.bjliveat.com/	radio and IR
ELDAT **Easywave RX09 USB**	http://www.eldat.de	radio
GEWA **Gewa Control Micro**	http://www.abilia.com	IR

Use the tool *EnvironmentalControlConfigurator.exe* which is located in the IntelliGaze folder to define radio transmission coded and to learn infrared remote control commands.

The tab indicates if the driver for the environmental control is properly installed and the device is connected to the PC.



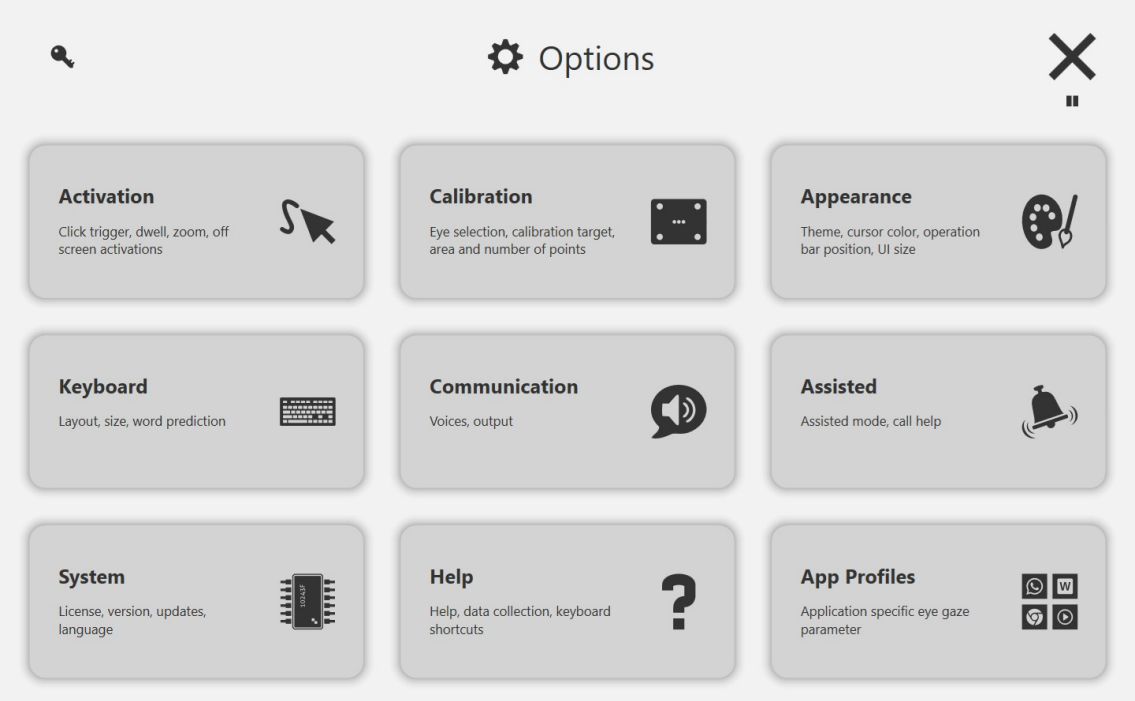
The installation depends on the hardware configuration. Radio based systems are usually using hardware switches to determine transmission codes. Assign the codes to a command and give it name. The name will be used in IntelliGaze to refer to the defined command. IR based systems learn the codes by pressing the appropriate button on the remote (TV, DVD, home stereo). IR command can be grouped to ease navigation in IntelliGaze.
All environmental commands are stored at this location

c:\Users\YOURNAME\AppData\Local\alea_technologies_gmbh\IntelliGaze\Communication
It's recommended to use the build in IntelliGaze Backup / Restore mechanisms to transfer environmental commands to another PC.
Refer to the chapter preferences communication to learn more about backup / restore of communication sets and environmental control commands.

6.5 IntelliGaze Options

The options menu can be changed with gaze, mouse or with touch. They can be accessed via the IntelliGaze tray icon or by pressing Ctrl-F11. Alternatively it can be accessed from the operation bar.

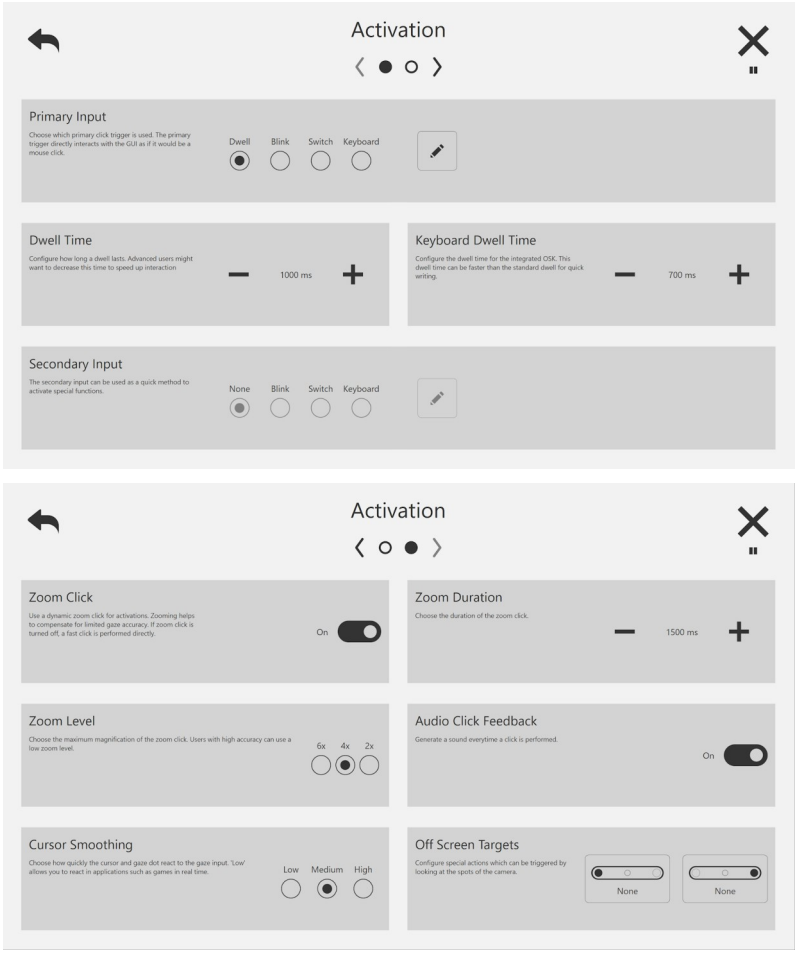
The options are grouped into 9 categories. Each category can be locked for user access by the carer using the lock function. The pause symbol in the upper right corner indicates that the options where open by the carer. All gaze access is disabled to allow unobtrusive usage by the carer.



- Activation — Click trigger, dwell and zoom parameter, cursor smoothing and off-screen commands
- Calibration — Calibration parameters
- Appearance — Theme the UI, operation bar customization
- Keyboard — Layout, word prediction, size
- Communication — Voices, volume, speaker selection
- Assisted — Assisted mode, call help
- System — License, version, upgrade, language, system health, glasses mode, sunlight mode
- Help — Online help, data collection, video recording tool

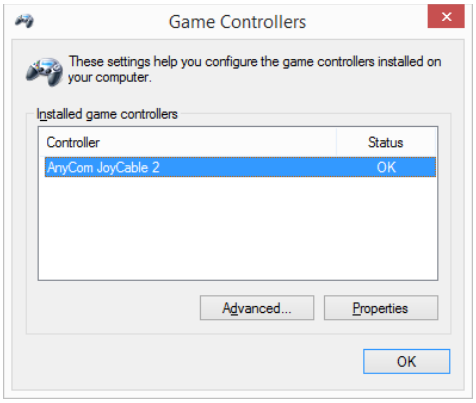
- App Profiles Overview of all configured application profiles

6.5.1. Activation



Primary Input

Clicks and other IntelliGaze actions can be triggered with dwell, blink, switches or keys. There are different channels for triggers which can be used. The primary trigger can be dwell, blink, switch or key. The secondary trigger can be blink, switch or key.
Some external switches generate physical key presses rather than Windows joystick button click events. Choose “key” as trigger input and define which key is to be used.
To check if your hardware can be used as switch (Windows USB joystick) run the following windows program. “setup USB game controllers”. You device should appear in the list if it supports Windows USB joystick. Windows USB joysticks are access as “switches” in the IntelliGaze Input options.



Input	Description	Parameter
Dwell	Use dwell as mouse click activation	Prevent unintended double clicks
Blink	Use eye blinks as mouse click activations	Blink duration
Switch	Use external buttons with a joy-cable to trigger mouse clicks	Input channel
Keyboard	IntelliGaze will raise events when the configured key is send. The key can be emulated with an external hardware.	Key to emulate the mouse activation

Make sure that a key trigger does not interfere with the application. It's recommended to use the function key F13-F24 if the hardware supports it.

Primary switches always act as “direct click” devices. Holding down the button on the switch will generate a mouse down event at the gaze location, allowing the user to perform a drag and drop action.

Dwell Time

Configure how long the user must fixate a target before the dwell click is done.

Keyboard Dwell Time

Configure how long the user must fixate a key on the onscreen-keyboard before the dwell click is done. This dwell time is usually shorter than the standard dwell time because users are very often familiar with the layout of the keyboard. Typing can be accelerated by choosing a shorter keyboard dwell time.

Zoom Click

When enabled a dynamic zoom is used for activation. When the accuracy is good enough user might want to turn this off.

Zoom Duration

The time in ms how long the zoom click lasts.

Zoom Level

A higher zoom level allows users to click tinier elements. User with a good accuracy generally choose a smaller zoom level.

Audio Click Feedback

An audio click feedback gives users a hint when the click is performed to know when it's save to look at the next target.

Cursor Smoothing

A temporal filter is applied on gaze data to either smooth the gaze cursor (Low) or speed reaction times up (High).

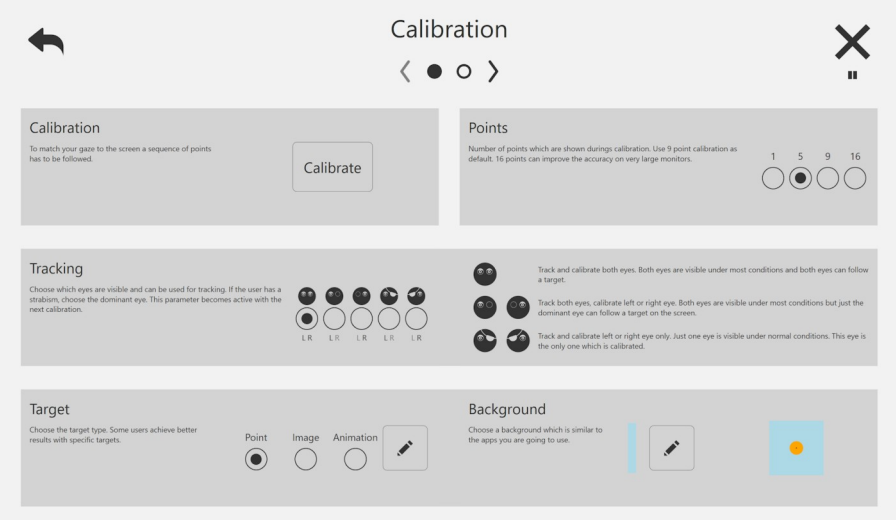
Off Screen Targets

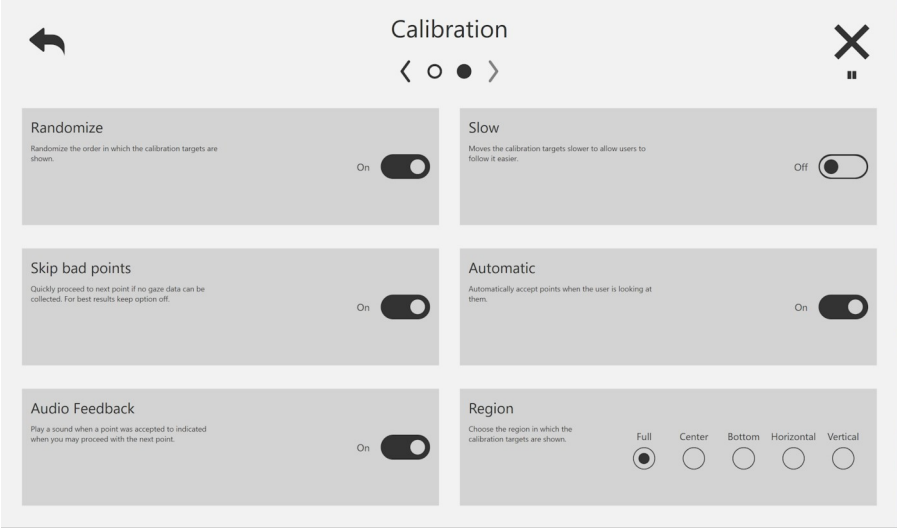
Put frequently used actions on the left and right spot of the camera to quickly access these actions by looking at these spots.
The central location (silver mirror) is always reserved for the onscreen keyboard.

6.5.2. Calibration

During the calibration, the IntelliGaze™ system calibrates the internal calculations to the individual parameters of a subject's eye.
A calibration requires the subject to fixate a number of targets on the screen. Typically the system will automatically detect the correct fixation and interactively cycle through the point sequence. The parameters for this process can be configured as described below.
After the calibration, the system will provide an intuitive feed-back about the quality of the calibration.
Once a calibration has been completed successfully, it will be automatically saved and re-used, until another calibration has been completed. This works even over restarts of the system.

In order to achieve and maintain the highest accuracy, we recommend calibrating the user after system changes or longer periods of time. Very large changes in ambient illumination might also be compensated by a new calibration run.





Calibration Parameter	Values, <u>defaults</u>	Description
# of points	1, 5, <u>9</u>, 16	Number of points in calibration sequence. A higher number can increase the accuracy. The 16 points calibration is optimized for highest accuracy. Head movement range is limited with 16 point calibration. This method is designed for ALS users who want to control the Windows desktop.
Tracking	<u>both-both</u>, both-left, both-right, left-left, right-right	Choose which eyes are visible and can be used for tracking. This parameter becomes active with the next calibration.
Target	<u>point</u>, image, animation	Choose the target which will be used for the calibration. Children are often more attracted by an image or the animation.
Background	n/a	Color for the calibration screen *Please pick the calibration background colors close to the future operation scenario, in order to avoid gaze calculation artifacts through large pupil dilation changes, i.e. calibrate on dark background, when the operation environment will be dark.*
Randomize	Y / <u>N</u>	Changes the point sequence randomly to avoid prediction artifacts.
Audio Feedback	<u>Y</u> / N	Sound feedback with point acceptance.
Slow	Y/ <u>N</u>	Slows down the automatic calibration process.
Automatic	<u>Y</u> / N	Cycles through the point sequence automatically, checking proper fixation on each point. When turned off, the operator has to accept each point manually. *ESC will cancel the calibration sequence at any time.*
Skip bad points	Y/ <u>N</u>	After a while a non-fixated point will be ignored and the sequence

Calibration Parameter	Values, defaults	Description
		will continue. When turned off, the system will wait indefinitely for a proper fixation.
Region	Bottom, Center, Full, Horizontal, Vertical	Very large screens or visually impaired subjects might require on calibration only a part of the screen. *In most cases, the 1-point calibration on 'full-screen' will yield similar results to a reduced calibration are .* *Horizontal and Vertical options are only available with 5-point calibration.*

Tolerant Calibration

When calibrating both eyes the systems stalls at each point until data from both eyes is available. This ensures the maximum data quality sacrificing tolerance to unstable data. Some users can not be calibrated because there will be points where at least one eye is not visible or unstable.
Waiting at that calibration point for some time will relieve the acceptance criteria. The system calibrates the point with whatever data is available at this point.

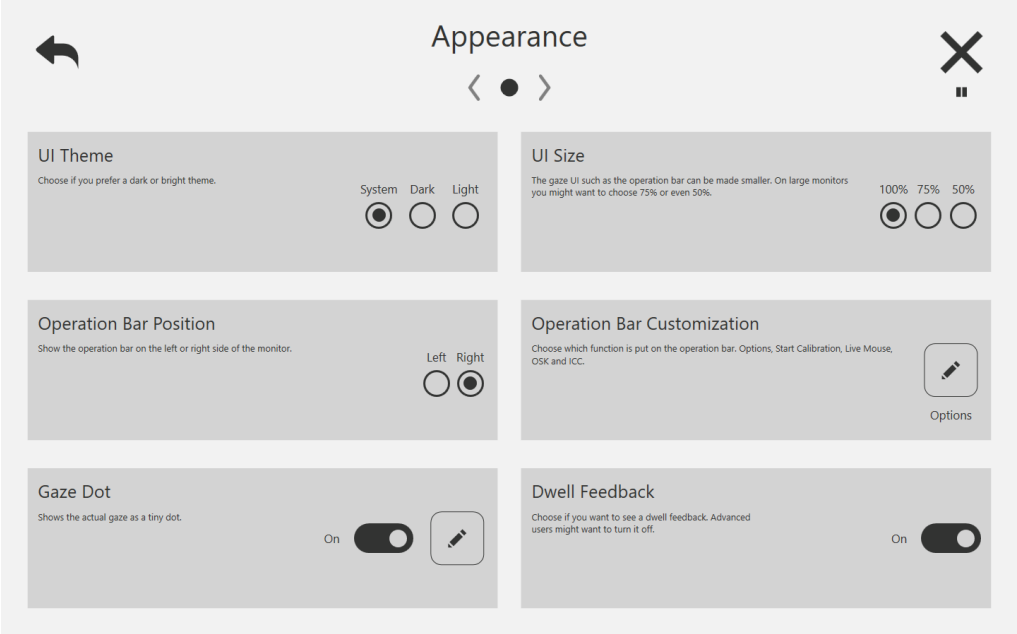
The calibration overwrite routine can also be used for user with problematic glasses. Pressing the space bar will force the system to accept data which would be rejected under normal calibration.

Calibration Profiles

A calibration can be saved for later usage. This is especially useful when working with several users on a system and the calibration is difficult to achieve. Using Load and Save Calibration you can very easily switch between calibrations. Beside the individual calibration data, the profile contains all settings of the calibration procedure.
Use the IntelliGaze Home/Calibration menu to access this function:

The calibration profiles are shared with the Gaze Assistant tool, where several management functions are provided.

6.5.3. Appearance



UI Theme

Choose of the theme of the IntelliGaze should be themed bright or dark.

UI Size

On larger monitors you may choose to make the UI of IntelliGaze smaller. 12” tablets should never scale the UI down because the buttons will likely be too small for safe gaze access

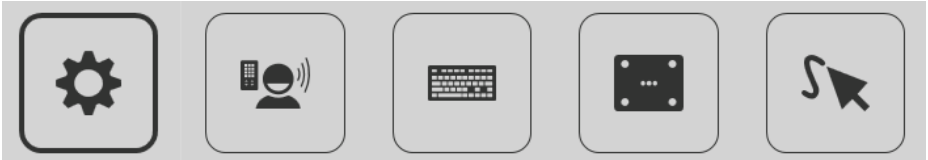
Operation Bar Position

The operation bar can be positioned on the left or the right side of the monitor.

The operation bar reserves space on the GUI. Windowed applications will not be shown behind the operation bar when maximized.

Operation Bar Customization

The function of the option button can be changed to put the most frequently used function on a prominent position in the operation bar. It can be either of the following functions.



Dwell Feedback

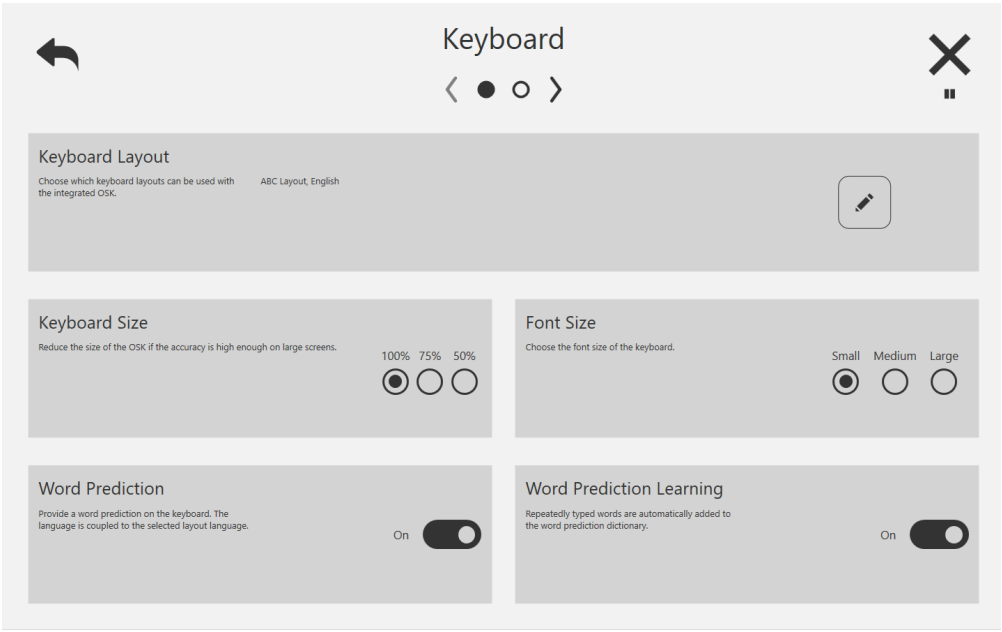
Hide the dwell feedback cursor. Advanced users often don’t need or want permanent dwell feedback.

Gaze Dot

Show the actual gaze as a tiny dot. Some users can use this dot to correct inaccuracies and overshoot with the actual gaze.

6.5.4. Integrated Keyboard

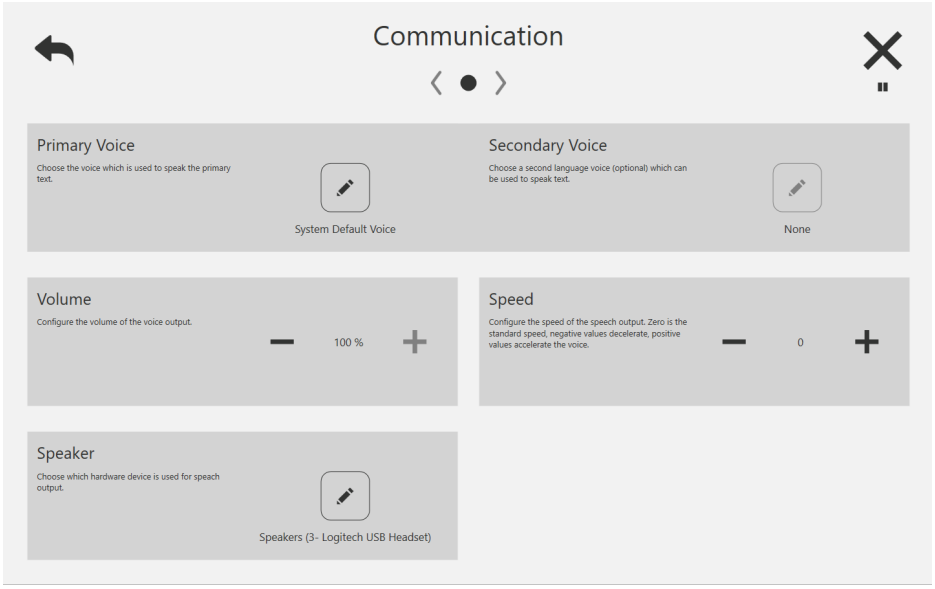
The IntelliGaze desktop control comes with an integrated keyboard. The keyboard layout can be selected on this page. Multiple layouts can be unlocked at the same time. They are switched at run time by the user. The keyboard does have a word prediction and a word correction.



Parameter	Description
Layout	All layout which are ticked here can be switched when the keyboard is open
Use large font size	Letters on the keyboard are displayed large
Keyboard Size	Choose if the keyboard spans over 100%, 75% or 50% width of the display
Use Word Prediction	Enables the integrated word prediction
Word Prediction Learning	When enabled the word prediction will add frequently used words and phrases to the dictionary
ABC Layout Word Prediction	Since the ABC keyboard layout doesn't have a language preference you need to choose which language is to be predicted for the ABC layout

6.5.5. Communication

The integrated alea keyboard can open a quick communication. The home menu can open the ICC (Integrated Communication & Control). The communication page allows user to quickly say short sentences using the speaker of the computer. IntelliGaze uses the Windows system default voice for speech output.
A camera with the icc extension offers desktop users a possibility talk using predefined communication pages. Additionally environmental control can be achieved using IR or radio environmental control systems. Refer to chapter Communication & Control to learn more about this extension.



Parameter	Description
Primary Voice	Choose a voice for speech output. To choose a different language you need to install a new Windows language.
Volume	The volume of the voice
Speed	Configures the speed of the voice
Speaker	Choose which output device will be used for speaking

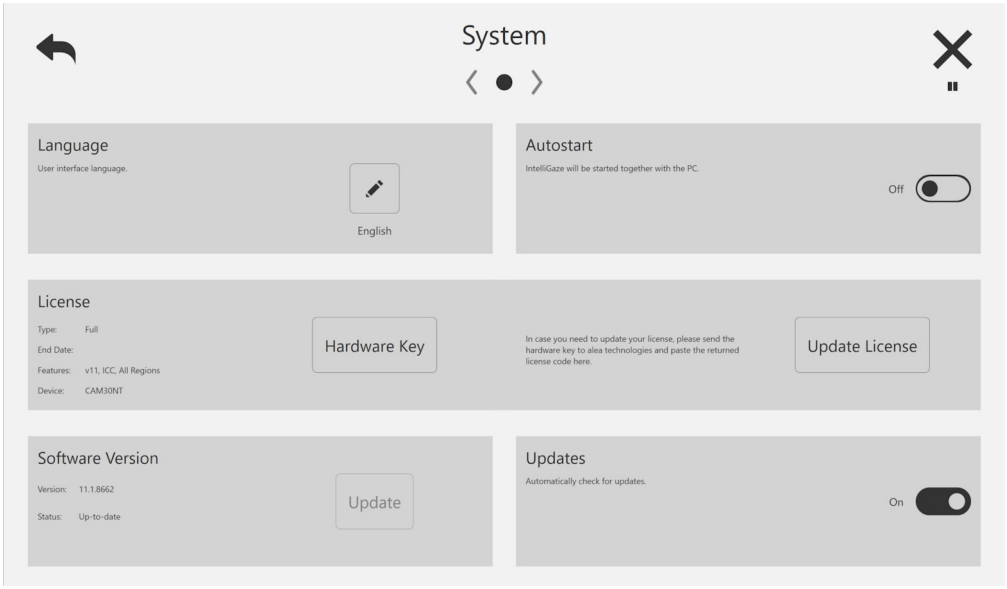
6.5.6. Assisted

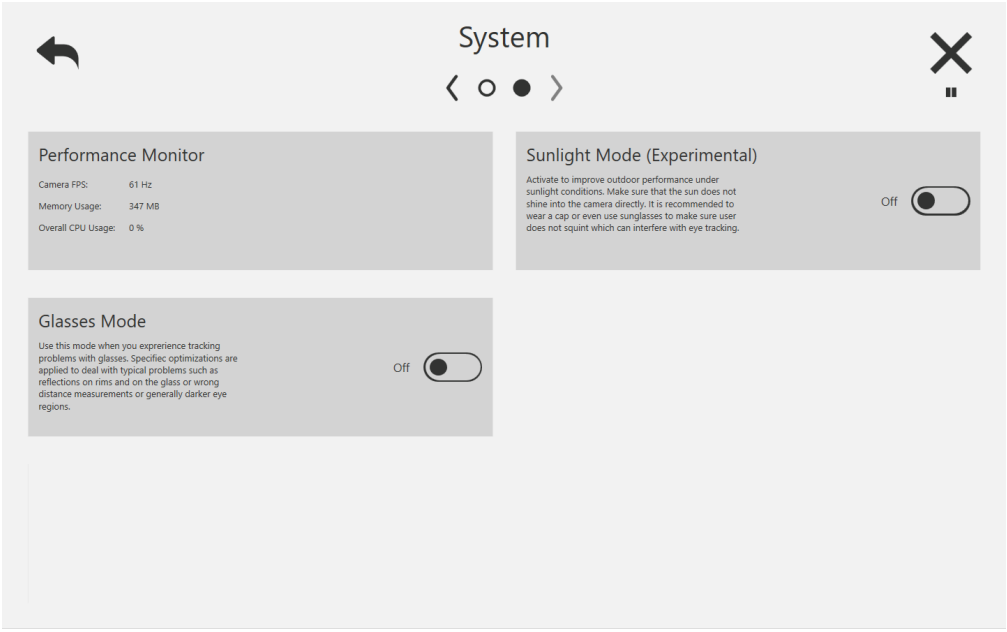
IntelliGaze can be configured to support the specialized operation mode – Assisted Access. Refer to chapter 5.6.Operation Modes.
The call help options defines which actions are performed if the user clicks the help button in the home menu. 

Call Help	Effect
Default Sound	A standard sound is played at maximum system volume
Custom Sound	A sound file must be chosen which is played at maximum system volume
Execute File	A batch file must chosen which may trigger any additional actions such as sending a text message or trigger an environmental control command.

Call Automatically	Parameter
Enable	If enabled IntelliGaze will trigger the call help function automatically if the device isactive for N min. This function is useful to assist the user if a good tracking position is lost without being noticed by the caretaker.
Min	Number of minutes before the alarm is triggered

6.5.7. System





Language

The user interface language of IntelliGaze can be adapted by choosing an entry from the list.

Auto-start

IntelliGaze can be automatically started with Windows. If a third party application is auto started you don't need to auto start IntelliGaze because the third party application will launch IntelliGaze.

License

The IntelliGaze licensing scheme is handled by the camera module's hardware. The license key is stored in the camera module. This allows the user to install and run the software on several computers. Wherever the camera will be connected, the licensed functionality will be available.

> *The IntelliGaze™ software will only start properly if the camera has been connected.*

The actual licensing is done during the production process according to the customer order.
The license might also restrict the use to particular client software or only grant access to particular features.
The status of the system license can be checked under: → Options → System

Feature	Description
Full	Allows desktop control using the Desktop 2 automation
End Date	License will degrade to a trial license of the date expired
Demo	All functions are available, camera is only to be used for demo purposes.
Professional	Device is licensed for professional applications that access raw data just like head speed, binocular gaze and eyeball position
Region A	Device supports only North American languages (English, French, Spanish)
ICC	IntelliGaze Communicate & Control Extension

If you are running the system on a temporal license, a warning will be issued, a few days before it will terminate.

The license can be programmed on-site without extra tools:

- The Hardware Key will have to be transferred to alea technologies.
- alea technologies will issue a new license key and re-transfer it.
- This license key needs to be programmed into the device, an option that will be offered by IntelliGaze™, when the camera is connected and no license is found. Alternatively the current license can be overwritten with the *Update License* command link on this page
- The 'Device' parameter informs the user about which device is licensed. i.e. on a Grid

Software Version & Online Update

This entry shows the currently installed software version and can optionally provide information about available online updates.
Please refer to chapter 7 'IntelliGaze Software Update' for details.

Performance Monitor

Camera FPS should match the nominal value of the camera. Slight variations are acceptable. Cam30NT will drop in frame rate if no eyes are detected. Cam30NXT provides approximately 60Hz under normal conditions.

> *Windows computer can be performance degraded temporarily if excessive background tasks such as updates, indexing or third party apps are in operation. Wait until the background tasks are finished to access proper working of IntelliGaze*

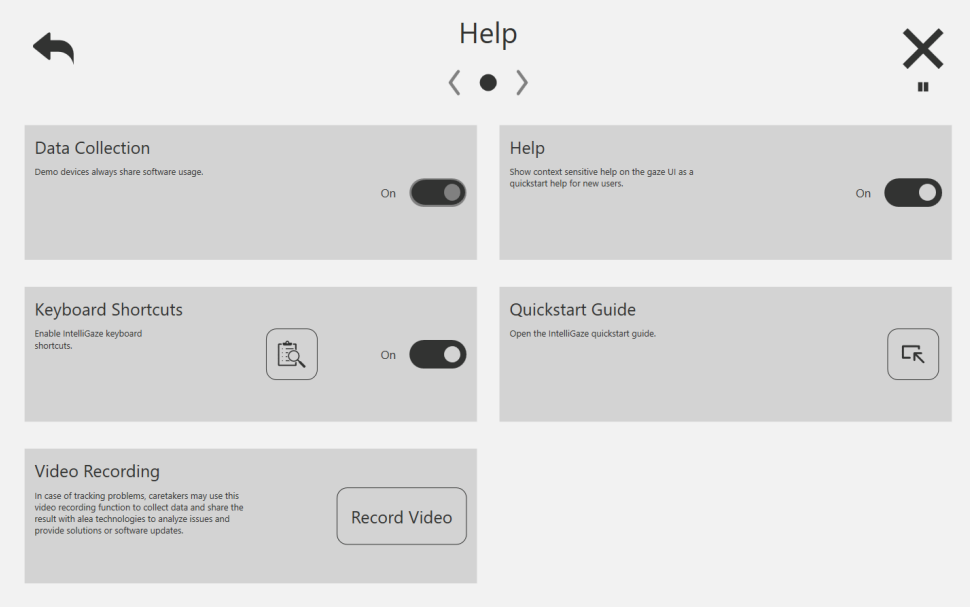
Sunlight Mode

This experimental features increases sunlight compatibility even further. If operating IntelliGaze under very bright conditions this feature can improve tracking. This mode should be enabled if IntelliGaze is used outdoors and indoors. If IntelliGaze is exclusively used indoors this mode should be disabled.

Glasses Mode

This options optimizes eye tracker performance for some special cases using glasses. Enable this mode if you experience trouble with glasses. The mode will also be active when a third party application such as Grid is being active.

6.5.8. Help



Data Collection

When enabled IntelliGaze will collect crashes and anonymous usage data of the software and send it to alea technologies. This data helps alea technologies to resolve common issues.

Help

Show context sensitive help on the gaze UI as a quick-start help for new users

Keyboard shortcuts

Turn keyboard shortcuts on/off for IntelliGaze. Show an overview of all available shortcuts

Quickstart Guide

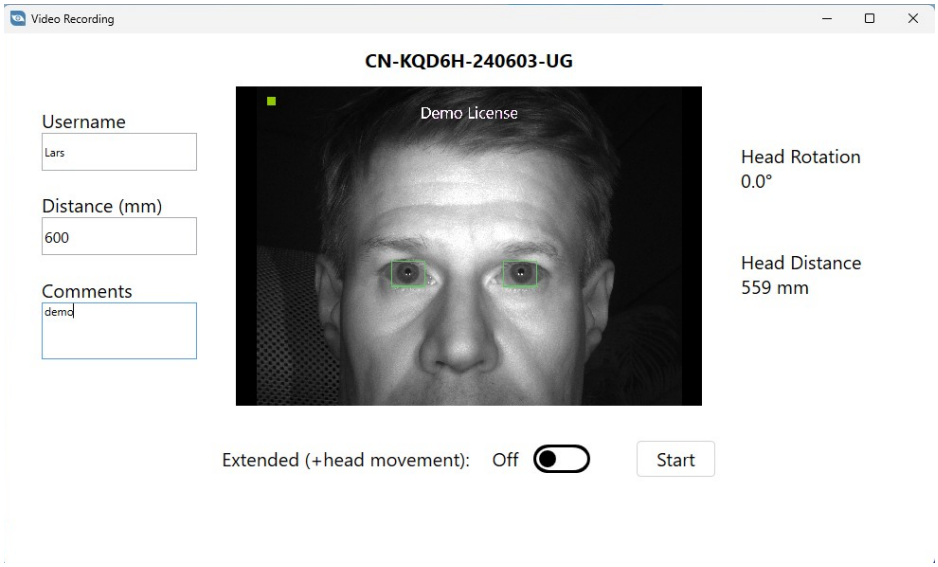
Open the quickstart guide of IntelliGaze.

Video Recording

When you experience problems with the tracking (stability, accuracy) you may use this tool to generate a service case which records eye data of the user which can be send to alea technologies to analyze and fix issues which can result in software updates which improve tracking performance.

Position the user at 70cm in front of the display. Follow the general rule, ‘head aligned with the monitor’ and ‘face parallel to the display’. 5.2.Environment

Option	Description
Username	Optional
Distance	Enter the distance at which the user is located, the eye tracker can determine the distance automatically use the ‘Head Distance’ value which is shown on the right side.
Comments	Describe the environment and users condition. i.e. sunlight, eye drops, contact lenses, strabism, wheelchair
Extended	If enabled a second video sequence is recorded where the user is supposed to move the head. (if able to)

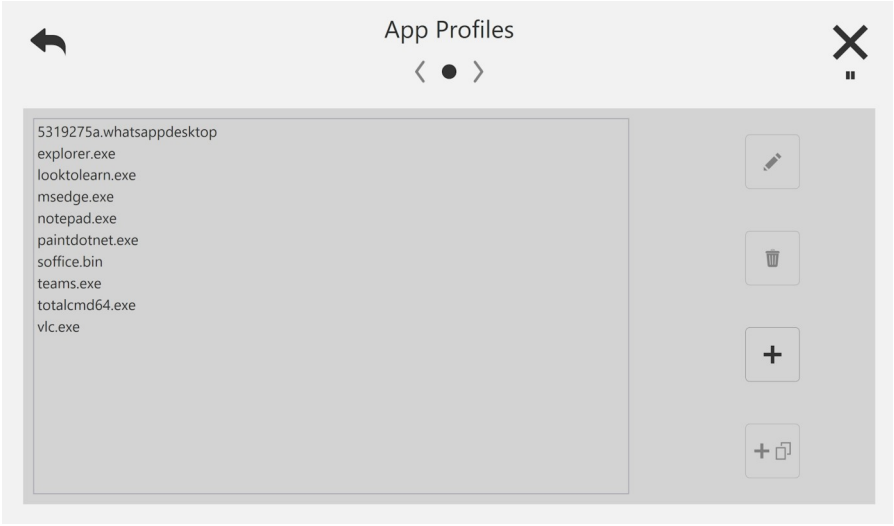


Start the procedure. A dot will move across the screen in a short sequence and the user is requested to look at the dot. When the recording is done a data packages is put on the windows desktop. Please upload this package to WeTransfer and send the download link to *support@alea-technologies.de*

> The data provided is not saved any longer than required to process the service case. If you want to delete the provided data send an email to *support@alea-technologies.de* and provide the Case Number of the case which is to be deleted.

6.5.9. App Profiles

Overview of all profiles in use on this pc. You may delete or edit the profiles.



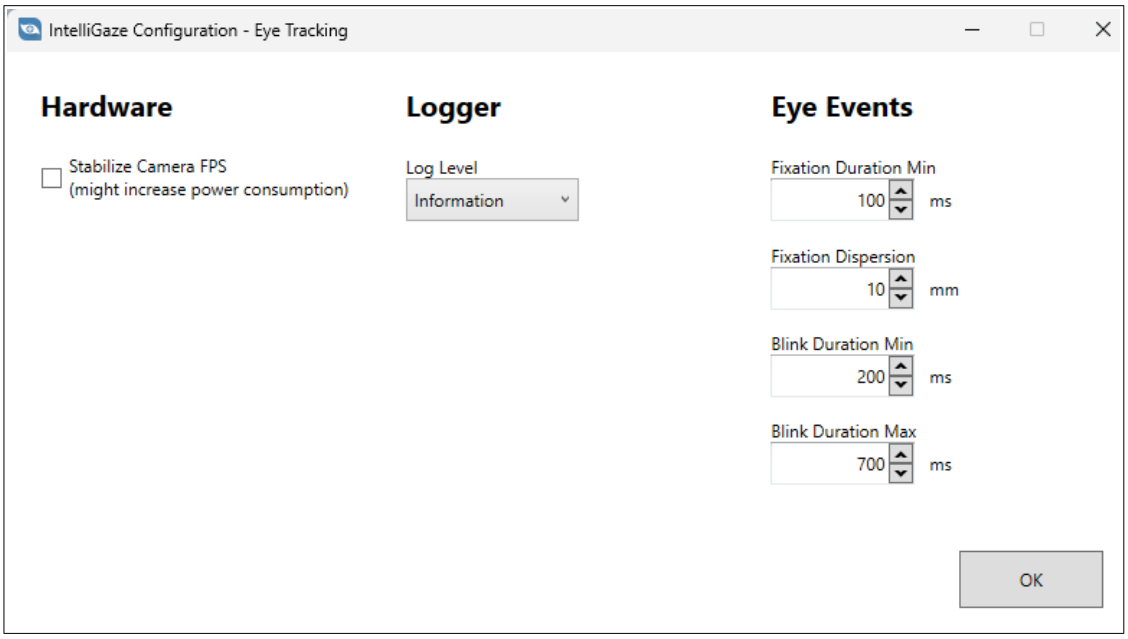
Alternatively you may access profile settings of a specific application in the 6.3.4.Application Bar

6.6 IntelliGaze Configuration

System integrators may access in-depth parameters using the IntelliGaze Configuration. Lauch the configuration from

c:\Program Files (x86)\alea technologies\IntelliGaze\tools\IntelliGazeConfig.lnk

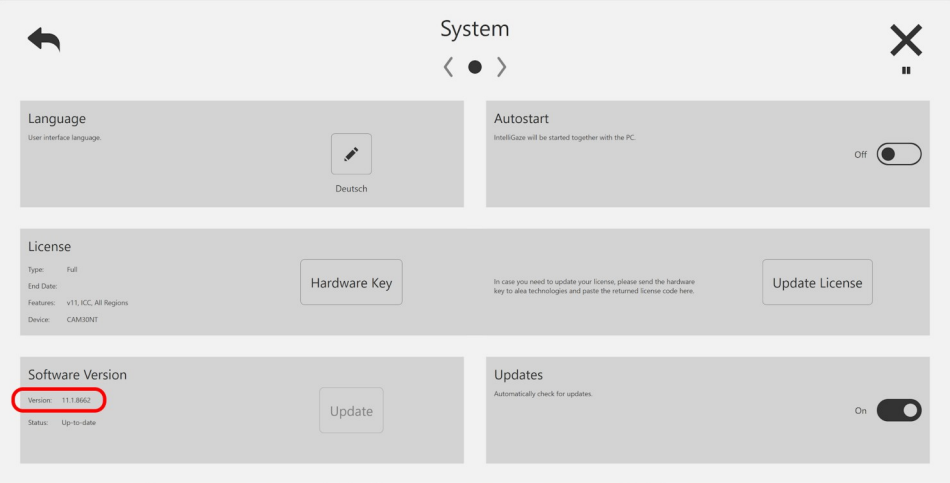
> ⚠ **contact alea technolgies before changing IntelliGaze configuration. Some settings can degrade system performance if not used correctly.**



Option	Description
Stabilize camera FPS	Some platforms have unique power saving functions which can degrade camera FPS. If the camera check fails, enabling this option will stabilize FPS.
Log Level	Set the details of the IntelliGaze logging. Default is “Iinformation”
Fixation Duration	Set the duration of a fixation used by IntelliGaze event detection
Fixation Dispersion	Define the dispersion of a fixation. When dealing with users which have a nystagmus you might want to increase this value
Blink Duration Min	Configure the blink duration min for the IntelliGaze event detection
Blink Duration Max	Configure the blink duration max for the IntelliGaze event detection

7 IntelliGaze Software Update

You can check the version of IntelliGaze™ under Options → System



7.1 Web-Download

The latest IntelliGaze can be downloaded from the following URL. The download contains all software drivers and prerequisites.

http://download.intelligaze.com

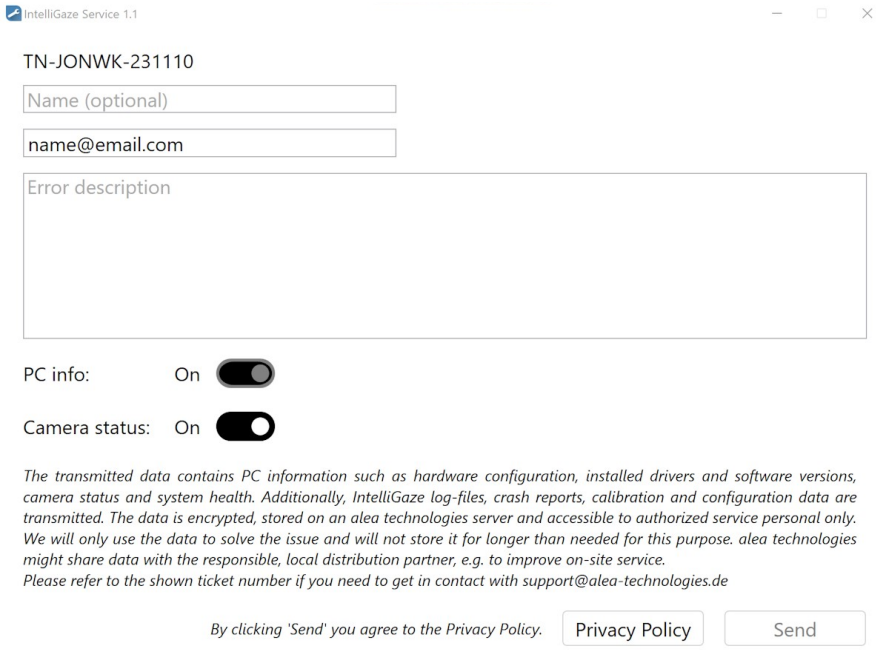
7.2 Online-Update

IntelliGaze from v.1.2 onward additionally provides an online update function. Software version below 11 will not be updated to version 11 with the online update. Manually update versions below 11.
Options → System: “Update”
open the update dialog and provide you with the Release Notes of the new version. This link is only available when a new update is available.
Please read the Release Notes of the new version to find out whether an update is advisable.
Clicking “Download and install” will then execute the update automatically. The execution of the online update does require Windows administrator rights!

The check for online updates can be suppressed with the option “automatically check for updates

8 Service Tool

In case you need any assistance with a potential malfunction close IntelliGaze and start the IntelliGaze Service. The service tool is in the Windows *start menu / alea technologies / Service* Describe the error, add a contact email and send the service request to alea technologies. A ticket number is generated which should be refereed to if any further communication is needed. The service request will be send to alea technologies if the PC is connected to the internet.
Please refer to chapter 10.1.Hardware Problems for details.



Please note the Ticket Number and refer to it when contacting alea technologies support with regard to the service case. If a valid email is provided the ticket number is automatically send.

The data provided is not saved any longer than required to process the service case. If you want to delete the provided data send an email to *support-@alea-technologies.de* and provide the Ticket Number of the service case which is to be deleted.

Option	Description
Name	Optional
Contact mail	email to which the confirmation and Ticket Number is send under which the case is filed
Error description	Describe the context in which the error occurs, provide as much details as possible to reproduce the error
PC Info	General PC information about hardware, drivers, event logs are collected and filed with the service case
Camera status	Performs a camera health check and files the data with the service case

9 Gaze Assistant

9.1 General

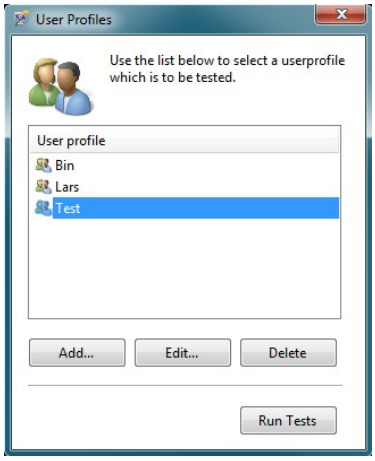
The Gaze Assistant is wizard-like tool to measure and protocol the gaze interaction capabilities of a user. It also helps the caretaker to set up the system. It splits up the setup process into small well defined steps that help to identify problems early.
The Gaze Assistant does not require an a user specific gaze calibration..

9.2 Usage

9.2.1. User Profile Selection

Create a user profile for a user. You can have several profiles per user if you want to switch between tests for different glasses in example.

The user profiles are shared with the IntelliGaze calibration profiles. Each user calibration created with the gaze assistant is also available in IntelliGaze under "Calibration Profile/Load"

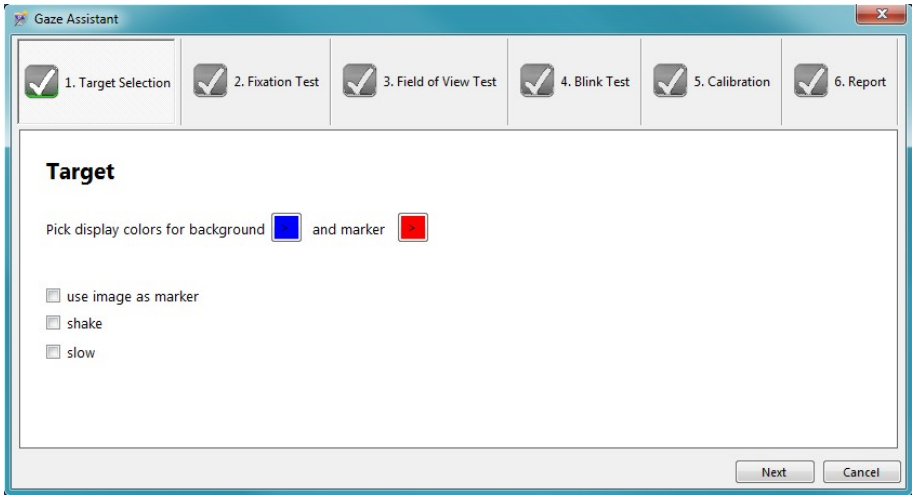


Group	Description
Add	Creates a new user profile. All settings and results are saved per user.
Delete	Deletes the highlighted profile
Run Tests	Performs the test for the highlighted user

9.2.2. Target Selection

In this step of the wizard you can define a gaze target for the user. This target will be used later in the test as well as in the calibration.

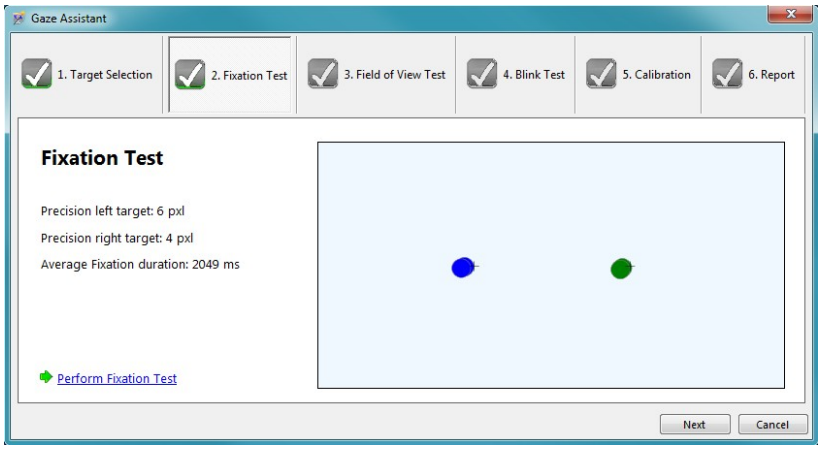
The target selection is a fundamental part of the set up process. A target / contrast / image that can only be poorly seen by the user will result in a poor performance. When working with children it's recommended to use a picture to draw their attention to the gaze target.



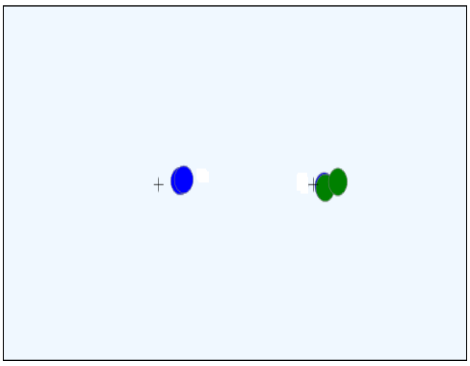
Target Selection	Default Value	Description
Colors Bgnd / Target	Blue / Red	Defines the color the background and the target during the following tests. The contrast should be high
Use image as marker	off	Use an image instead of a point as gaze target
Shake	off	Shakes the target whenever it's moved to a new position to draw the users attention
Slow	Off	Moves the target much slower to help users with a weak cognition to follow the target

9.2.3. Fixation Test

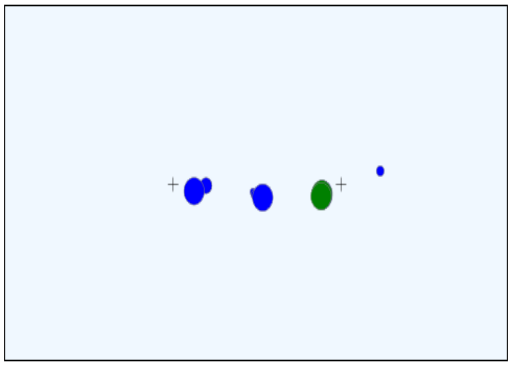
The fixation test evaluates the previous target selection if the user is capable and or willing to look at the target. This tests confirms that there is some kind of reaction of the users to the target. It can reveal brain neglects as well as visual impairments.
The test will switch the gaze target between two spots on the monitor and repeat this three times. It will measure if the eyes meaningfully respond to this stimulus change.



Fixation Test	Parameter	Description
Precision	OUTPUT: Left / Right	A low value < 100 px indicates that the user did react to the left or right stimulus.
Average fixation	OUTPUT: ms	How long was the user able to fixate the targets. This value a also an early indicator how long the maximum dwell time should be
Perform Fixation Test		Starts the test.



Good – clear reaction on both spots



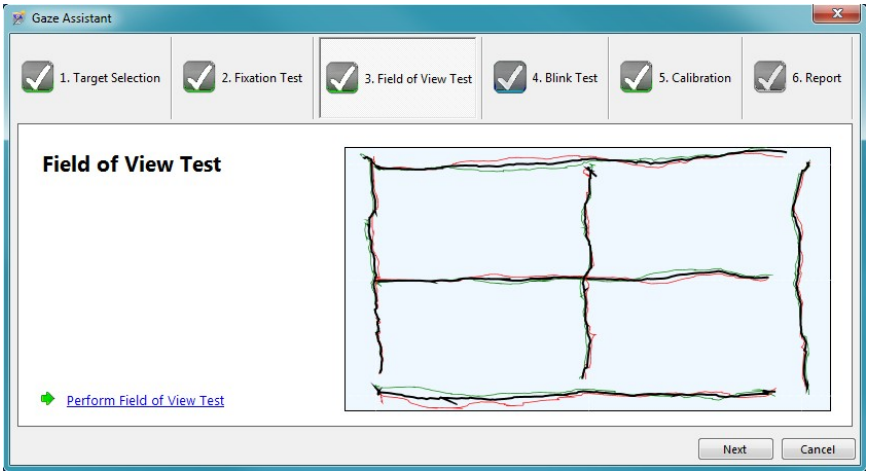
Bad – arbitrary reaction on the left spot

Gaze-Ass. Hotkey	Function	Comment
Enter	Starts the test	
Escape	Interrupts the test	

If the Fixation Test fails its recommended to go back to the target selection page, choose a different target and repeat the fixation test to check if this helps the user to react to the target better.

9.2.4. Field of View Test

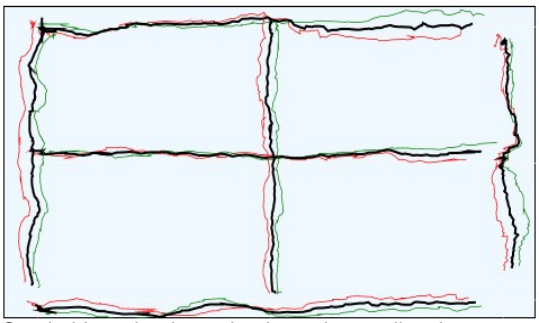
The Field of View Tests evaluates if the users is able to react to the gaze target on every critical position of the screen. The test confirms that the users reacts to the target on several screen positions and there are no eye tracking problems in that position. The test is binocular therefore it's possible to identify the problems per eye.
The test will move the gaze target across several lines on the screen. The user is supposed to follow the dot while the system measures the eye movements during that process.



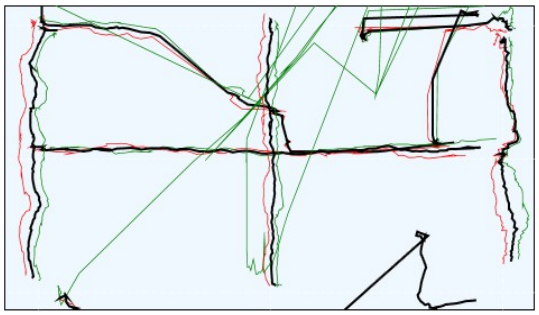
As a result you will get a visual representation of the scan path per eye.

FOV-Test	Parameter	Description
Red line	Left eye	Scan path of the left eye
Green line	Right eye	Scan path of the right eye
Black line	Combined eyes	Scan path of the intelligent gaze combination of left and right eye.

The lines don't have to be very accurate. The test is supposed to reveal a meaningful reaction to the moving gaze target. A meaningful reaction is a straight line, no matter where the line is.



Good - binocular determined reaction at all pathes

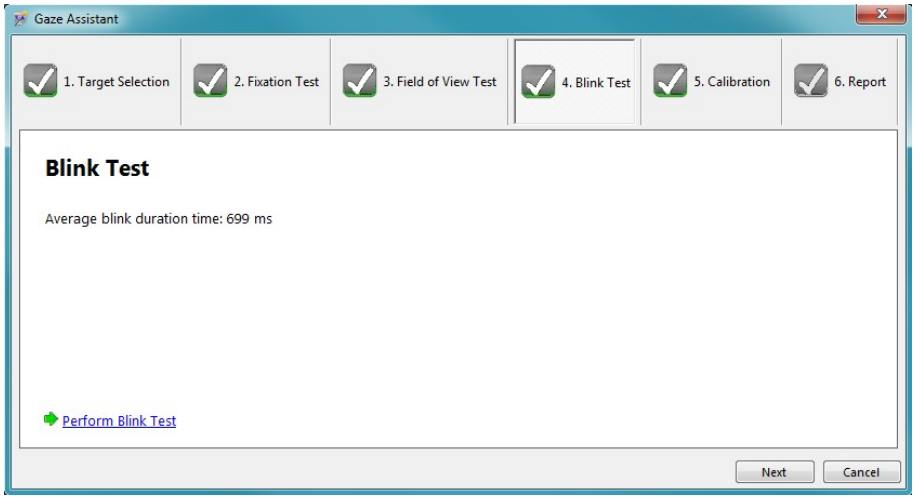


Bad - tracking problems or no reaction on the upper and lower path

Hotkey	Function	Comment
Enter	Starts the test at the chosen position	
Escape	Interrupts or ends the test	
1-6	Select a position to start a scan	Very often it's enough to just test the outer lines (1,3,4,6)

9.2.5. Blink Test

The blink test measures the user's blink behavior. During the test the user is supposed to look at the target and perform a couple of blinks he would use to trigger actions with the eyes. The system will measure the average blink duration.

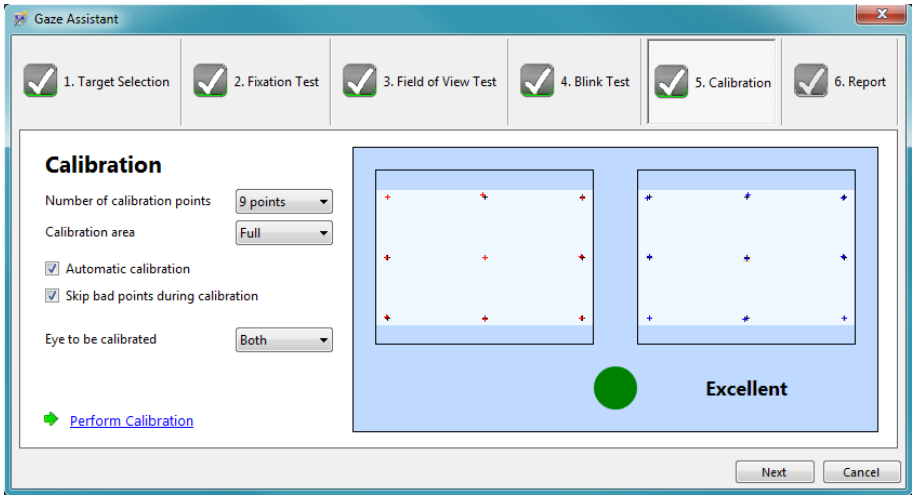


The blink test gives a recommendation for the minimum blink duration that should be used by IntelliGaze or a third party communication software to trigger clicks with eye blinks.

Hotkey	Function	Comment
Escape	Interrupts or ends the test	

9.2.6. Calibration

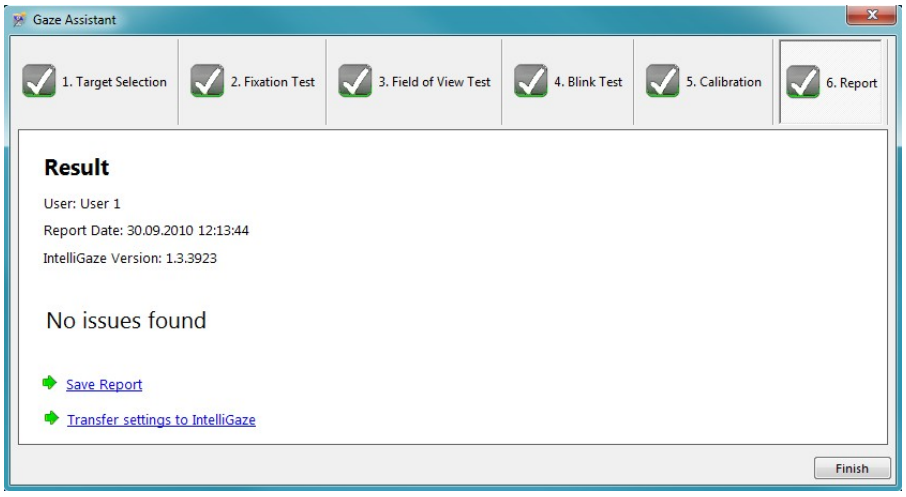
The calibration test allows the user to perform a calibration with the settings that where found in previous tests. Decide for the number of points, the calibration area and the eye that needs to be calibrated according the field of view test.



The calibration will create the first user specific calibration. Previous test will very often perform better after the first user specific calibration because the system now doesn't rely on a default calibration to measure the gaze anymore.

9.2.7. Report

The report gives a short summary of the test. It's possible to export the result to an XPS document. The results itself are stored automatically. After quitting the Gaze Assistent and opening the same user again all results are in place.



The XPS-viewer is pre-installed on every Windows Vista (and higher) system and will also be installed with the .net 4.5 framework which comes with later IntelliGaze versions.

Group	Description
Save Report	Export all test results to a XPS file.
Transfer settings to IntelliGaze	Pushes all settings for calibration and target to IntelliGaze.

10 Troubleshooting

10.1 Hardware Problems

Definition

If the PC or the camera does have a hardware or driver related malfunction you can use the service tool to request any help and provide alea technologies with information needed to process the issue. PC diagnostic data is collected and automatically send to alea technologies.

Procedure

Quit IntelliGaze and launch the Service Tool from the start menu.

10.2 Tracking Problems

Definition

The hardware seems to work flawlessly. Double check with another person if the tracking is OK. If the camera does not pick up the eyes or the status window shows a smiley permanently changing from red to green or if the eyes are not picked up when the user is looking in the corners or can't archive a successful calibration you can use the recording tool to provide alea technologies with eye data to analyze and improve the eye tracker.

Procedure

Open the IntelliGaze options/help and follow the instructions. 6.5.8.Help Video recording

10.3 General

10.3.1. Camera not connected

Definition

IntelliGaze reports in the 5.6.Info Bar that the camera can't be found.

Solution 1

Makes sure the camera driver is installed and the alea camera is shown in the Windows device manager. 4.7.3.Camera Driver

Solution 2

Cam30NXT must be connected to a USB3 port. If a hub is used, make sure the hub supports USB3 as well.

Solution 3

Double check the cables and connectors. Remove any hub or cable extensions.

10.3.2. IntelliGaze crashed

Definition

The IntelliGaze application crashed and the camera stopped working, the IR LEDs are turned off.

Solution 1

Create a service case using the service tool 10.1.Hardware Problems

Solution 2

Enable telemetry data collection 6.5.8.Help to provide alea technologies with all relevant data next time the application crashes.

10.3.3. Monitor Sleep button is grayed

Definition

The monitor sleep button is deactivated in the home menu.

Solution 1

The connected standby on some tablets prevents this function. Disable the connected standby as described here 4.6.2.IntelliGaze™ Software Installation

10.3.4. Bad Accuracy

Definition

The gaze accuracy is much worse than specified also there are no obvious reasons such as tracking problems. The user is calibrated successfully.

Solution 1

Make sure the monitor is measured properly. 5.4.Monitor Calibration

10.3.5. Gaze control is ‘sluggish’

Definition

The gaze cursor and the gaze interaction reacts much slower and there are data drop outs.

Solution

When Windows does updates in the background the whole PC is often blocked, degrading the performance of the eye tracker. Wait until all updates are finished. Sometimes Windows updates are installed iteratively, especially if a PC was offline for while.

10.3.6. IntelliGaze ICC can’t start Webapps such as WhatsApp or Browser

Definition

A third party package “WebView2” is required to operate web apps of ICC

Solution

Download and install the following software package

https://developer.microsoft.com/en-us/microsoft-edge/webview2/

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11 Notes