ERGONEERS
FROM SCIENCE TO INNOVATION

HOW TO…

CREATE A GAZE VECTOR WITH A DIKABLIS EYE TRACKER IN NEXUS?

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SUMMARY

The data of Motion Capture Systems can be enriched by adding a gaze vector to the head segment of a moving body to follow the gaze of the subject, while it is performing tasks, like arranging objects or doing sports.

CONTENT

1. HARDWARE SETUP

Set up Vicon Cameras. Connect the Cameras to the PoE switch via network cable and adjust cameras (angle, focus, aperture).

For more detailes refere to Vicon manual or the Vicon support (support@vicon.com). In case you are an experienced user (🎓) of the Vicon Systems, you can set up and calibrate the Camera System like usual. Afterwards concentrate on steps with 👁. They are related to the Eye Tracking.

Set IP addresses for LAN adapters. Set the computers to the following static IP addresses to connect them in a local area network (Microsoft help). Do not change the IP address of the tablet or any Wi-Fi adapter.

- D-Lab Laptop IP: 192.168.10.80   👁
- Vicon Laptop IP: 192.168.10.1

Option 1: Connect the cable bounded Dikablis Eye Tracker. First connect the Dikablis Eye Tracker to the D-Lab Laptop via USB cable. Afterwards connect the power supply to the Connector Box. The eye data of Dikablis left eye camera is transmitted to Nexus via the D-Lab Mocap Tool using TCP/IP protocol.👁
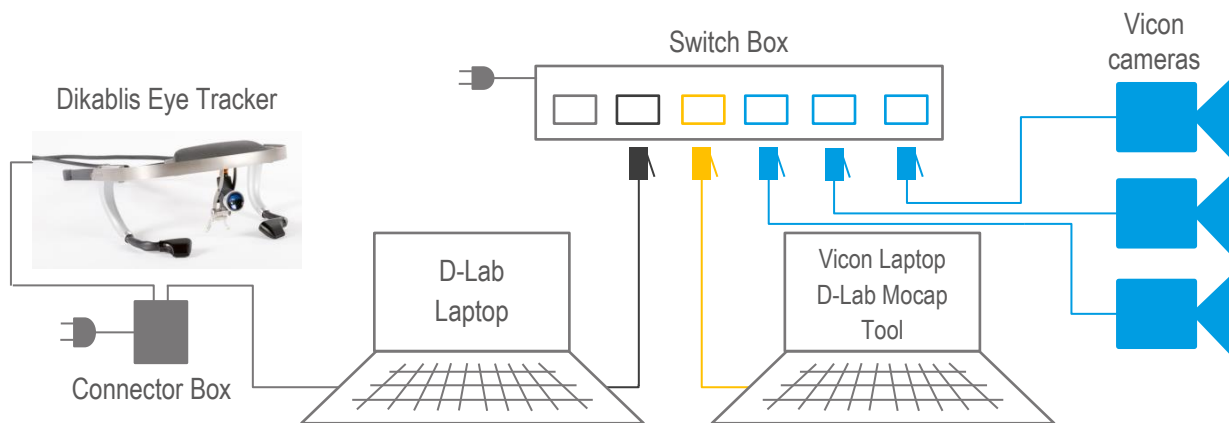
Option 2: Set up the Dikablis Professional Wireless. Prepare the backpack according to the Dikablis Professional Wireless Quick Start Guide and set up the D-Link router. The eye data of Dikablis left eye camera is transmitted to the D-Lab Laptop via Wi-Fi and is forwarded to Nexus.

NOTE: Make sure you connect the Dikablis Eye Tracker to battery AFTER starting D-Lab Mi👁
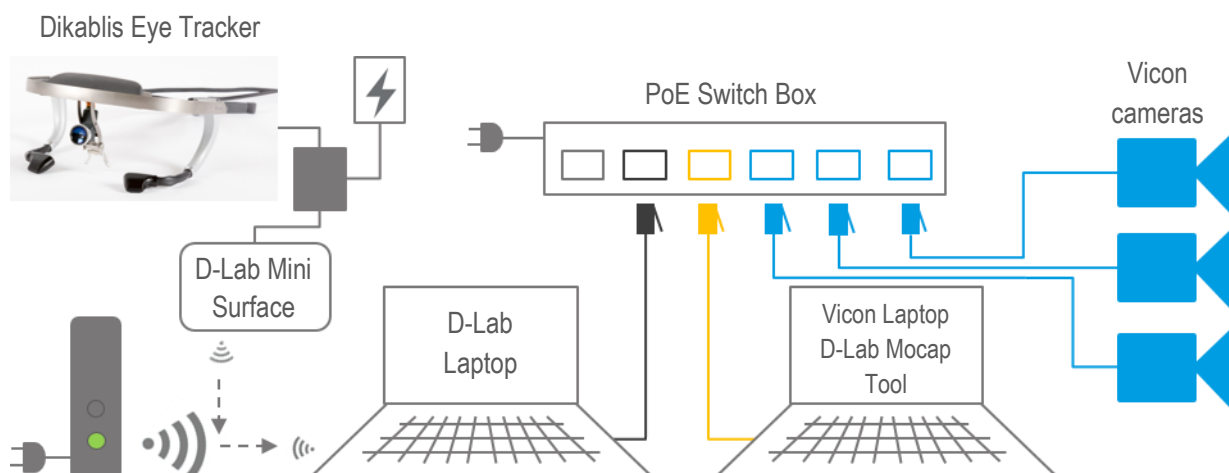
Turn of Windows firewall. To learn more about how to deactivate the Windows firewall, follow this [link](#).

Deactivate Anti-Virus Software. How to deactivate an Anti-Virus Software depends on the manufacturer. Please refer to their websites or manuals.

Test communication with ping. Open command prompt (Windows Key → search "cmd") and type the command "ping" followed by the IP address of the other laptop.

Prepare the Dikablis Head Unit with Markers. In order to define the Eye Tracker as an Object that can be tracked in Nexus, you have to attach at least four reflective Vicon Markers to the Frame of the Dikablis Eye Tracker.
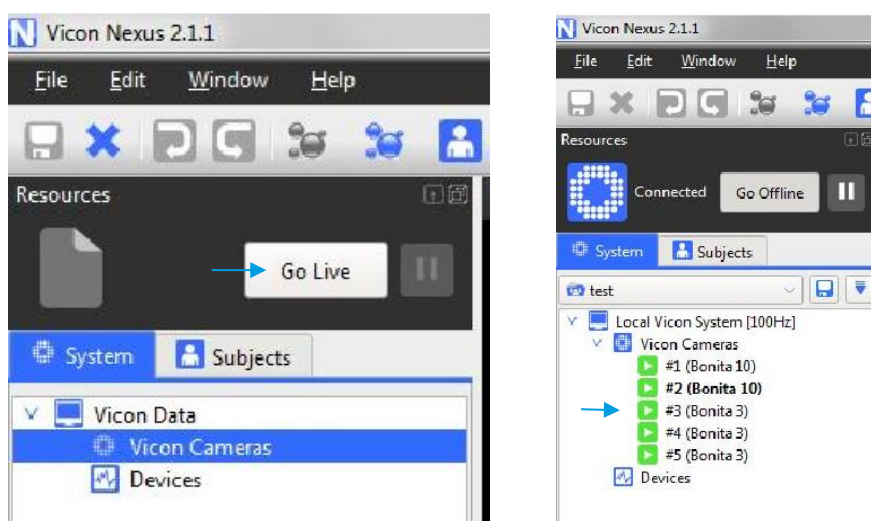NOTE: Make sure the Markers do NOT form a symmetric object. ⊚

2. CALIBRATE NEXUS CAMERAS

Open Nexus.

"Go Live" with the camera view. Check if all installed cameras are available (green symbol).


Select all cameras in the "System"-Tab and switch to "Camera"-View. You can change the view on the top left corner of the central window.

Mask and Aim Cameras. Execute the functions in the Tools menu from top to bottom.
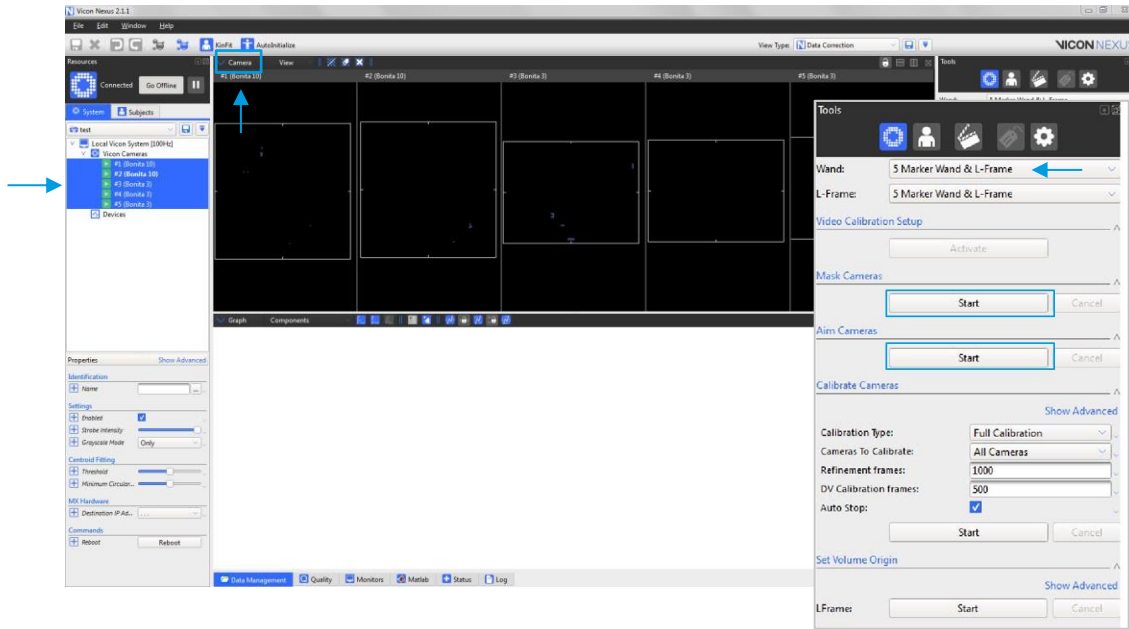
Start Calibration using the Calibration Wand. Makes sure that "All Cameras" is selected in Calibration Options. Move the Calibration Wand through the Tracking Volume, especially cover the area where the main Motion Tracking will take place. If "Auto Stop" is selected, the Calibration will automatically stop, when the necessary number of frames is reached (default: 1000 frames).
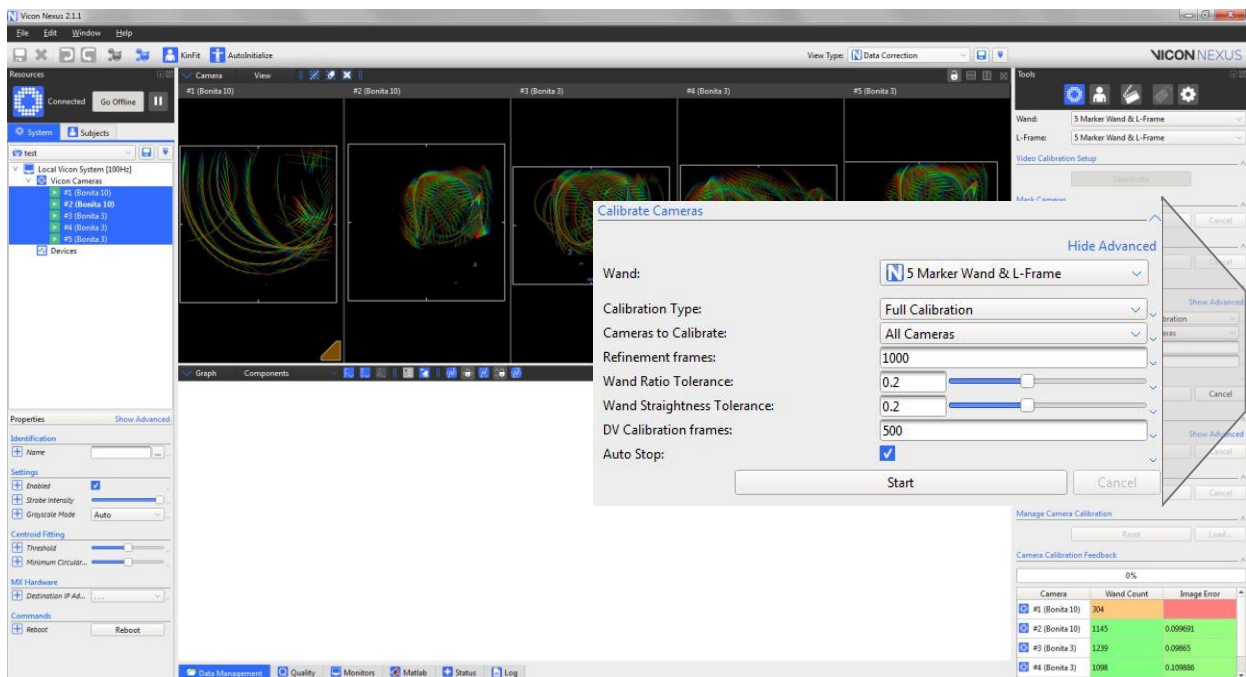
Change back to 3D-Perspective. You will see the reference plane (white grid).

Set origin of the Tracking Volume. Place the calibration-wand in the volume horizontally (ideally in a height that can be your reference height later on). Press "Start" in "Set Volume Origin" in the Tools menu.
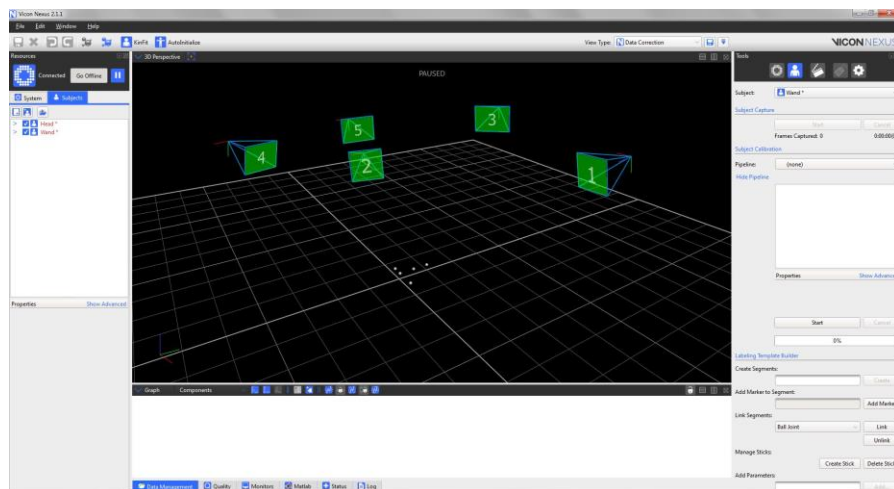
3. DEFINE HEAD- AND CALIBRATION OBJECT

Ensure that you have created or opened a session in a database in which you want to store the trial data, and that it is the active session (see vicon help)

Create Wand-Subject

Create a blank subject called "Wand". Go to the Subject Tab on the left side of the Nexus Window and create a blank subject that you name "Wand". NOTE: Make sure you already created a new Patient Classification, Patient and Session in the Data Management Tab.

Put the Wand in the Volume. The wand should be clearly visible in the 3D-perspective-view. Switch to [icon] on the right side of the Nexus Window and select "Wand" from the "Subjects" dropdown menu.

Press [icon] under "Resources".

Name the segment you are about to create. Go to [icon] and type "Wand" as segment name in the "Create Segment" field and click create.

Add all markers to the created Wand-Object. Start by clicking on the middle marker of the short part of the wand which is the Origin of the wand. Click "Add Marker". Go on with the other Markers and click "create" after you finished. NOTE: The Origin Marker will be used for the following calibration of Dikablis Eye Tracker.
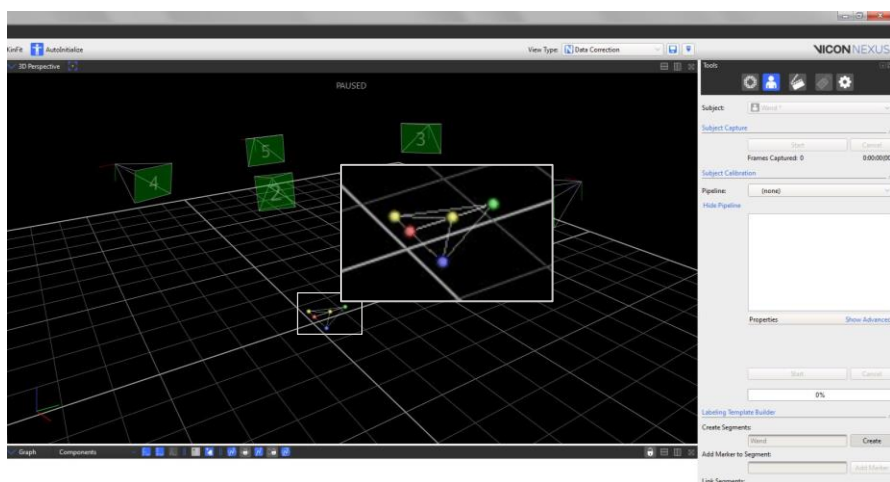
Create Head-Subject

Create a blank subject called "Head". Go to the Subject Tab on the left side of the Nexus Window and create a blank subject that you name "Head".

Place the Dikablis Eye Tracker in the Volume. Switch to 👤 on the right side of the Nexus Window and select "Head" from the "Subjects" dropdown menu.

Press ⏸️ **under "Resources".**

Name the segment you are about to create. Go to 👤 and type "Head" as segment name in the "Create Segment" field and click create.

Add all markers to the created Head-Object. Start by clicking the marker with the closest distance to the left eye to set here the origin of the Head-Object. Click "Add Marker". Go on with the other Makrers.
NOTE: This will be the marker from which you will define the offset of the Eye
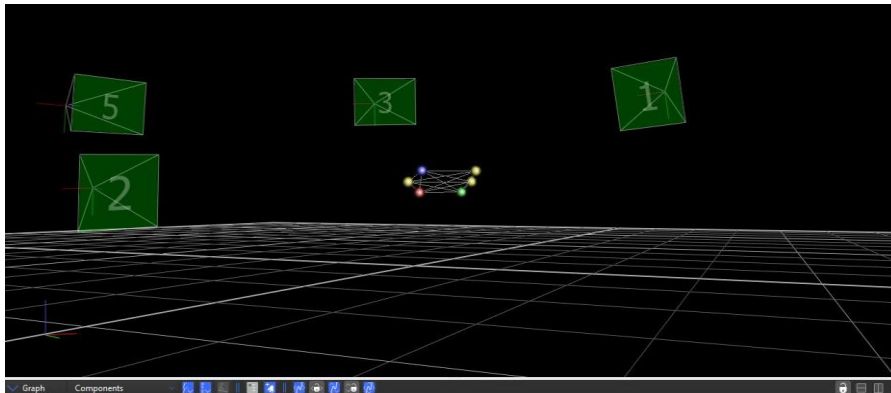
Click "Create" to finish the definition of the "Head"-Object. Head-Unit and Wand can be tracked in Nexus now.
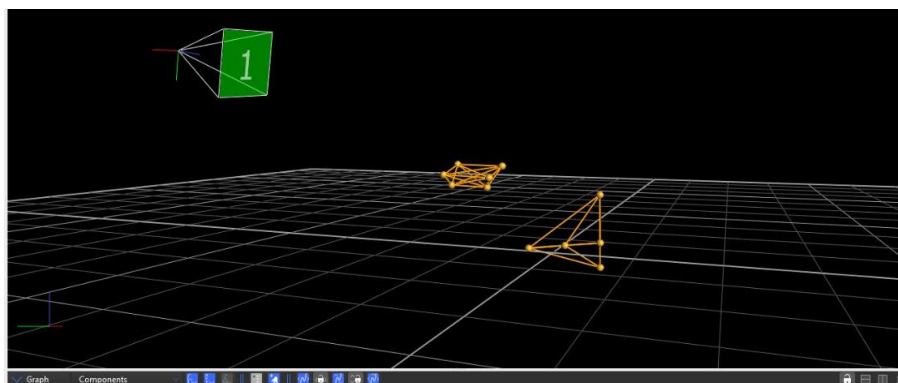
4. CONNECT DIKABLIS TO NEXUS 👁️

The use of Dikablis data in Nexus the Software **D-Lab 3.45** is required with a **Eye Tracking Head Mounded license**. Download the latest D-Lab version.

D-Lab Settings 👁️

Start D-Lab Mini in case you use Dikablis Professional Wireless. Connect Dikablis to battery and press the button on the battery.
NOTE: Make sure the Tablet and the D-Lab Laptop are connected to Dikablis-Wireless Network.

Start D-Lab. Click on 🔲 to open D-Lab and create a project.
NOTE: Make sure to plug in the Dongle with your license. The connected Dikablis Eye Tracker shows up automatically in the Recording Device Window.

Open a Relay. Go to the Screen Layout Tab and click on ((A)) to open a Relay Window. An empty Relay opens in the visualization area of D-Lab. It transmits chosen data to the network via TCP/IP.

Insert Eye Tracking Data to Relay. Drag and drop the whole Dikablis Professional Eye Tracker from the Recording Device Window to the relay.

Adjust settings of Relay. Open the setting of the Relay with the small arrow on the lower left corner of Relay visualization and choose the IP of the D-Lab Laptop (192.168.10.100) and note the Port Number (default: 9015).
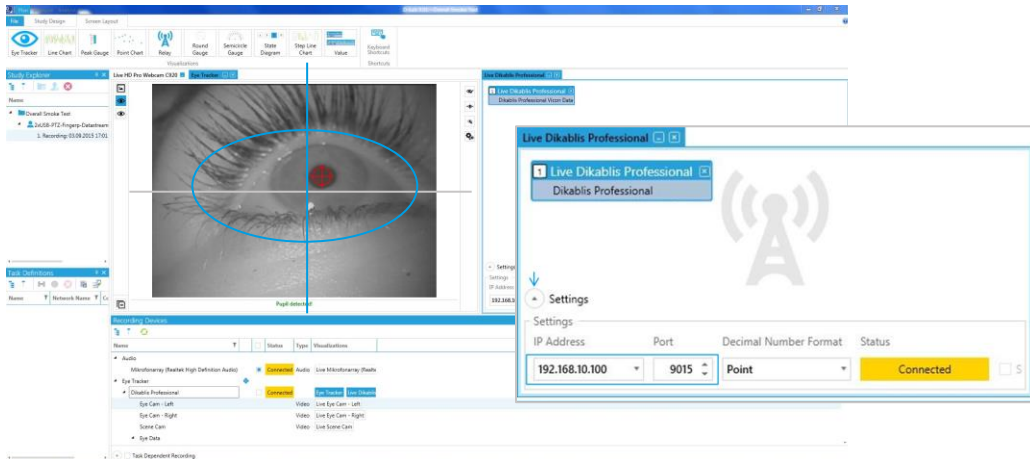
D-Lab Mocap Tool settings 👁

Copy D-Lab Mocap Tool to Vicon Laptop. Go to the D-Lab directory (default: C:\Program\D-Lab) and copy „D-Lab.Mocap.exe" and the corresponding configuration file „D-Lab.Mocap.exe.config" to the Vicon Laptop, e.g. to the Desktop.

Adjust sending frequency of D-Lab Mocap Tool. Open „D-Lab.Mocap.exe.config" with an editor (e.g. Notepad++) and change the number in line 29 to the appropriate frequency. In case there is more than one open relay, also change the D-Lab Port written in the Relay.

Recommended frequencies depending on Dikablis version:

– **Dikablis Professional Cable:** 60Hz (default)
– **Dikablis Professional Wireless:** 30Hz
– **Dikablis Essential:** 50Hz (default)

NOTE: Change sending frequency in Camlab. Use "combine fields to frame" for Dikablis Prof. Wireless.

Start „D-Lab.Mocap.exe" as administrator. After starting the .exe, a small window displays the settings in the configuration file. Check if they fit to your equipment. NOTE: Do **NOT** close this window but minimize it. If you close this window no data transmission will be possible.
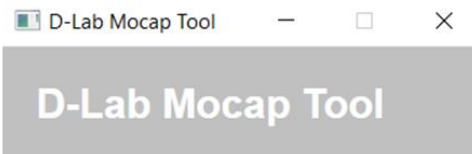
Add the Dikablis Eye Tracker in Nexus ⊚

Add a Dikablis Eye Tracker. Right Click on "Devices" on the system section → Select "Add Digital Device" → "Add Dikablis Eye Tracker" and show its Advanced Settings in the lower section.

**Name the Eye Tracker and select "Head" as Head Segment.**

Use the Mocap IP address and the Permanent Port as shown in D-Lab Mocap Tool. If the connection to D-Lab was successful the Eye Tracker will show up and display the frequency of incoming data (visualize graph).

Measure the Offset of the Eye. Measure the distance of the Eye to the Marker that was defined as Origin for the Head Object and put this values into the appropriate fields in the Properties section. Take the values according to the coordinate system of the Head Object.

"Eye" according to Eye Offset
(Origin of Head Body)
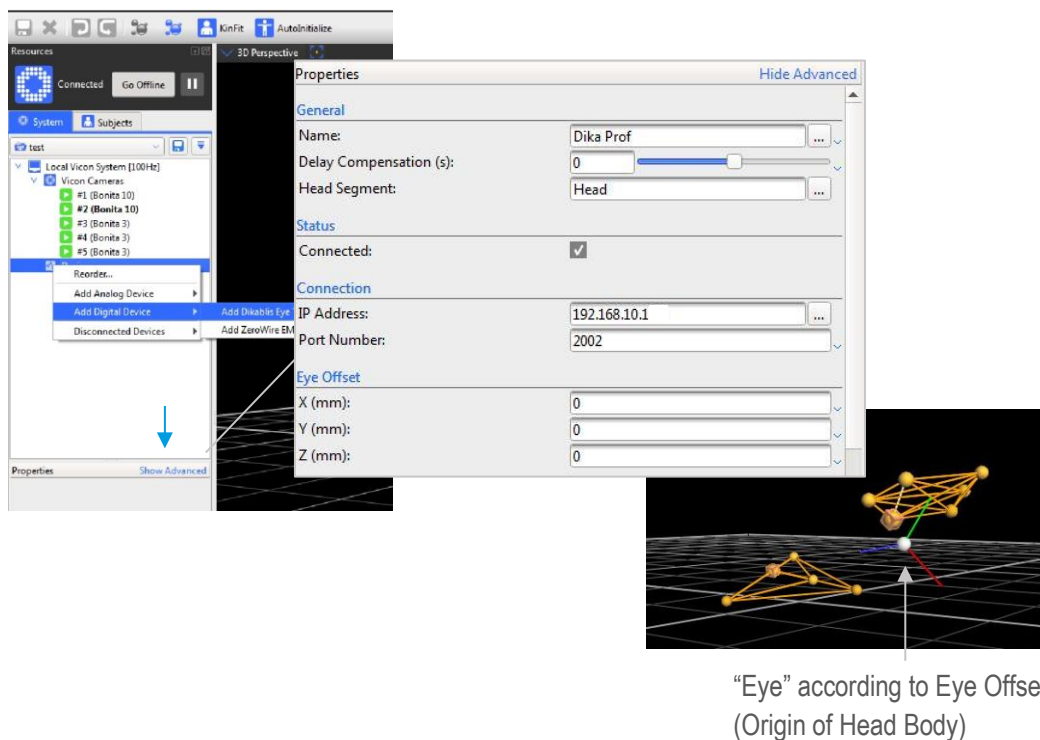
5. CALIBRATE DIKABLIS IN NEXUS ⊚

Set the "Processing Output Level" to "Kinematic Fit". Go to System Menu and mark the whole "Local Vicon System". Select "Kinematic Fit" from the dropdown menu under "General"

Properties
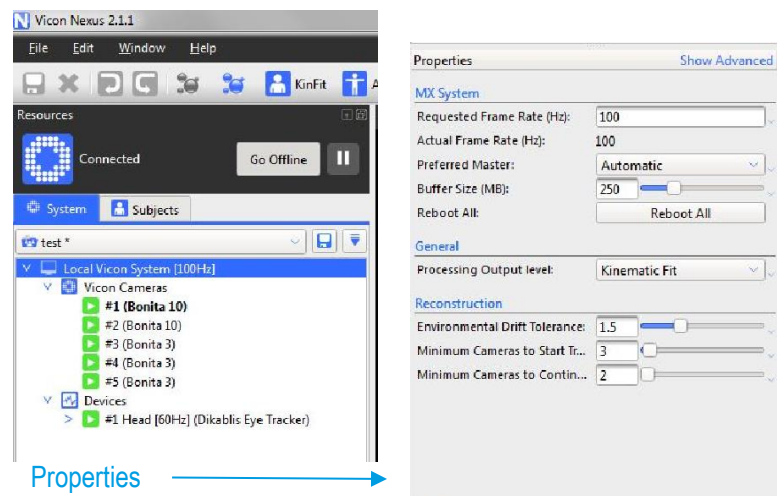
Select "Wand" as Calibration Object for the Eye Tracker. Mark the Dika Prof Device and enable "Show Advanced" on the lower left section.

NOTE: You have to select a trial in the Data Management tab to add calibration points for the Gaze Vector.

Perform the calibration with the subject inside the volume. The Subject that is wearing the Eye Tracker has to look constantly on the Origin Marker of the Wand (defined above), while another person is moving the Wand slowly from left to right in a circle.

Click the button "Add" in the Eye Tracker Properties until a gaze vector becomes visible. As soon as enough calibration information is available, Nexus starts to draw a gaze vector.

6. GET HELP

You can find answers to your questions, as well as instructions and troubleshooting information on the Ergoneers FAQ (http://www.ergoneers.com/faq) or via the Vicon Help (https://docs.vicon.com/).

In case of other questions regarding the Ergoneers Product Family (Dikablis, D-Lab), please refer to support@ergoneers.com.

For questions and information about Nexus or Vicon Hardware, please refer to the Vicon manual, Online Help or the Vicon Support (support@vicon.com).