ETR556

UX RESEARCH TECHNOLOGY COURSE

INSTRUCTIONAL DOCUMENT FOR MOBILE EYE TRACKING TECHNOLOGY

Mobile eye tracker technology consists recording and the gaze behaviors of a study subjects.It is used to capture and analyze the direction of subject's gazes, as well as the movements of their eyes and heads, in experimental situations. Using this technology, the researchers can record where the eyes of the subjects are attracted to (Magnussen, Zachariassen, Kharlamov, & Larsen, 2017).

In education, mobile eye-tracking technology is used to identifyhow much of students' time is devoted to the material lectured in the classroom. In addition, from the perspective of the instructor of class main inhibitors of students' concentration can be recognized. As (Jung, Zimmerman, & Pérez-Edgar, 2018) pointed out, mobile eye-tracking technology is useful to collect data in classroom to collect comprehensive data about attention patterns of students through recording their gaze behaviors. That is, what they observe, how much time they spend time to observe that task. In addition, using mobile eye-tracking technology the researcher can use it to collect data about the quality and quantity of social interaction between learners in after-school settings.

Other research areas for mobile eye-tracking technology

Research areas of using mobile eye tracker technology includes health, museum studies (Jung, Zimmerman, & Pérez-Edgar, 2018), medical studies (Stuart, Alcock, Godfrey, Lord, Rochester, & Galna, 2016), education (Jung et al., 2018; Magnussen et al., 2017).For example, in medical studies the researchers (Stuart et., 2016) have used mobile eye-tracking to

diagnose saccades after comparing two groups of ordinary adults and adults suffering from Parkinson.

Another area of research that have used mobile eye-tracking in museum studies. For example, children interaction in a science museum has been studied by (Jung et al., 2018) Stuart et al. (2016). The researchers collected detailed data about learners' visual attention and interactions in museum environment. The results of data analysis demonstrated patterns of visual and bodily interactions with exhibits and with family members.

Eye Tracker Advantages and Disadvantages

We believe that everything in life has advantages and disadvantages even people, there is nobody perfect, each person has different characteristic that people may differ on, some people may like it and other my not! Same thing with products, in the past, when they released the first phone in the world, some people said this will destroy our world and it is not beneficial. However, nowadays, it is almost impossible to find someone can live without a phone. Eye tracker mobile is one of the newest technologies which may make a big difference in some fields, we are going to see the advantages and disadvantages for this product.

Advantages.

1-The main advantage of the eye tracker mobile is to understand people behavior, what they look at? What is the first thing that attract them when they get inside a specific place? All those questions can be answered by using the eye tracker mobile when watching the eyes movement in several fields. For example, we can make students use the eye tracker mobile in the class to see how students interact with the instructor, maybe they focus more on slides, maybe they get more excited with videos that played in the class, all that can be known by the eyes movement of the students.

2- Since the device made as glasses people may wonder if they can wear the device while they are wearing their won glasses, the answer is yes, this is one of the advantages that people can wear it on their own glasses so it won't cause any problem for them.

3- Companies can use the device to see what attract customers the most and that will make the company focus on what to provide for customers which is what attract them the most and that will lead to increase the sales.

Disadvantages.

1- Expensive: Eye tracker mobile is very expensive, the minimum price that you can spend to buy it is $10,000 and it can reach more than $40,000 which is very expensive! So low-class or even middle-class people will not be able to buy it, it is more for people who have business. However, you will spend more money on lectures to teach people who will use the eye tracker mobile if you buy it to do a research on a specific store.

2- Suddenly freezing: We had problems with the device, it always freezes suddenly. We used Alienware laptop with eighth Generation Intel i7 processor, SSD hard drive, 16GB RAM, and 8GB Graphics. The software run smoothly and we were able to bring the left, right, scene cameras, and the audio all together without any problem. we worked on it for three hours without any issue. However, after the three hours, the scene camera freeze on standstill image.

3- Not comfortable: the device is heavy and cannot be worn for more than 15 minutes because it is not comfortable especially because it is not a wireless so you can't move as you want to.

Step by step guidance on how to use the technology with screenshots (Haider)

  Semi-mobile Eye Tracker Operation Manual

 A. Box Contents

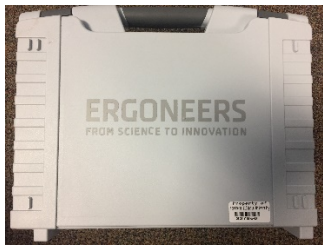 Below is the hardware component of the eye tracker system.

Figure 1 Container Box

Figure 2 Power Cable

Figure 3 USB Software License Dongle

Figure 4 USB Data Cable

Figure 6 Software and Manuals Data

USB

Figure 5 Connector Box

Figure 7 Eye Tracker Headset

Figure 8 Two different view angle

Lenses

B. Software Installation

1- The software installation required to enable .NET 3.5 in the laptop

2- Newest software for D-Lab application could be download from the following link:

http://www.ergoneers.com/faq/index.php?action=news&newsid=3&newslang=en

3- The installation steps is out of the scope of this operation manual

C. Device Calibration

1- Ensure the device hardware is recognized by the laptop by going to the Device Manager -> and locate VRmAVC-2 (hardware, it suppose there is no red or yellow icon on this device)
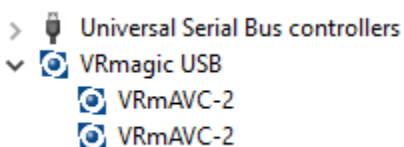
Figure 9 Device Manager -Hardware Driver

2- Locate D-Lab icon on the laptop's desktop, and double click to start the software. The Icon is shown in Fig. 10.
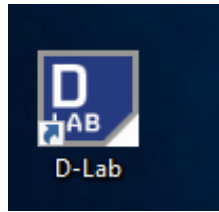
Figure 10 D-Lab Desktop Icon

3- Create new study project from file -> New and give it an appropriate name (i.e., UX)
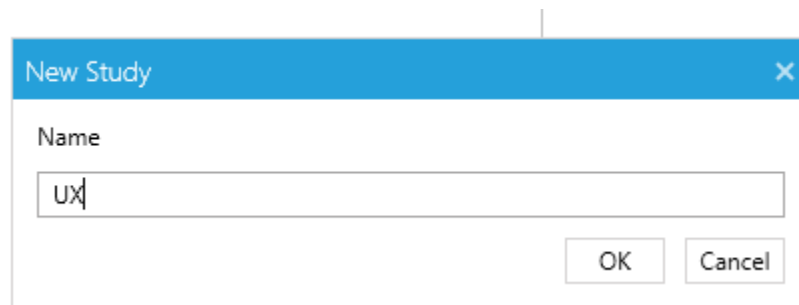
Figure 11 Dialogue Box for Creating New Study

The created study, will be shown on the "Study Explorer" panel as shown in Fig. 12.
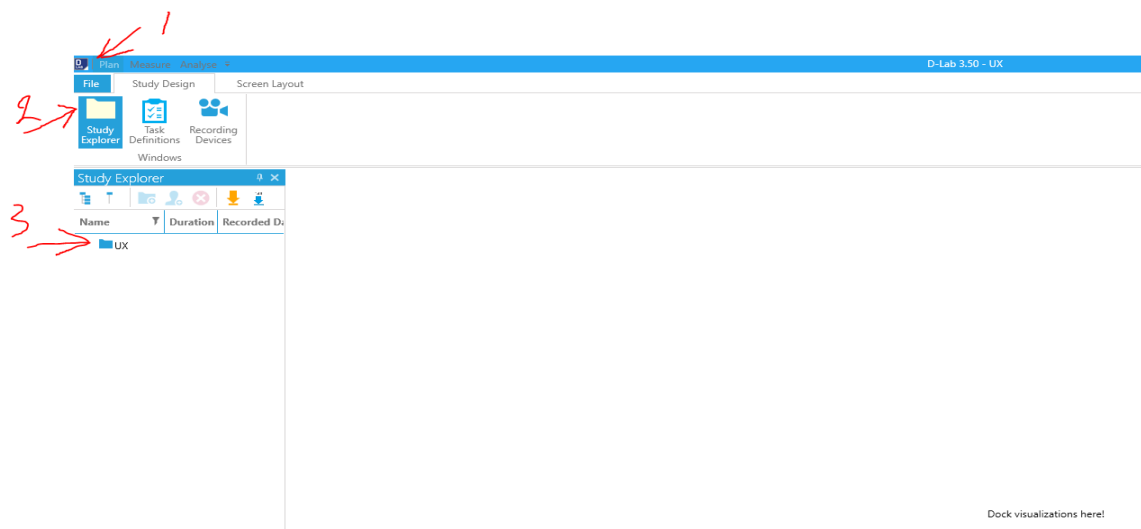
Figure 12 Study Explorer Navigation Panel

If your study does not show up, then click on the "Plan" tab -> "Study Design", and the "Study Explorer" will showed up

4- Highlight your study folder icon, and click adding a subject for test (user subject for your study test i.e., Subject01) as shown in Fig. 13.
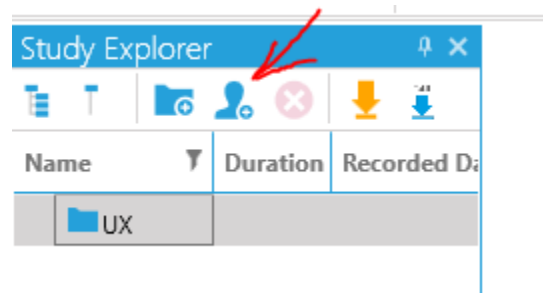
Figure 13 Creating User for the Study
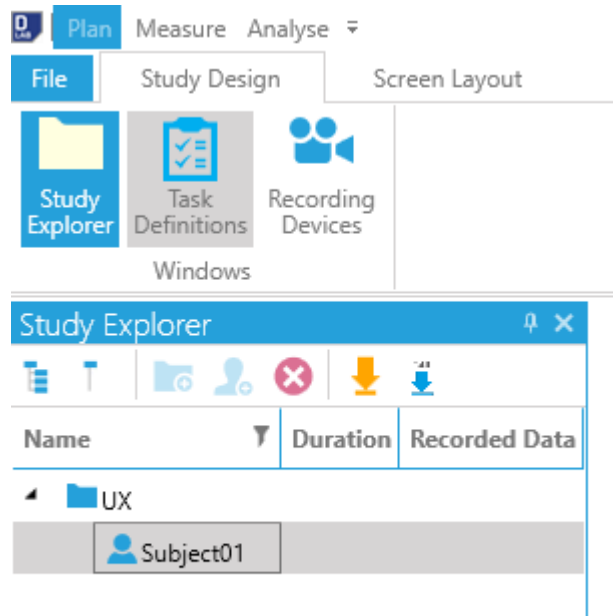
Figure 14 Study Explorer with New User

5- To switch to the live view, click on "Measure" tab, and highlight your subject user. If the Eye tracker device was connected and detected properly, your screen shall be shown similar to Fig. 15.
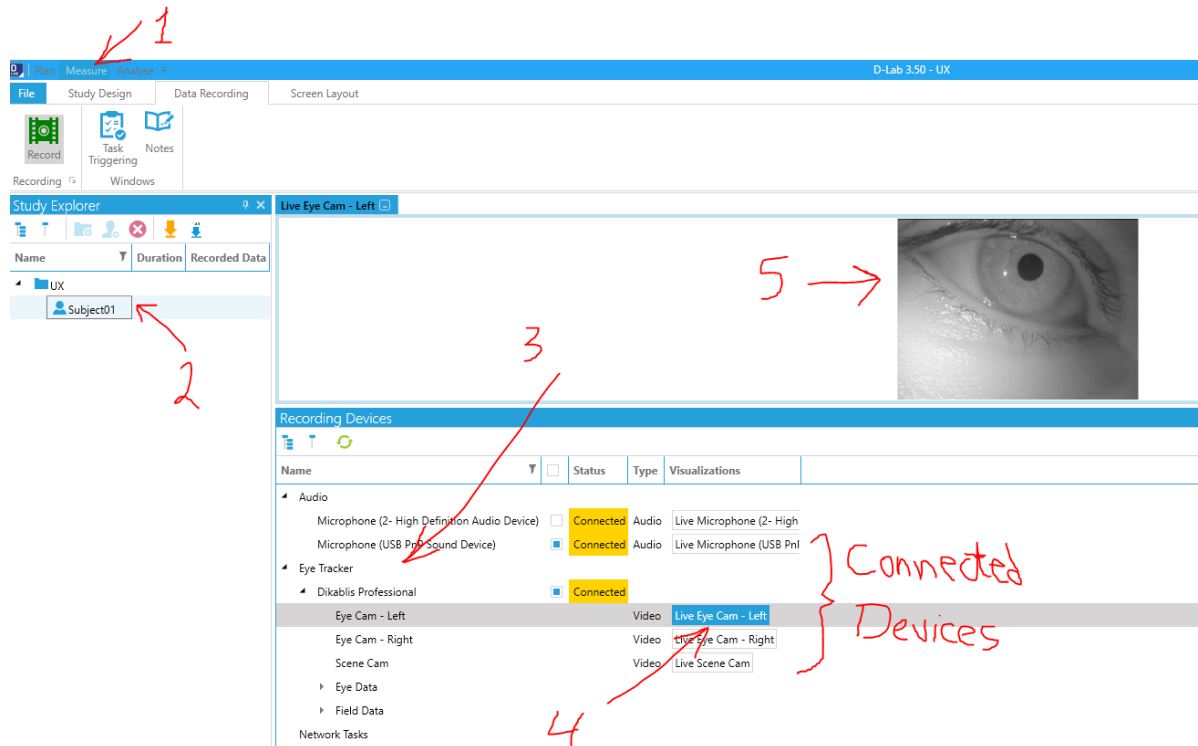
Figure 15 Live View Mode

To view eye camera live, single click on the interest one, and it will be displayed in live modw

Automatic Calibration

To start automatic calibration, see Fig. 16, assure that you clicked on the "Plan" tab (step number 1), then from the "Screen Layout" add "Eye Tracker" view (Step number 2 and 3).
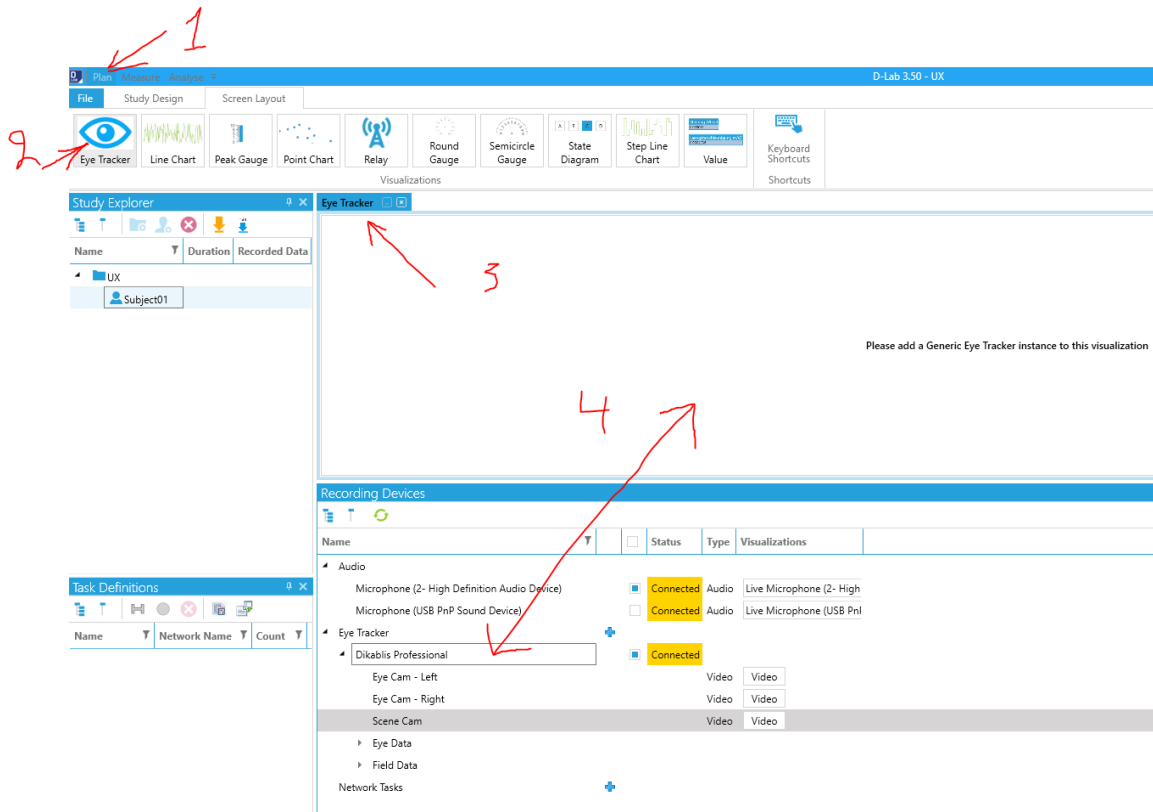
Figure 16 Eye Tracker Visualization and Calibration

From "Recording Devices" panel and underneath "Eye Tracker," high light "Dikablis Professional" device and drag it and drop it into Eye Tracker view (Step number 4).

Fig. 17 shows the connected devices and the front scene camera. Fig. 18 (step number 2) shows starting steps of the calibration wizard. This process represented by adjusting the both the left and right cameras by assuring the eye pupil is detected by the camera with the red target-sign as shown in Fig. 18.
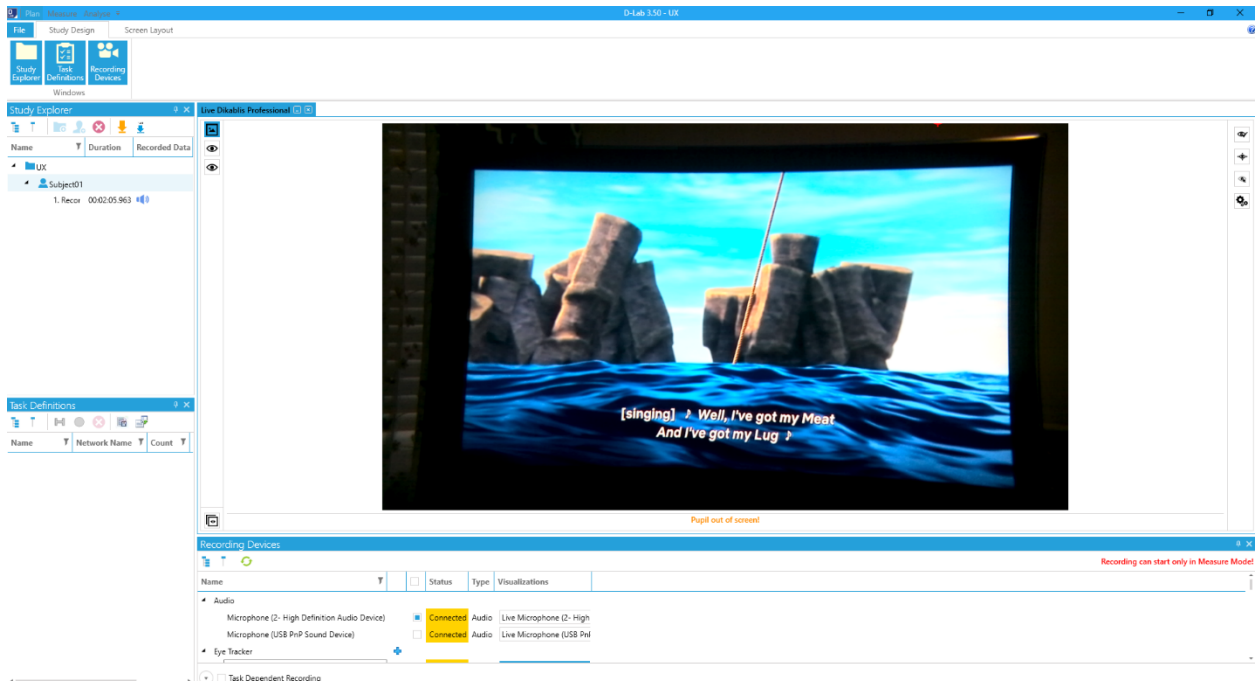
Figure 17 Connected Devices and Front Camera View
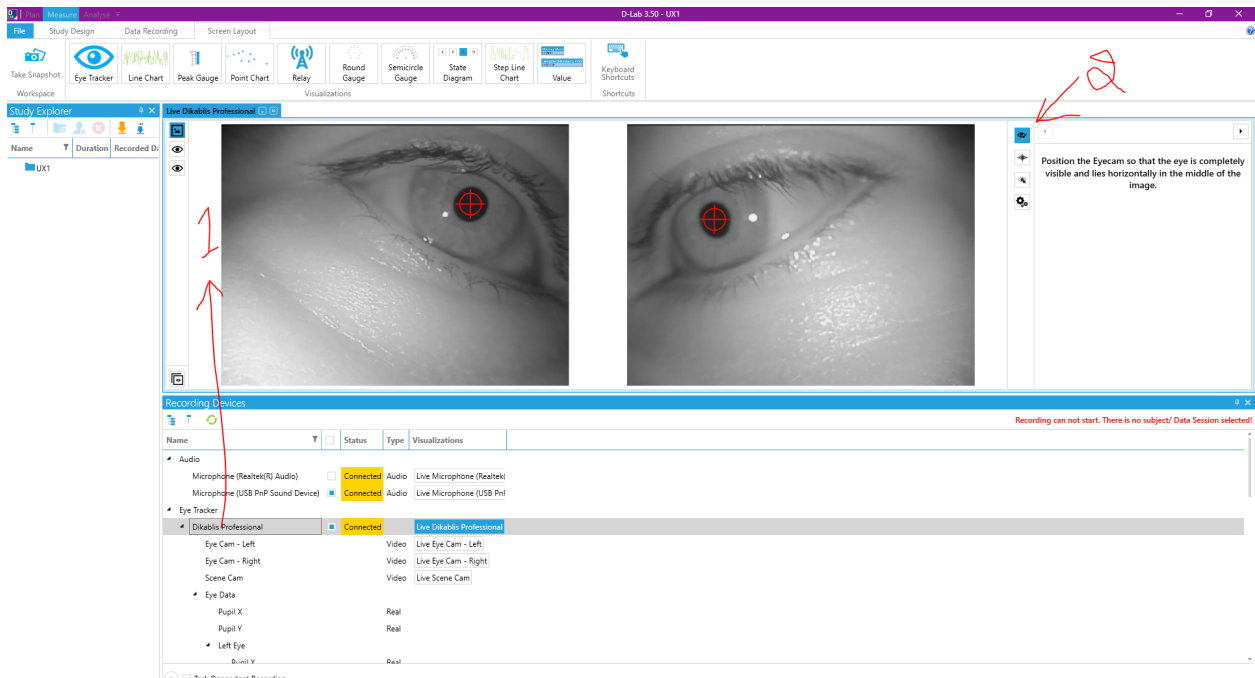
Figure 18 Right and Left Eye Calibration

Fig. 19 and Fig. 20 show the second step of the calibration wizard where the eye cameras can be adjusted to reduce the size of data processing and to reduce the tolerance error.
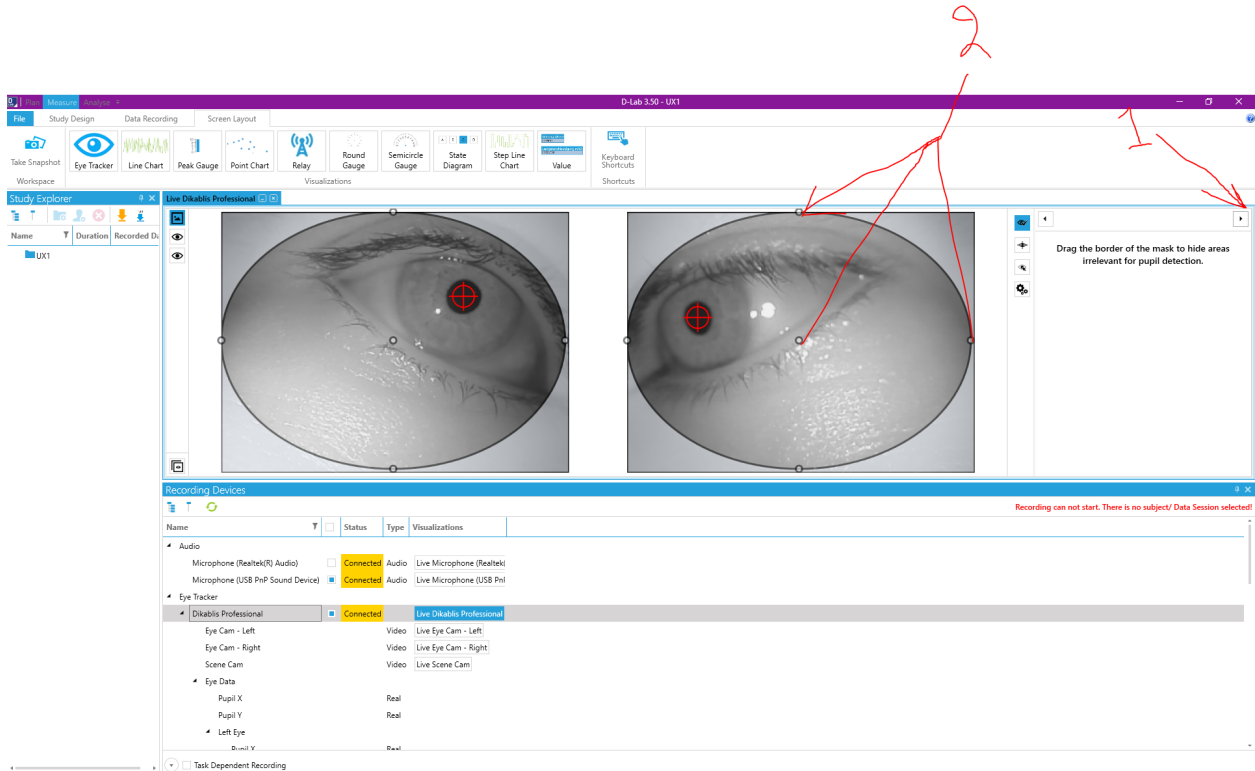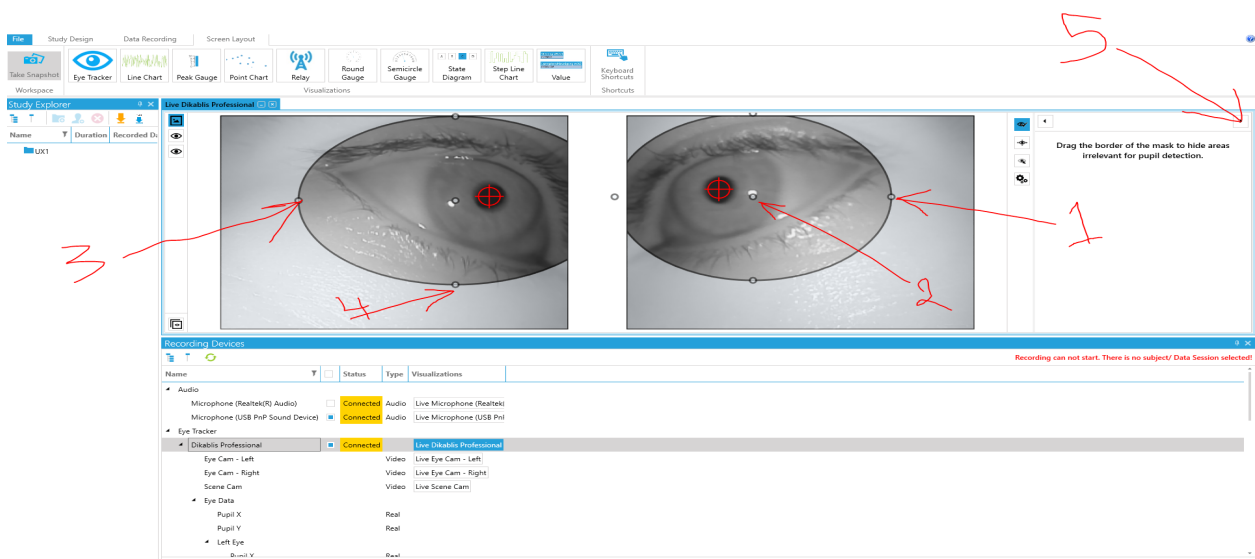

Figure 19 Adjusting Eye Camera Capturing Area

Figure 20 Adjusted Eye Camera Capturing Area and maintain Pupil Detection

Figures 21, 22, 23, and 24 show the front scene camera calibration. For each quarter of the calibration, it is required, as you go with front scene, to assure both eye pupils are detected. The subject shall look at the highlighted area and both eye pupils must be detected. If so, double click on the highlighted area to move to the second scene quarter. Otherwise, re-adjusting to the camera may be required.
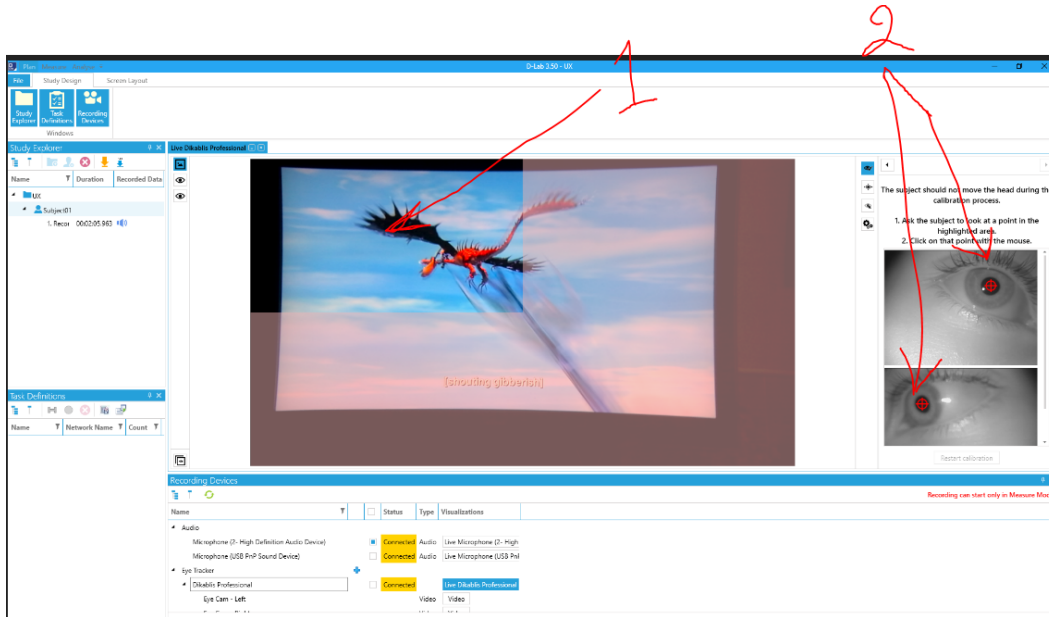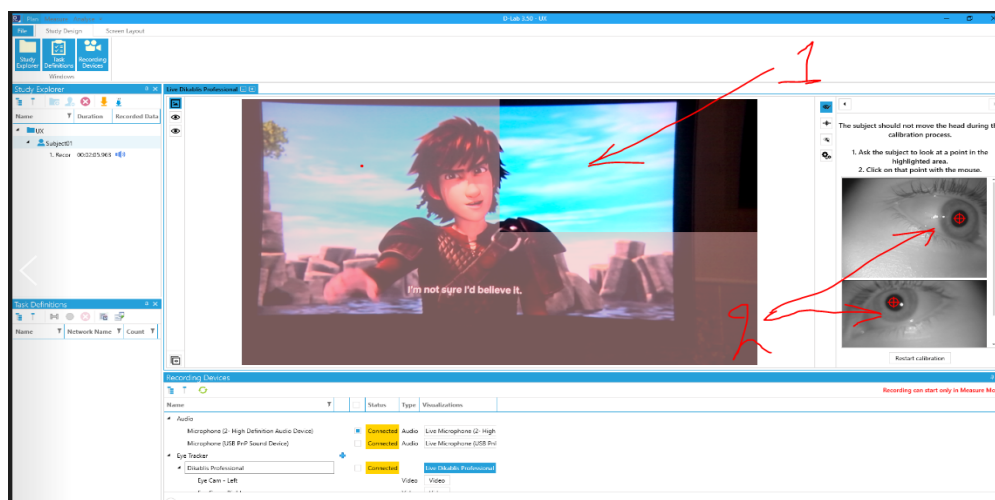

Figure 21 Front Camera Calibration Process - First Quarter

Figure 22 Front Camera Calibration Process - Second Quarter

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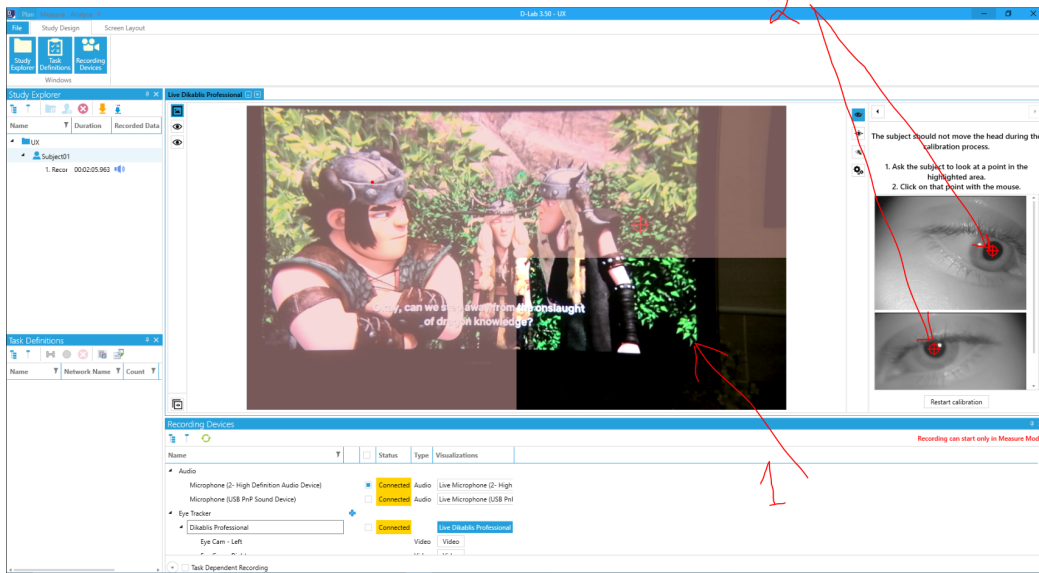
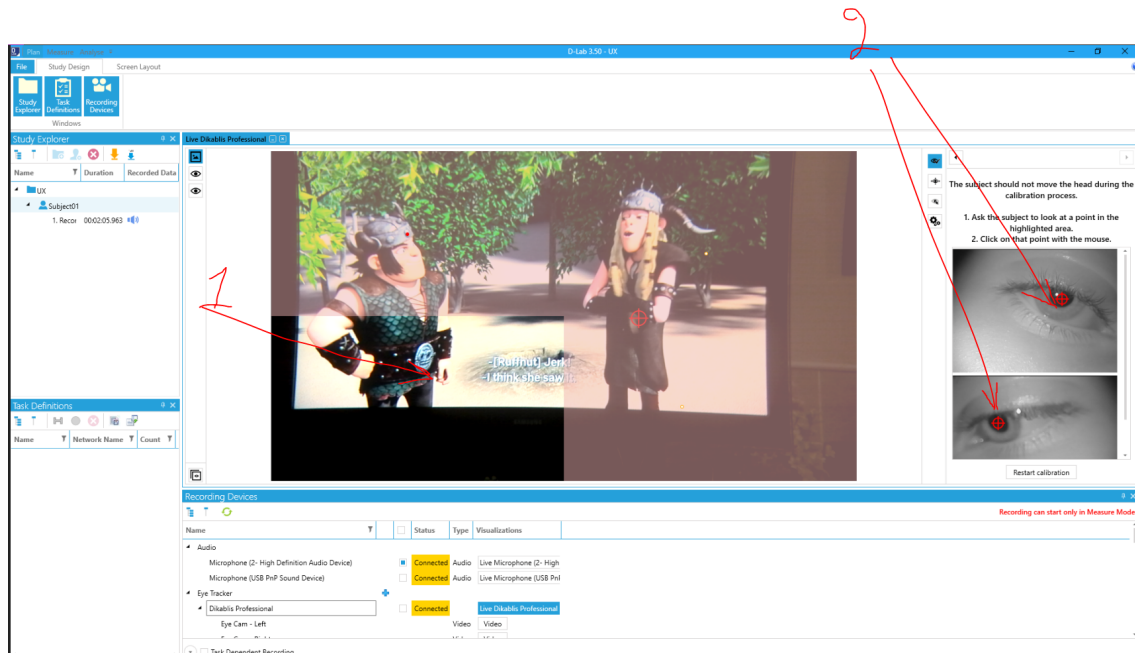*Figure 23* Front Camera Calibration Process - Third Quarter

Figure 24 Front Camera Calibration Process - Fourth Quarter

After the successful completion to eye cameras and front scene camera, it is needed to click on "save" to save the calibration process as shown in Fig. 25.

Note: It is needed through the calibration process to keep the subject's head standstill towards the interested recording area, and through the calibration, the subject shall look up down and right-left to detect the eye pupils but no turning to the head.
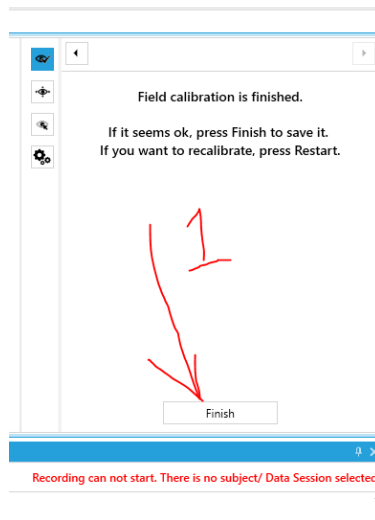
Figure 25 Saving the Calibration Process

6. Creating a task(s)

Task can be created for a specific achievement(s) such as proficiency of task completion or to measure a specific criteria or metrics.

To create a task, click on icon that similar to letter "H." You may add also a sub-task by creating a new one then drag it under parent task (Fig. 26 and Fig. 27).
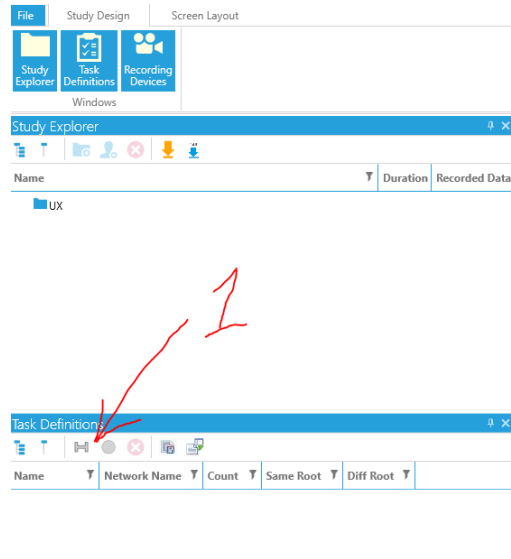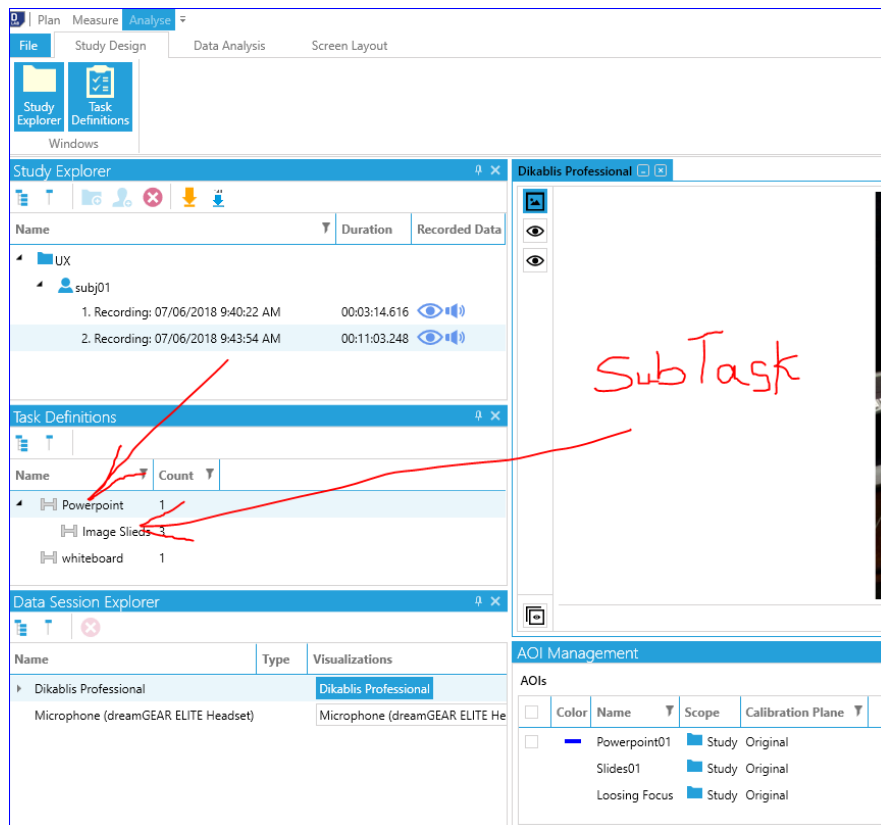
Figure 26 Creating a Task

Figure 27 Creating a Sub-Task

7. Start Recording and Data Collection

The process of collecting data and recording is start by switching to "Measure" tab (Fig. 28). The record button represented by VHS video tape, green in color. This button will be active only when you select a user (subject of the study) in order to associate all collected data to that subject. Also, assure to activate both "Task Triggering" and "Notes" panels (step number 3, Fig. 28)
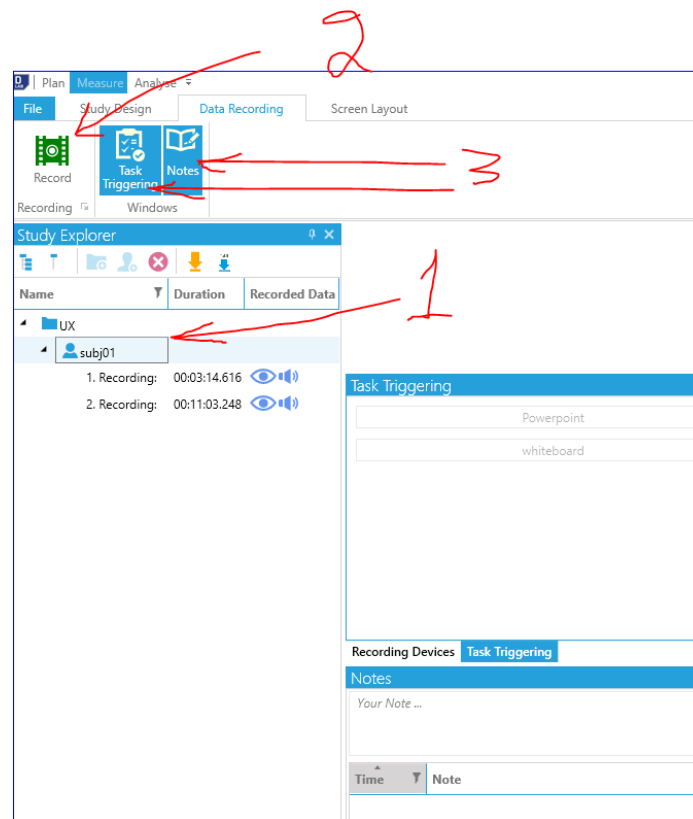

Figure 28 Start Recording

8. Adding Notes (Verbal Comments)

Fig. 29 shows video log data entry, and this can be entered live while the recording in progress or during the analysis process. You may write your comments in the empty text field then press Enter button. All entered comments will appear with a time stamp in the list below the text field. This time stamp is associated with your writing to the notes (see Figure 29).
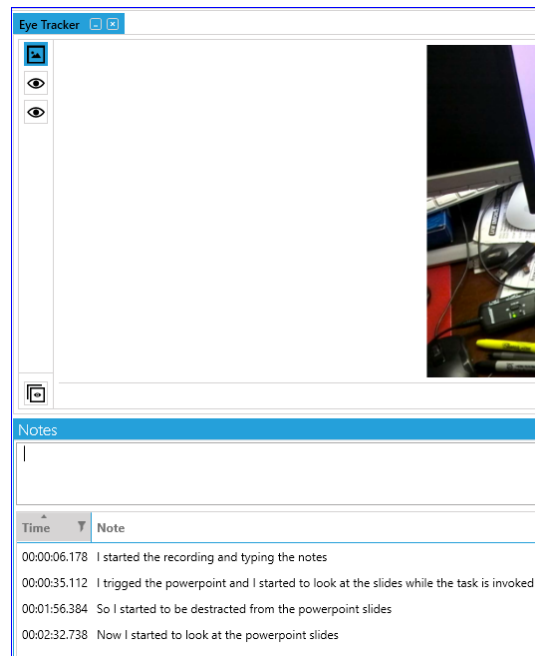
Figure 29 Video Log Data Entry

9. Creating Area of Interest (AOI)

Areas of interest (AOIs) are defined to identify areas for which the glance behavior is of interest. Creating AOI by clicking on "New" (step number 1, Fig. 30). You may select a desired color for each type of AOI. Each time the eye pupil detected on the AOI, will trig a data recording and the AOI will be highlighted (see Figure 30).
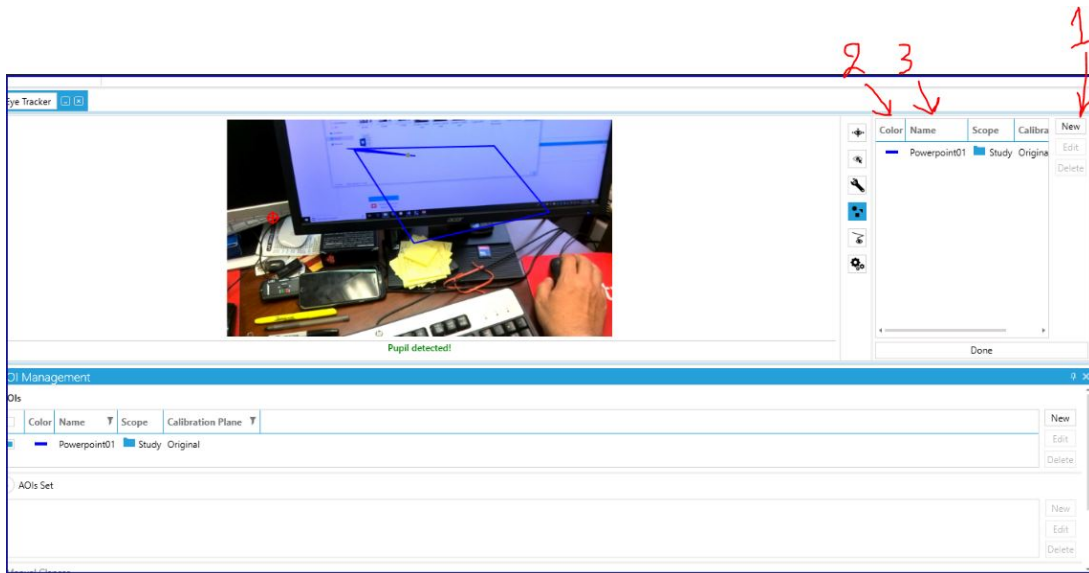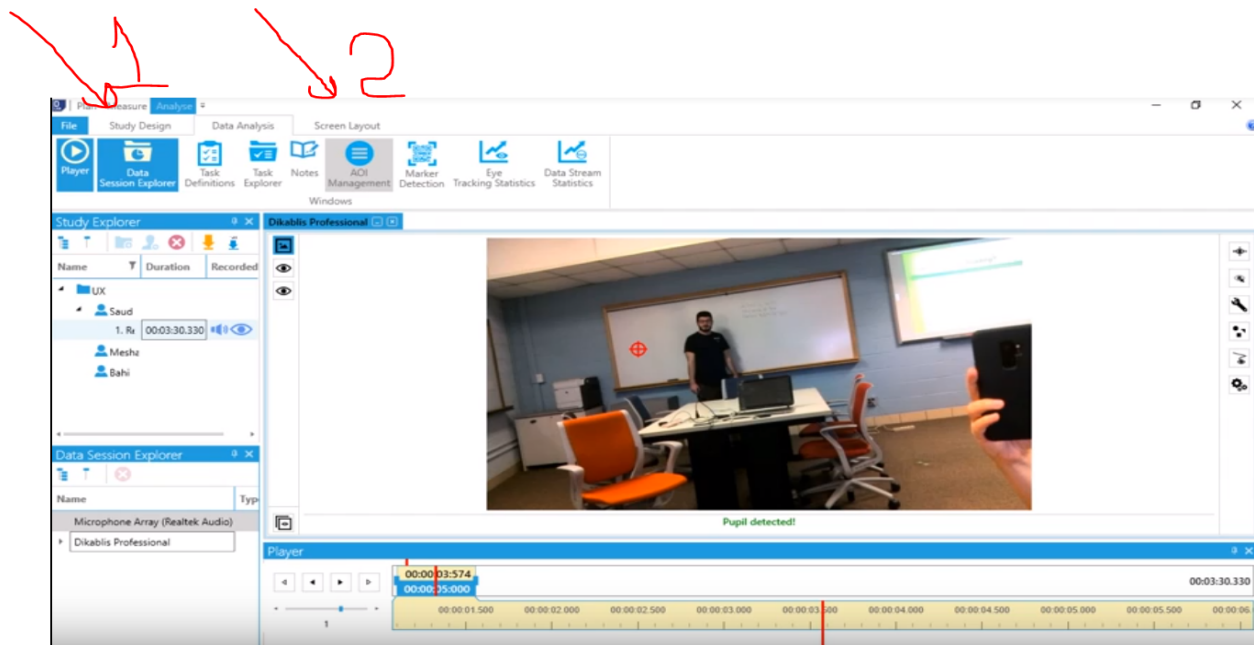
17

Figure 30 AOI Management - Creating AOI

Step by step guidance on how to collect and analyze data with screenshots

Area of interest

1. First, you should click on data analysis. Then, you click on AOI Management key. In this way you will have this tape popup to you.

2. secondly, you should press create button number one. After this, you will have small profile. In this profile, you should name this profile first. Then click fixed in the preference only when you do this, you are going to determine your AOI by double click on the mouse and then drag to include the area you want.
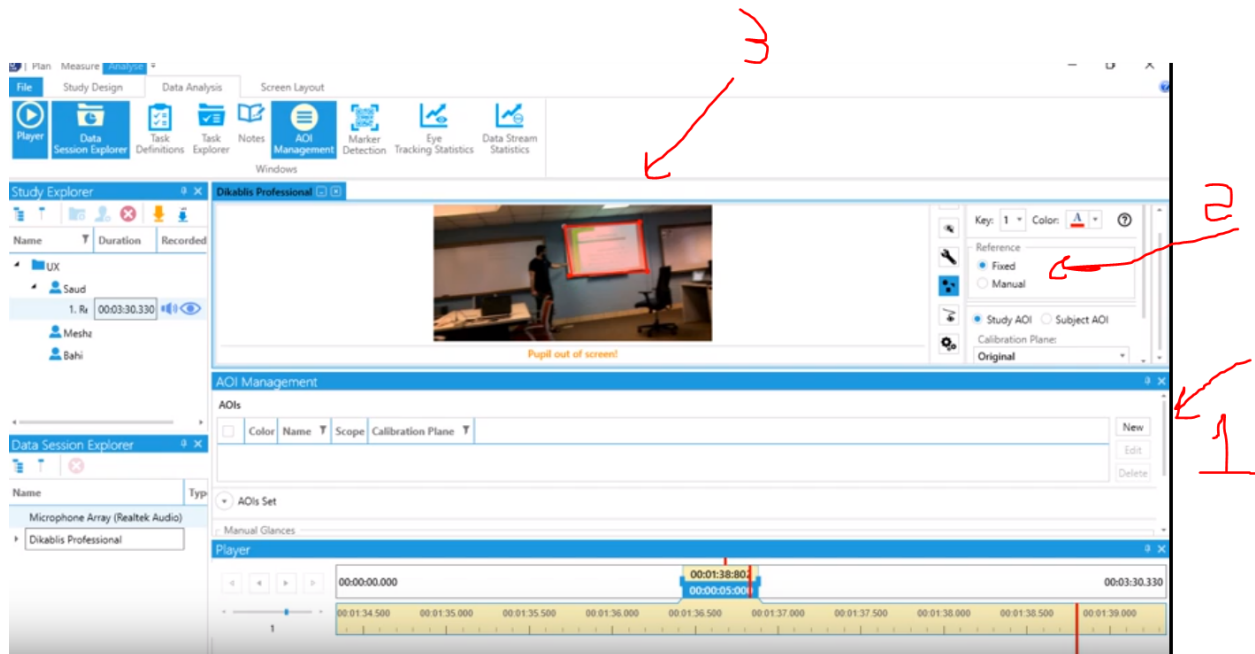
Summary of area of interest: we use area of interest to determine how long the user was looking into area. Then, we can conclude that this area gets the user attention more than other areas.

EYE tracking statistics

Eye tracking statistics is an important tool for data measurement.

First, you click on eye tracking statistics wedge then a small window will appear.
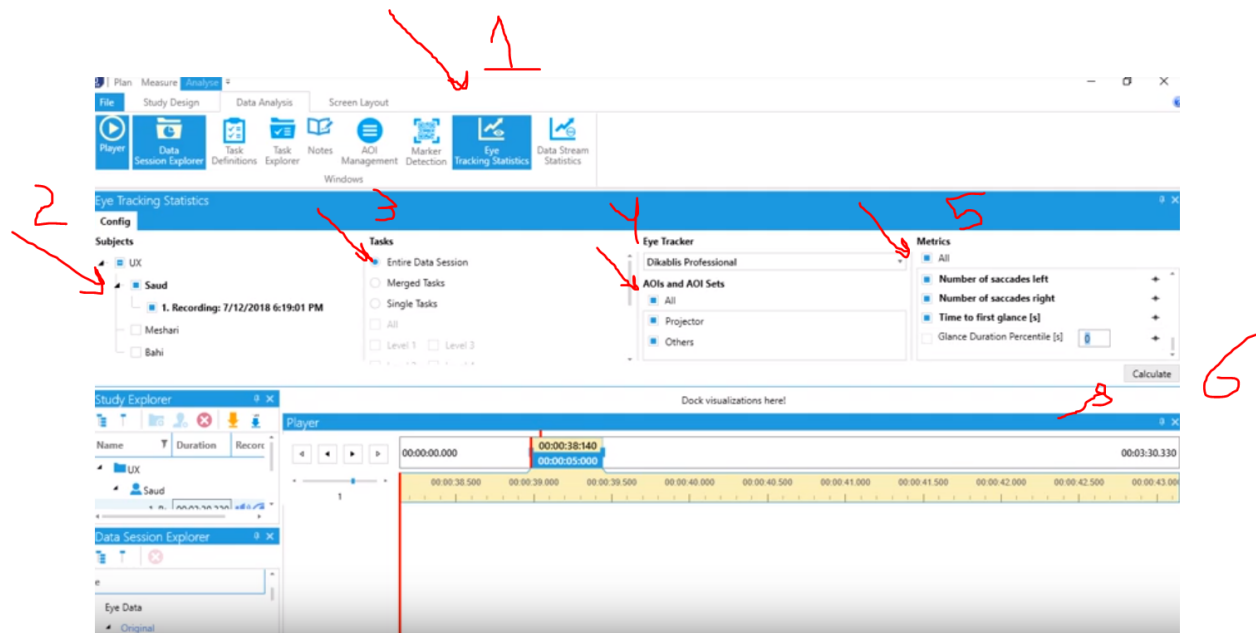
2. you should select your subject

3. you must choose your type of task there are more than one type you can chose from single task or entire data session if you want to include everything.

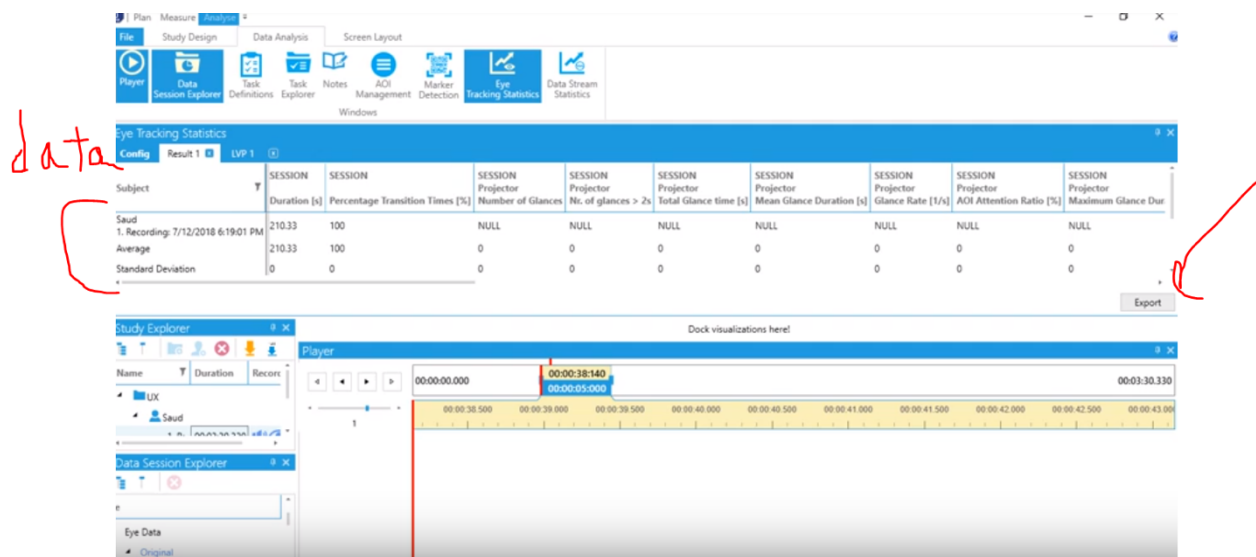4. Aoi you can choose more than one area of interest one just one, here we picked more than one.
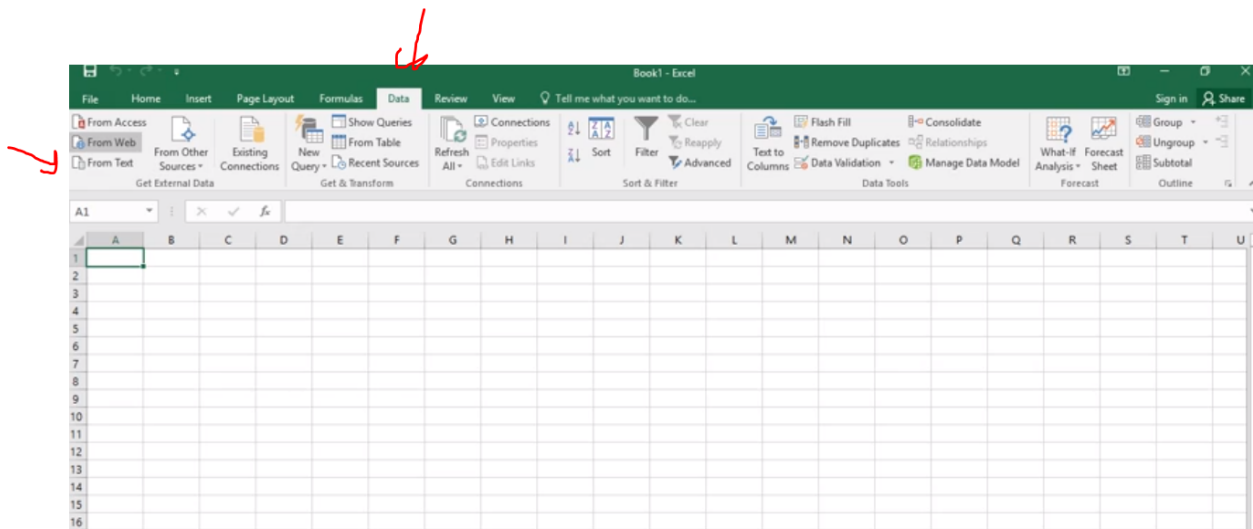
5. metrics chose all metrices

6. last thing, press create
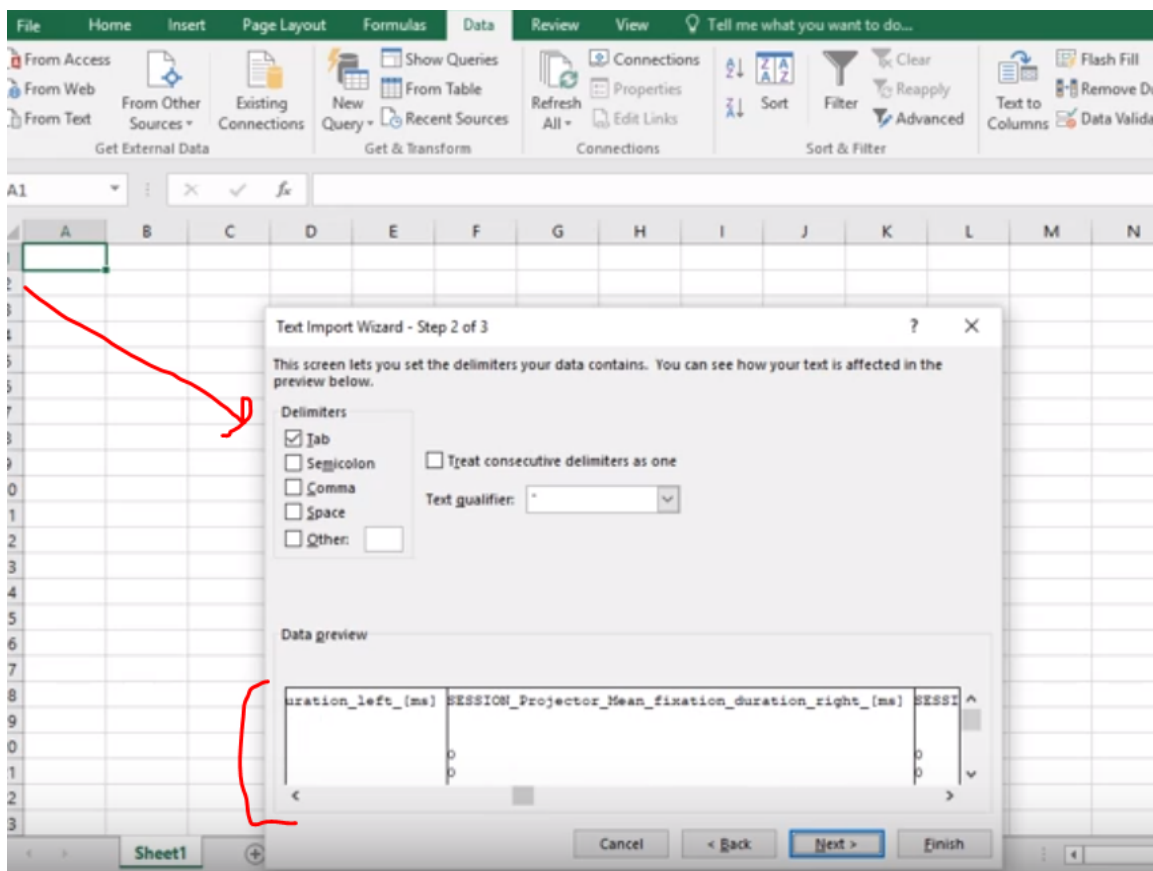

Exporting data

You will have all the data presented in front of you and you can easily export the data into excel
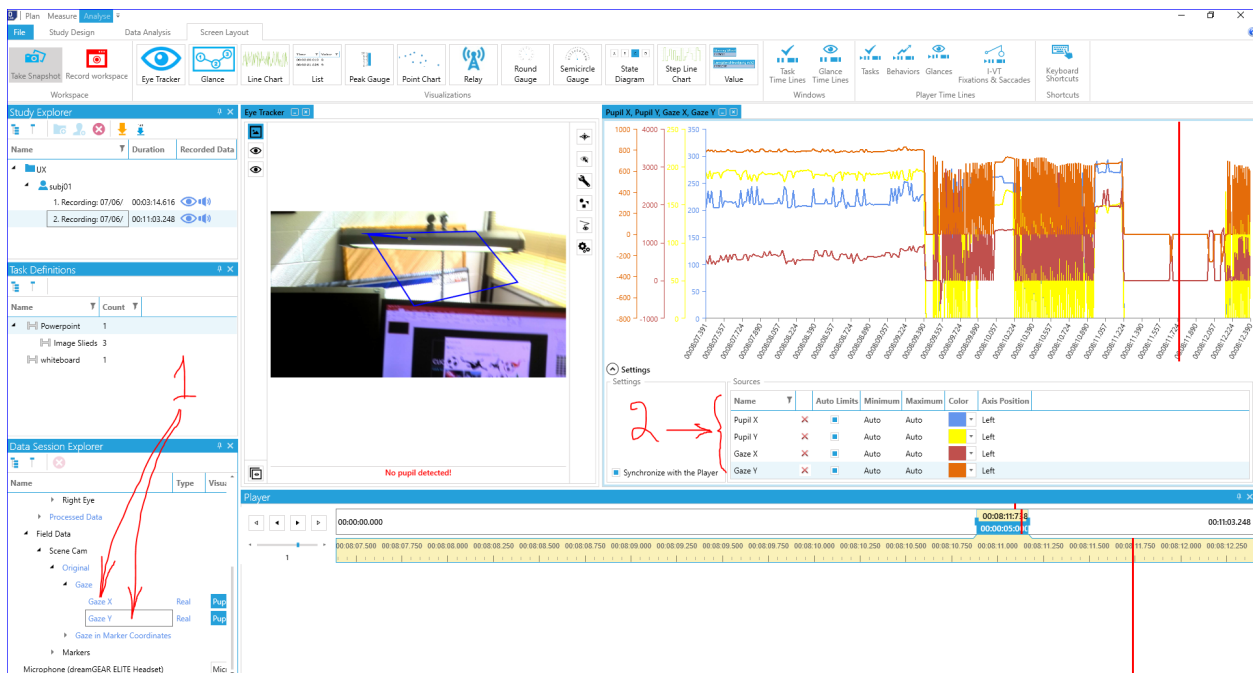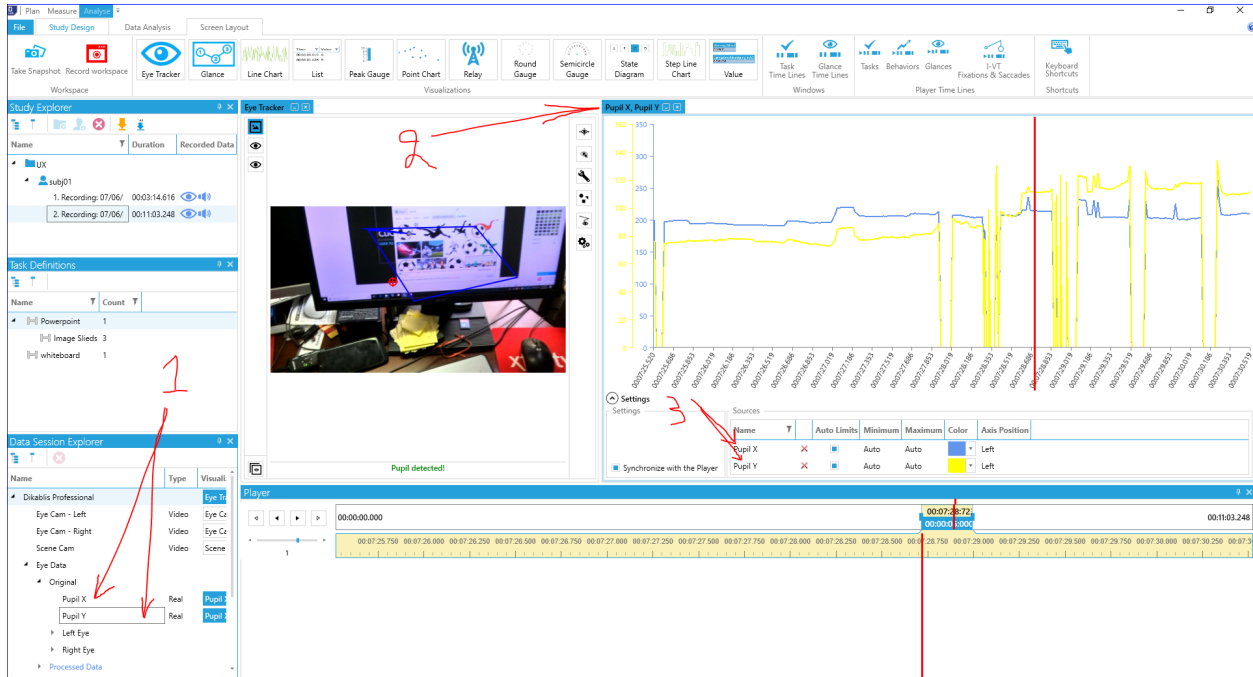
sheet by clicking export.

When you export the data, you should go to excel and import it from data, click on text.

After this you choose your file, and make sure that you click tap. You can examine the data below before you click okay.
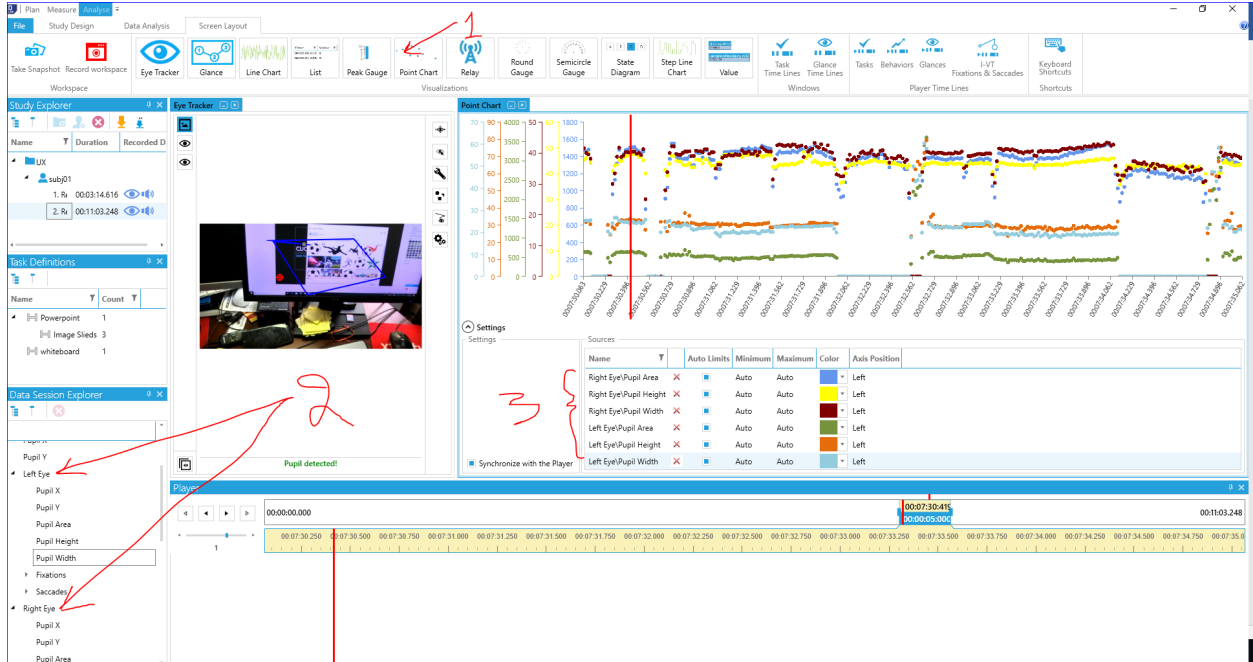
Line Chart – Pupil X & Pupil Y, and Gaze X & Gaze Y

Point Chart

chart that plots day-to-day movements without taking into consideration the passage of time. It is

very important tool for analysis

References

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