

Eyelink Stimulus Presentation

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- 软件介绍
- 准备事项
- 简单示例
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学习资源

学习资源

SR Research官网: <https://www.sr-research.com/>

SR Research论坛: <https://www.sr-support.com/>

学习资源

公众号 Eyelink博润视动



刺激呈现软件

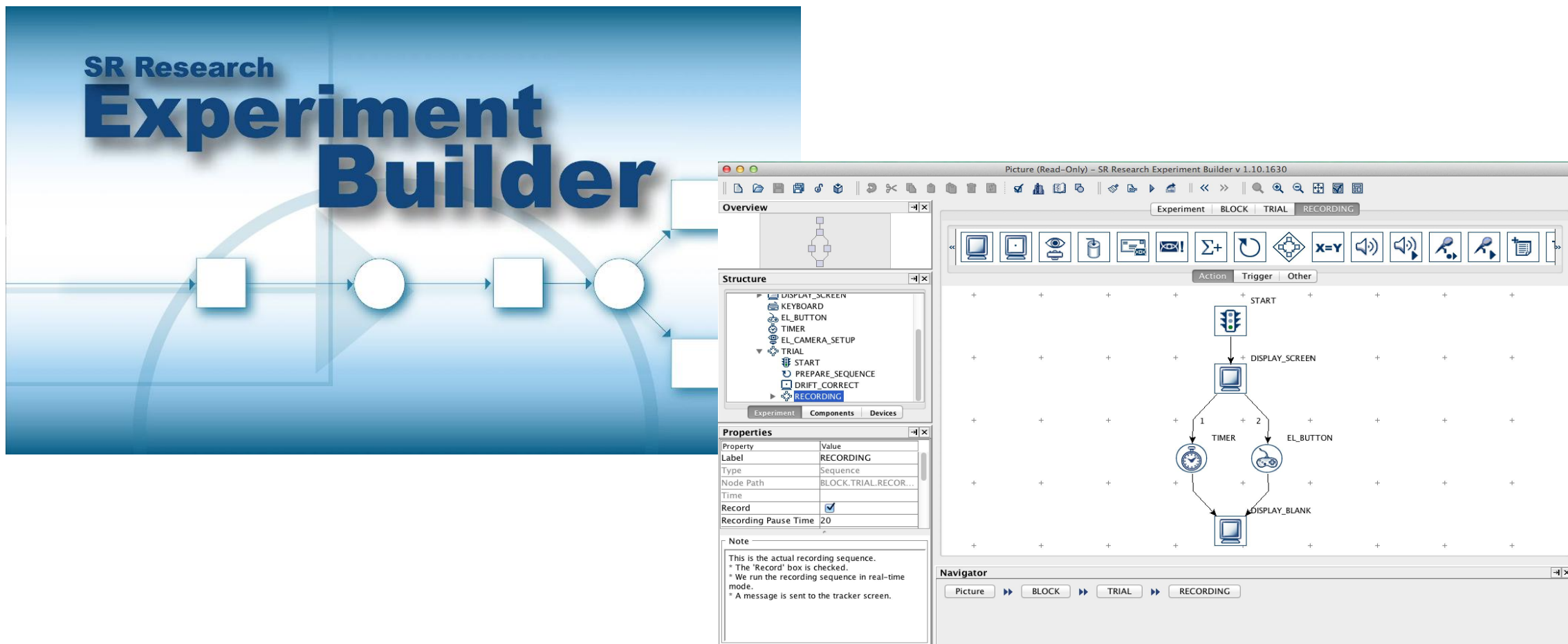
实验设计

数据采集

数据分析及
可视化

- Eyelink programming API
- Experiment Builder
- EDF Access API
- EDF2ASC
- Data Viewer

官方编程软件：Experiment Builder



The image displays the SR Research Experiment Builder software interface, which is used for creating and running eye-tracking experiments. The interface is divided into several panels:

- Overview:** Shows a high-level flowchart of the experiment sequence.
- Structure:** A tree view showing the hierarchical organization of the experiment components, including DISPLAY_SCREEN, KEYBOARD, EL_BUTTON, TIMER, EL_CAMERA_SETUP, TRIAL, START, PREPARE_SEQUENCE, DRIFT_CORRECT, and RECORDING.
- Properties:** A table for configuring the selected component. The table has two columns: Property and Value.
- Diagram:** A visual representation of the experiment flow, showing the sequence of events and their timing.
- Navigator:** A panel at the bottom showing the current state of the experiment (BLOCK, TRIAL, RECORDING) and providing navigation controls.

The **Properties** table is as follows:

Property	Value
Label	RECORDING
Type	Sequence
Node Path	BLOCK.TRIAL.RECOR...
Time	
Record	☒
Recording Pause Time	20

The **Diagram** panel shows a flowchart with the following steps:

- START
- DISPLAY_SCREEN
- TIMER (1)
- EL_BUTTON (2)
- DISPLAY_BLANK

Eyelink programming API

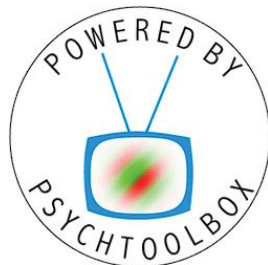
第三方刺激呈现软件

- E-Prime
- Psychtoolbox
- PsychoPy
- Open Sesame
- NBS Presentation

E-Prime



Psychtoolbox



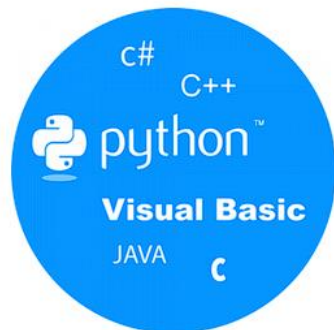
PsychoPy



编程语言

- C#
- C / C++
- Python
- LabView
- Matlab
- Etc.

Programming Languages



注意:

使用第三方软件或语言编程时需要安装Eyelink SDK:

DevKit版本为2.1.1, 支持Windows 7,8,10和MacOS系统 (注意区分系统版本号)

链接:

<https://pan.baidu.com/s/1MiQN7JgzusjK4bCb9NbVQA>

密码: el2c

下载EB

从北京博润视动公众号或者SRR官网下载最新版本。目前版本为2.3。

Experiment Builder版本为2.3.38，支持Windows 7,8,10和MacOS 10.12及以上的操作系统，百度网盘下载链接如下：

Windows:

链接: <https://pan.baidu.com/s/1Ntnd5-CGEcOhipxPnqHFXQ> 密码: fnt1

MacOS:

链接:
<https://pan.baidu.com/s/1YHIC243IHhDo65DQ6RKoSQ> 密码: j6pi

08-26-2020, 02:22 PM

#1

Experiment Builder 2.3.38

SR Research Experiment Builder is a visual experiment creation tool that runs on Windows and macOS.

Recent / Future OS Releases

The release of Windows 11 and macOS BigSur and Monterey may involve changes that impact the functionality of our software. We are currently testing our software on these OS versions and will update their supported status as soon as our tests are complete.

Experiment Builder is backwards compatible (projects created in earlier versions can be opened and edited in later versions), and any existing deployed projects are standalone executables, so upgrading to the latest version will have no impact on data collection / ongoing research.

Please download the latest version from the links below.

Microsoft Windows 32-bit (x86) and 64-bit (x64) releases of Windows 7, 8, & 10

- Experiment Builder 2.3.38

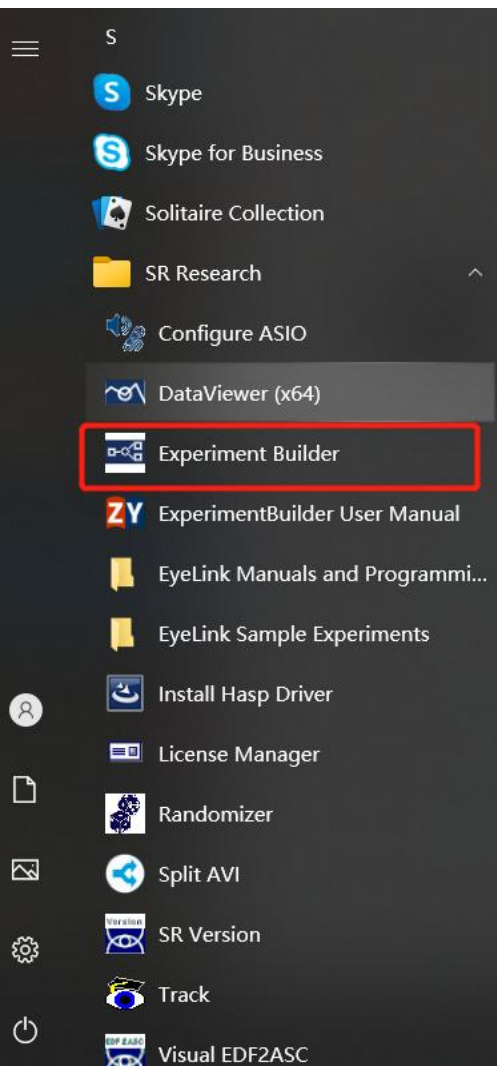
macOS 10.12 Sierra to 10.15 Catalina

- Experiment Builder 2.3.38

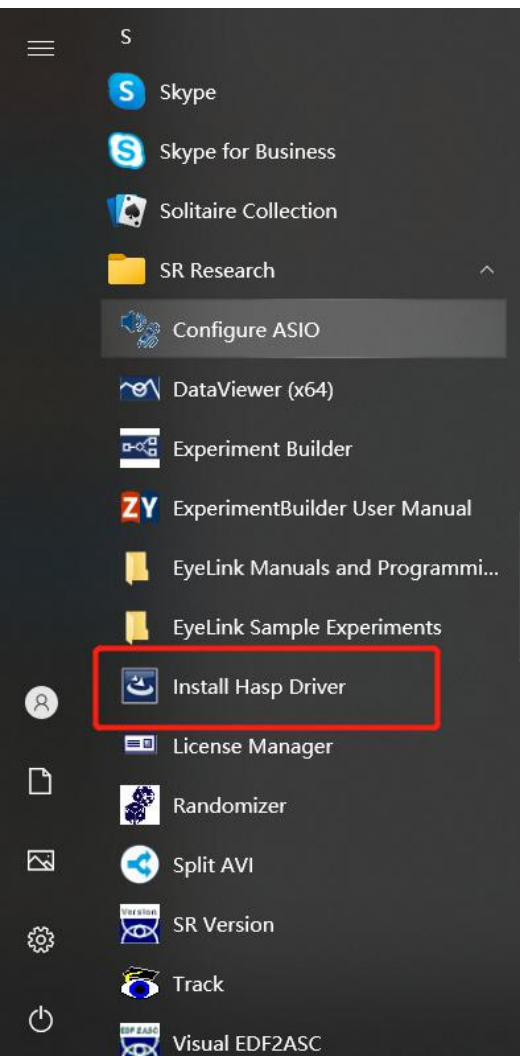
Please note that changes in recent versions of macOS may show inconsistency in visual stimulus presentation timing. While macOS can be used to develop and debug experiments, if accurate display timing is critical we recommend deploying the task on a Windows PC for data collection.

安装的时候需要注意。。

- 安装的时候关闭所有管家软件和杀毒软件，**按默认路径安装**在C盘， 建议不要更改安装路径， 否则程序运行可能会出错。
- 安装完成后， 在 开始 -- SR Research文件夹里面可以看到EB及其他eyelink相关软件。
- 如果安装了2.3.38版本后， 打开EB没反应， 可以安装2.3.527版本的EB。 可以在官网或联系工程师下载。



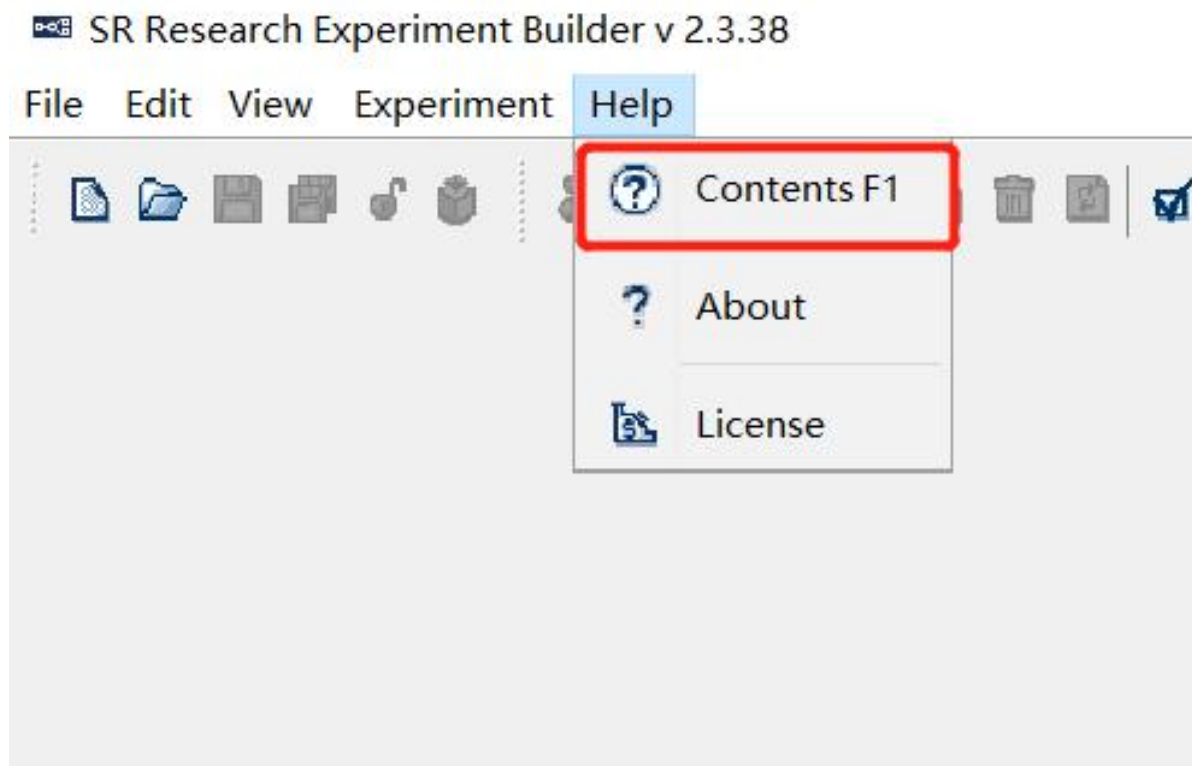
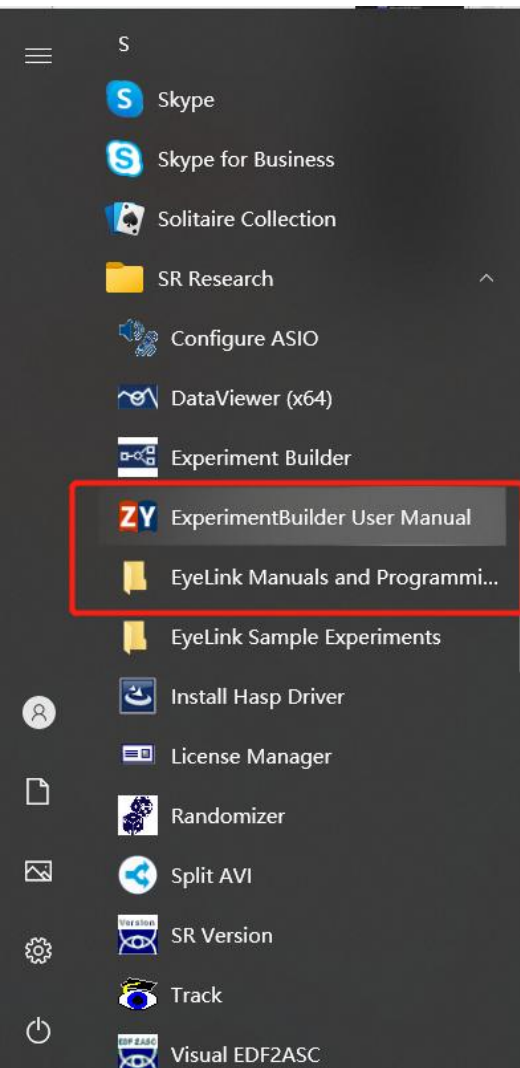
软件授权之加密狗问题



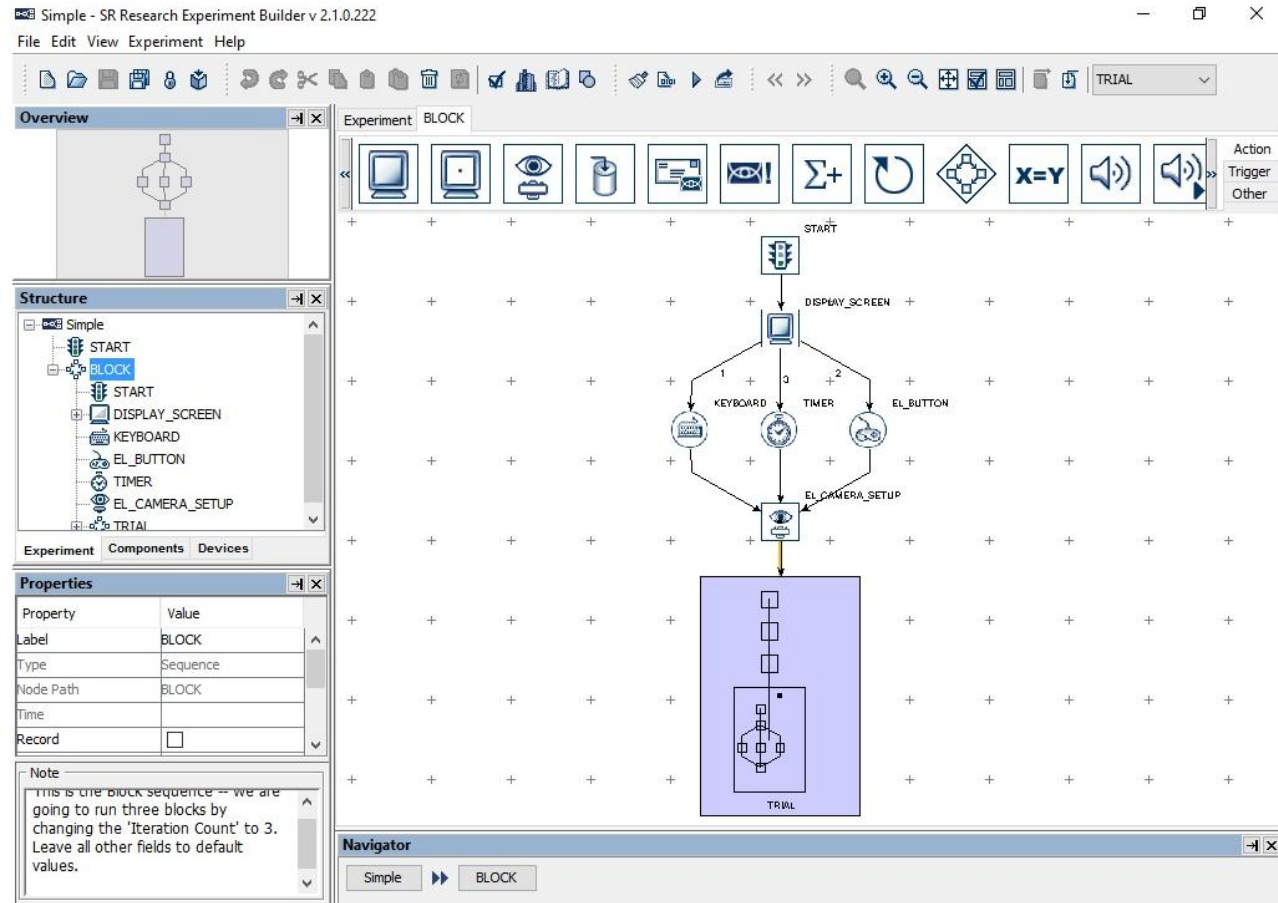
- EB软件在首次安装时，会附带时长为30天的Demo License。即30天之内是可以不用加密狗就可以打开EB软件的。
- **注意：Demo License和使用加密狗正式授权之间不互通。**换句话说，在Demo License下编写的实验程序无法在插了加密狗的条件下打开。而且在Demo License下运行的程序会有一个去不掉的红色水印，一般不能用于正式实验。
- 试用期过后需要插上**EB**的加密狗才能正常使用软件

学习EB的第一件事

- 学会查看和使用**EB**手册，90%的问题都可以轻松解决!



Experiment Builder Graphical User Interface



Experiment Builder Life Cycle

- Experiment Design
- Building and Test-running Experiment
- Deploying Experiment
- Participant Data Set Randomization (optional)
- Data Collection
- Data Analysis

Working with Files——文件

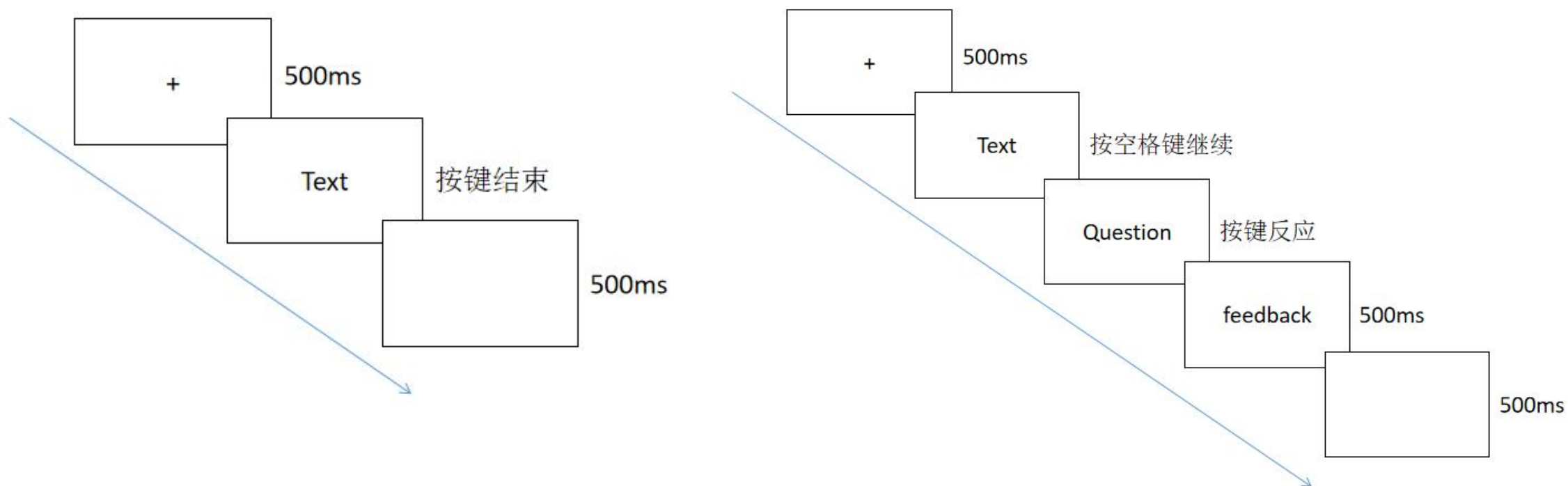
- Creating a New Project
- Saving a Project
- Saving an Existing Project to a Different Directory
- Opening a Project
- Reopening a Recent Experiment Project
- Unlock/Lock a Project
- Packing an Experiment
- Unpacking an Experiment
- Experiment Node Exporting
- Experiment Node Importing
- Building an Experiment
- Cleaning an Experiment
- Test-running an Experiment from EB Application
- Deploying an Experiment
- Running an Experiment for Data Collection
- Converting Projects between Windows and macOS
- Running Experiments in EB 2.3

Designing an Experiment in Experiment Builder

- Hierarchical Organization of Experiments
- Experiment Graph: Flow Diagram
- Actions
- Triggers
- Other Node Types
- Sequence
- References and Equations
- Clearing Trigger Input Queue

准备事项

实验流程

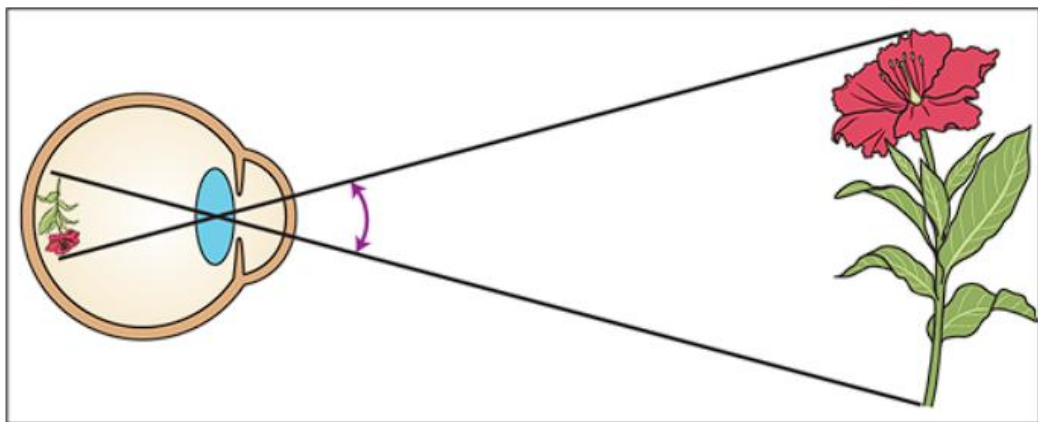


好消息：实验范式和模板可以在官网下载！

视角

Visual Angle

视角 (Visual Angle) 的概念对于眼动追踪研究的许多方面至关重要。眼动追踪过程中到处都可以见到视角这个概念。



例如，研究人员希望确保其刺激屏幕符合系统的“可跟踪范围”要求，如可跟踪范围为水平 32° 和垂直 25° ；

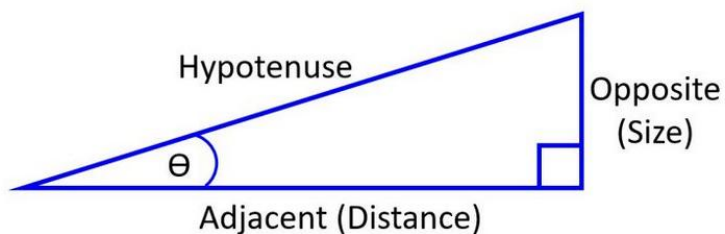
其他研究人员想要确保屏幕上的刺激位于 5° 的视角位置，或者目标出现在距屏幕中心 $\pm 10^{\circ}$ 的视角位置。

来自眼动仪的凝视数据通常以屏幕像素坐标报告，而其他重要指标如扫视幅度和速度则以视角度数和视角度数/每秒为单位报告。

同样，凝视数据通常根据眼睛的速度解析为扫视和注视，眼动仪以视角度数/每秒为单位对其进行测量。

最后，以视角度数报告了许多眼动的数据质量（和眼动仪规格）的关键指标，如“准确性”和“精度”。EyeLink 1000 Plus可以精确到 $<0.5^{\circ}$ 的视角。

Visual Angle



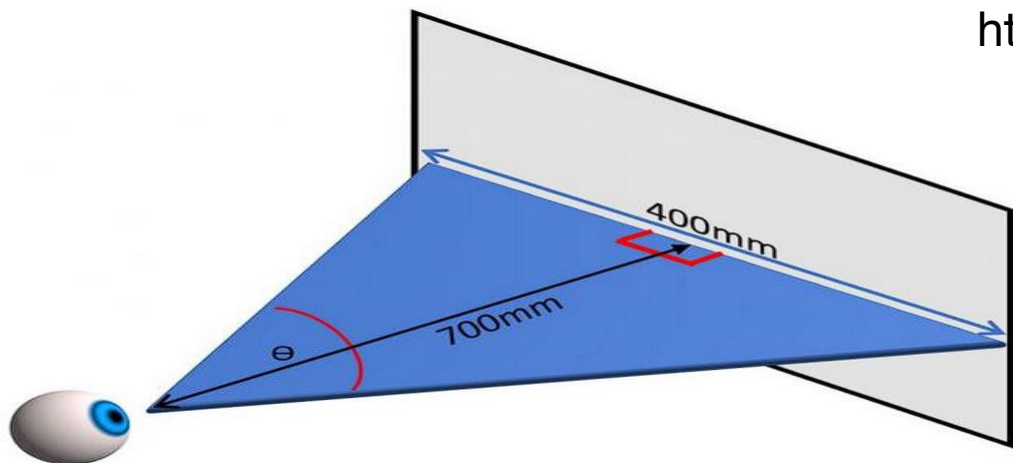
$$\theta = 2 * \arctan \left(\text{Size} / 2 * \text{Distance} \right)$$

Size=400mm, Distance=700mm, 代入, 得:

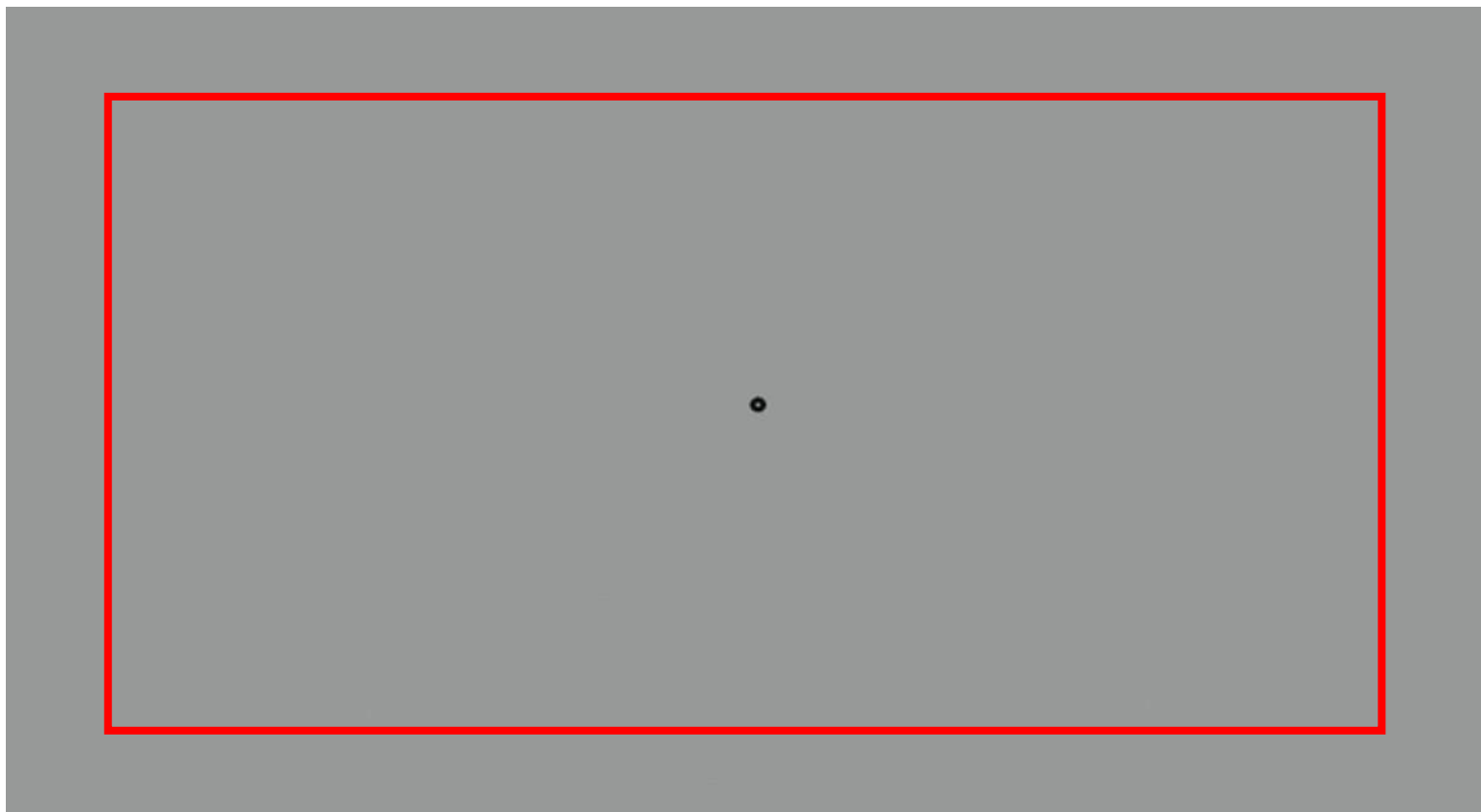
$$\theta = 2 * \arctan \left(400 / 2 * 700 \right) = 31.9^\circ$$

SR Research为大家提供了在线计算视角的小工具, 网址如下:

<https://www.sr-research.com/visual-angle-calculator/>



刺激呈现位置



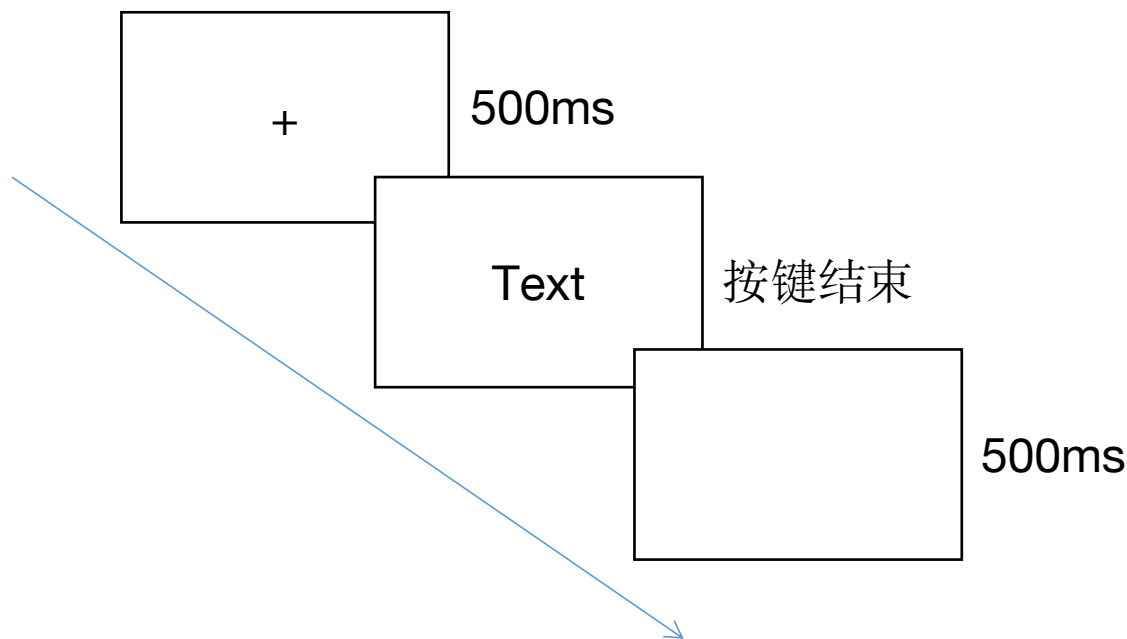
创建实验条件表格

TrialID	Text	ImageName	Condition1	Condition2	Question	CorrectAnswer
1	Text1	1. jpg	1	a	question1	f
2	Text2	2. jpg	1	a	question2	j
3	Text3	3. jpg	2	a	question3	f
4	Text4	4. jpg	2	b	question4	j
5	Text5	5. jpg	3	b	question5	f
6	Text6	6. jpg	3	b	question6	j

简单示例

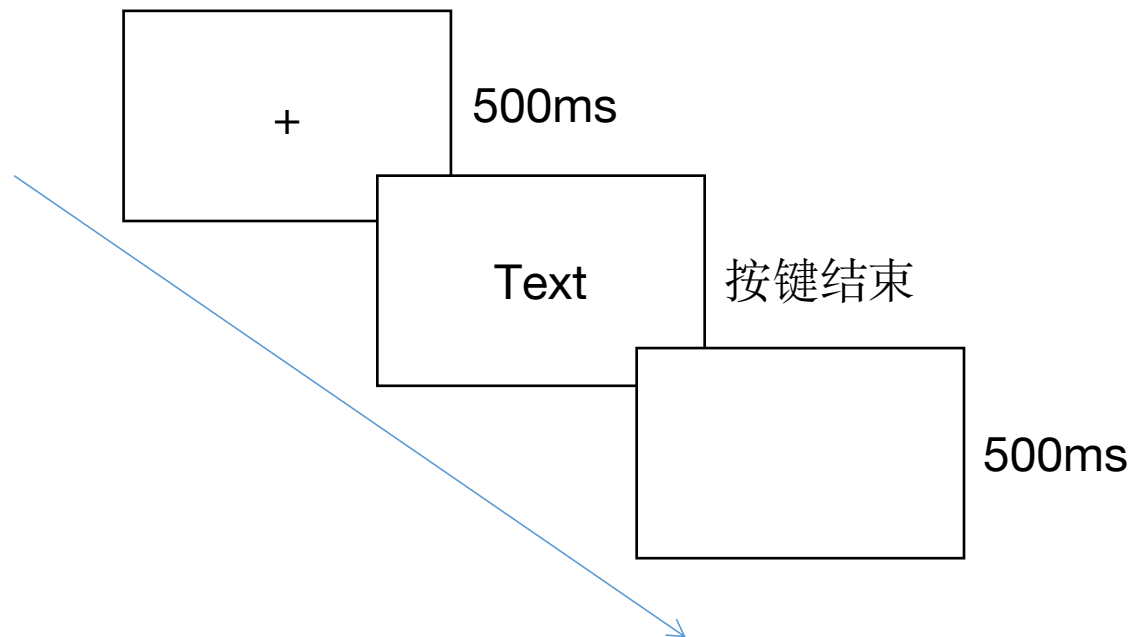
实验设计1

- 眼动仪型号: 1000plus
- 屏幕分辨率: 1024x768
- 屏幕刷新率: 60hz
- 采样率: 1000hz
- 实验内容: 文本阅读
- 实验设计: 单因素2水平被试内设计
- 实验材料: 中文和英文文本



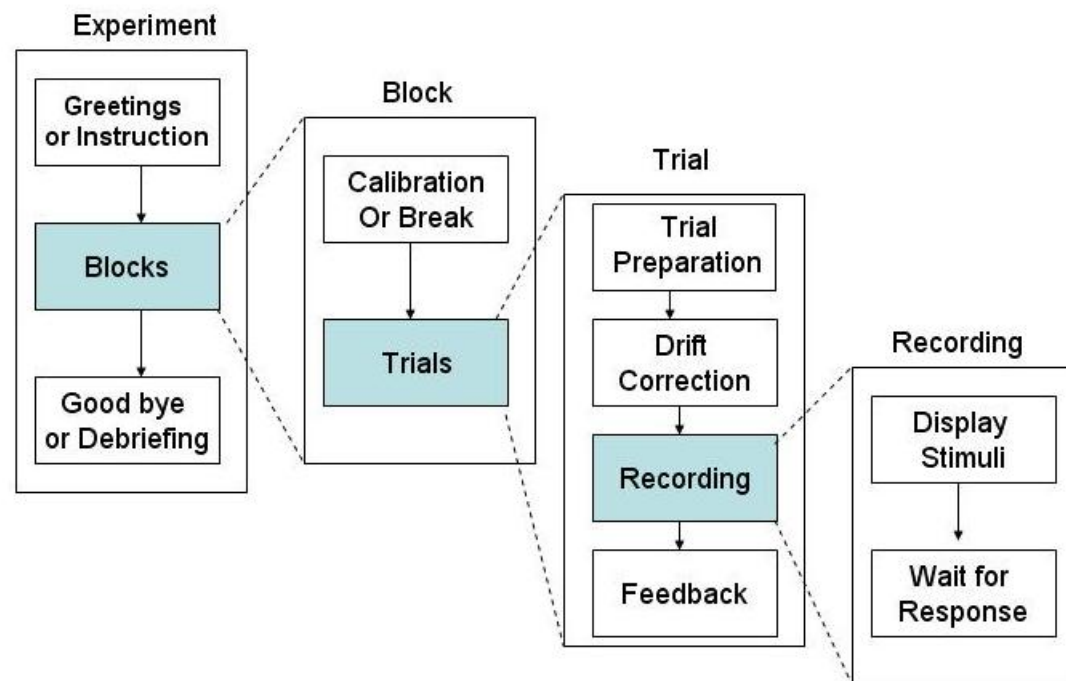
实验设计1

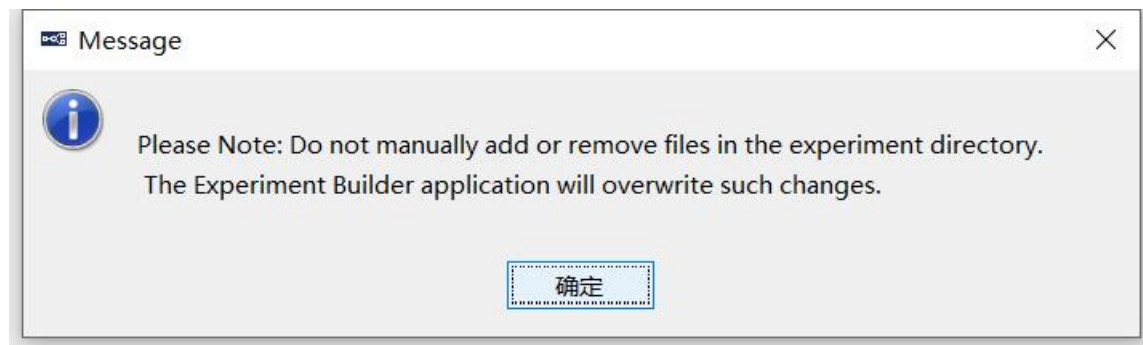
- 实验框架的搭建
- 试次循环和Datatype
- 变量引用
- 行为数据（反应时和按键反应）的记录
- 兴趣区
- 兴趣期和Message
- Test Run
- **Deploy**



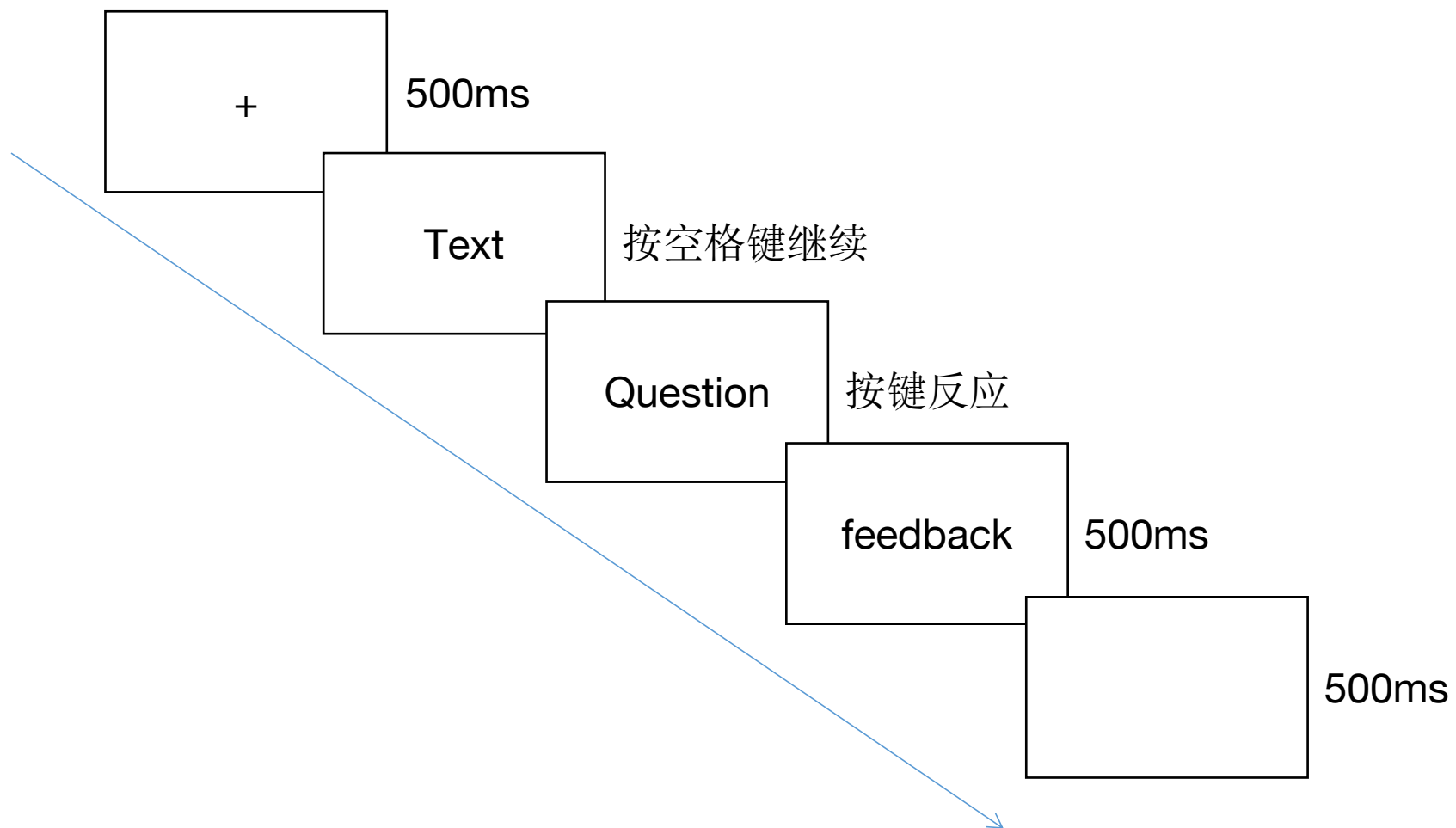
Designing an Experiment in Experiment Builder

- Hierarchical Organization of Experiments





实验设计2



兴趣区 (Interest Area)



IA1



IA2

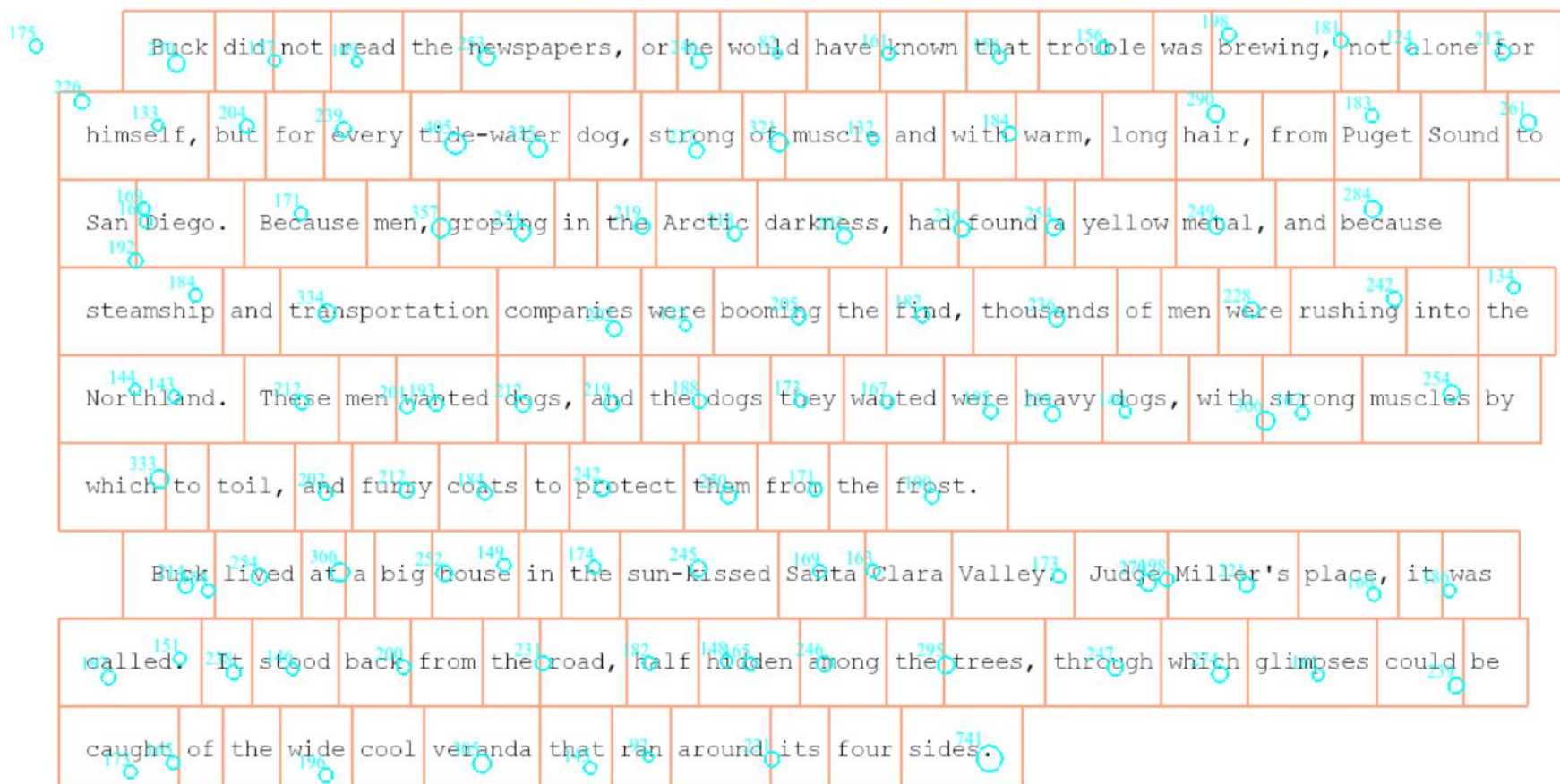


IA3



IA4

兴趣区 (Interest Area)



使用Auto Word Segment——英文

Step 1: 开启Auto Word Segment功能

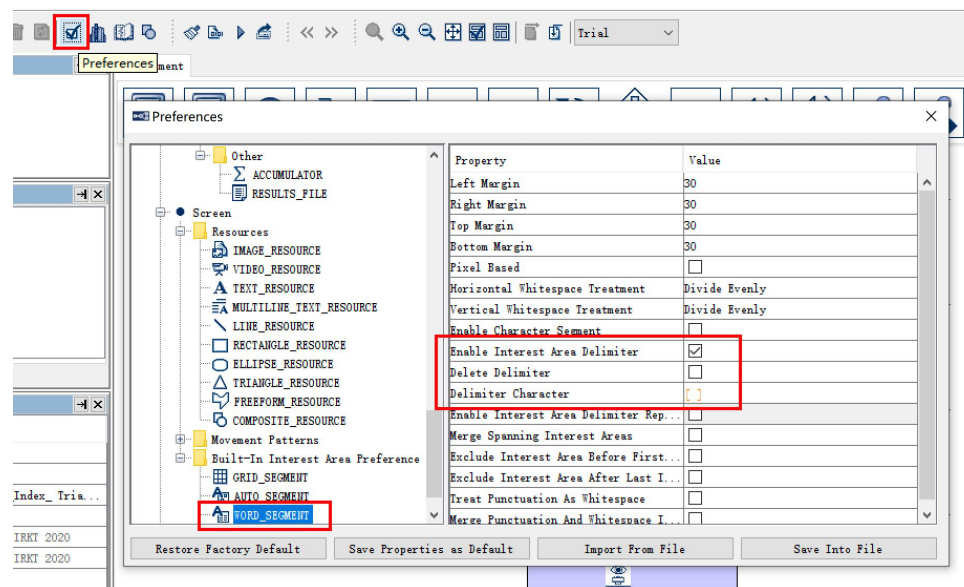
在工具栏中点击Preference，在左侧的树状结构中依次点击“Preference - Screen - Built-in Interest Area Preference - Word Segment”，找到Word Segment。

在此步设置中，我们需要执行三处设置：

将Enable Interest Area Delimiter设置为True，开启分词功能；

将Delete Delimiter设置为False，设置不隐藏分词符；

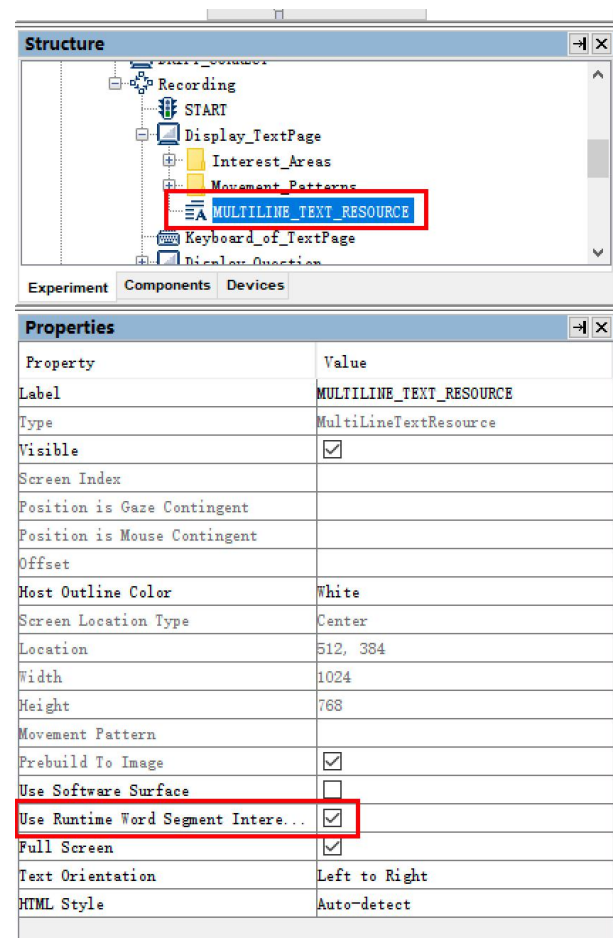
将Delimiter Character设置为“ ”，即空格。



使用Auto Word Segment——英文

Step 2: 对特定的TextSource进行Auto Word Segment

回到呈现文本刺激的Display控件中，选中承载Datasource中文本内容的MULTILINE_TEXT_RESOURCE，将其Use Runtime Word Segment InterestArea设置为True。



使用Auto Word Segment——中文

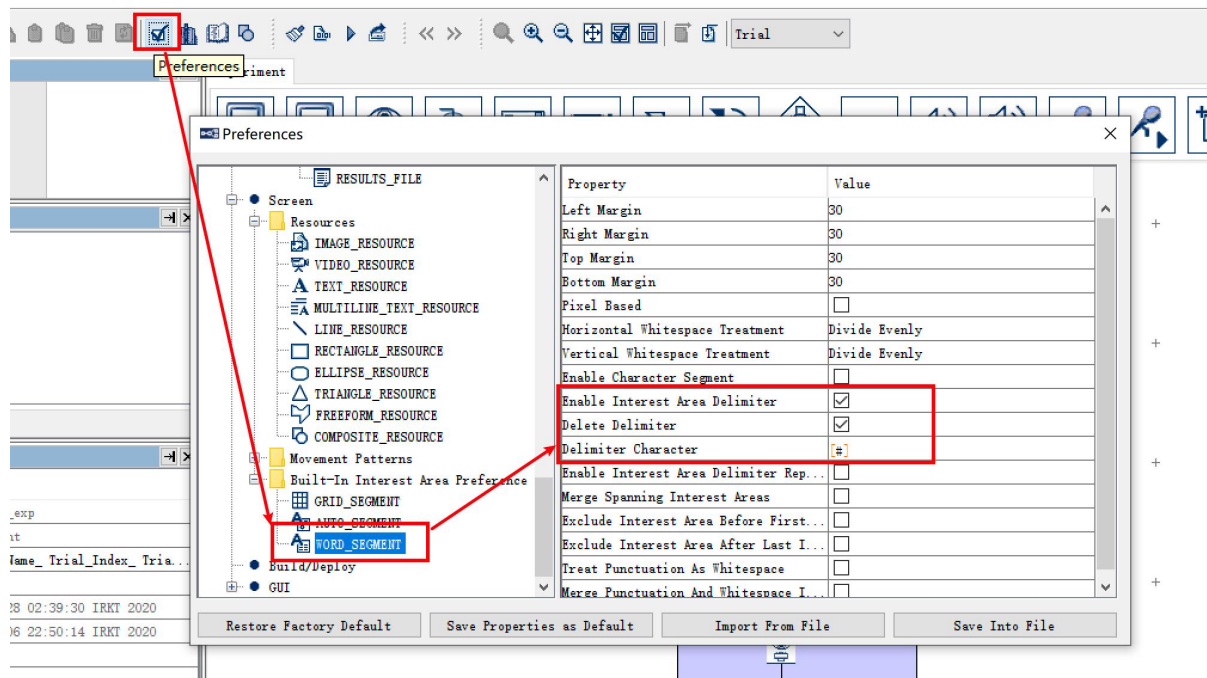
Step 1: 开启Auto Word Segment功能

在此步设置中，我们需要执行三处设置：

将Enable Interest Area Delimiter设置为True，此步开启分词功能；

将Delete Delimiter设置为True，此步设置隐藏分词符；

将Delimiter Character设置为我们制定的字符“#”。



使用Auto Word Segment——中文

Step 2: 修改DataSource

向我们的文字中加入分词符“#”，重新写入DataSource中。

天天玩苹果手机，拿不到博士学位。

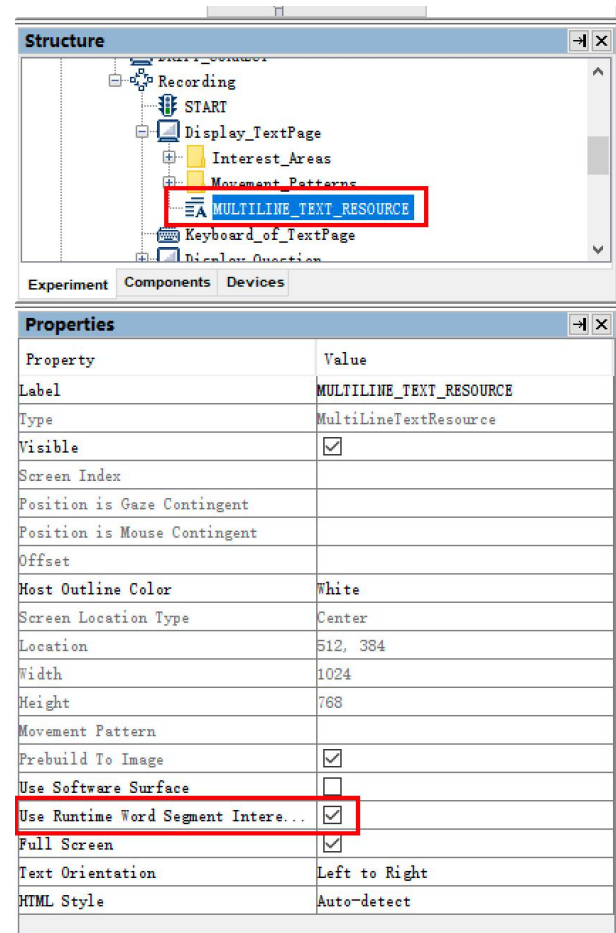


天天#玩#苹果#手机，#拿#不到#博士#学位。

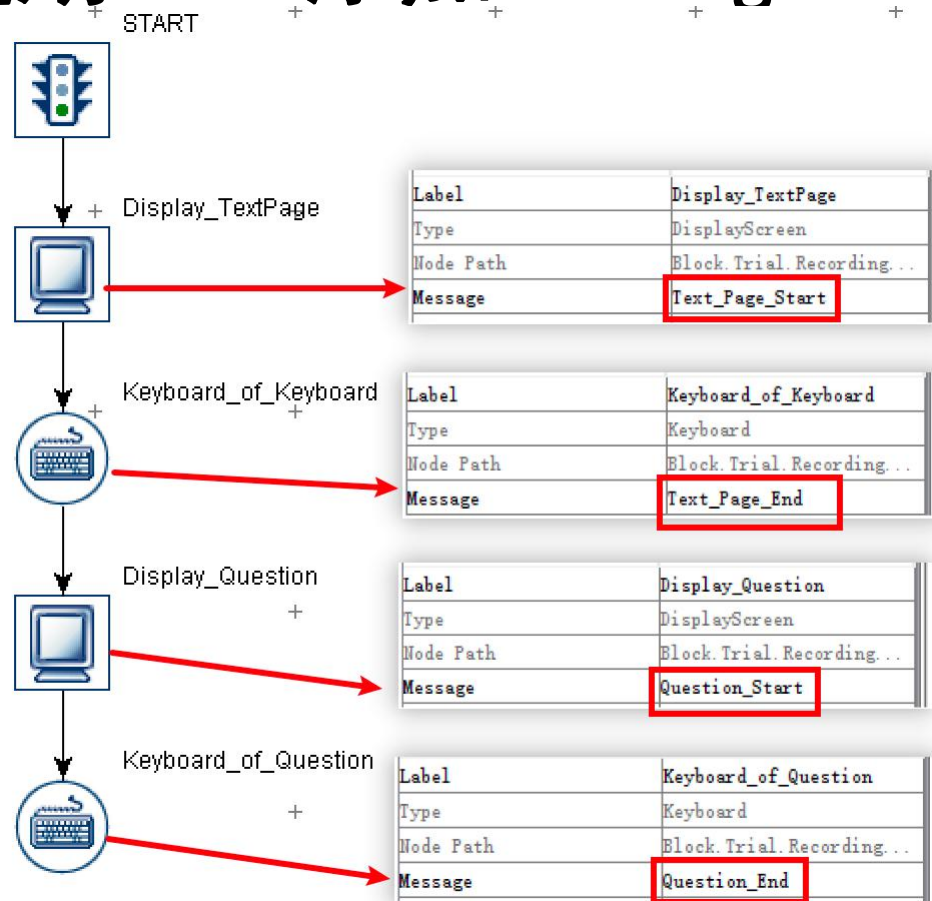
使用Auto Word Segment——中文

Step 2: 对特定的TextSource进行Auto Word Segment

回到呈现文本刺激的Display控件中，选中承载Datasource中文本内容的MULTILINE_TEXT_RESOURCE，将其Use Runtime Word Segment InterestArea设置为True。



兴趣期——添加Message



由主试主观划定的感兴趣的时间段

与实验设计强相关

Test Run and Deploy

- Test Run只能用于测试程序，需要注意的是，用test run采集的数据会不断覆盖，因此不能用test run采集正式实验的数据！正式实验的数据采集需要用deploy后的程序去采集！
- 程序经过测试后如果没有发现问题，建议先做预实验，采集几个数据并完整地分析一遍。

注意事项

Dummy Mode

The screenshot displays the EYELINK software interface. The top panel, titled 'Structure', shows a tree view of devices with 'EYELINK' selected. Below it are tabs for 'Experiment', 'Components', and 'Devices'. The bottom panel, titled 'Properties', shows a table of configuration settings. The 'Dummy Mode' checkbox is currently unchecked. A yellow tooltip with the text 'false' is visible next to the 'Link Filter Level' property.

Property	Value
Tracker Address	100.1.1.1
Tracker Version	Eyelink 1000 Plus
Camera Mount	Current
Dummy Mode	☐
Data Processing	
Link Filter Level	NORMAL false
File Filter Level	HIGH
Eye Event Data	GAZE
Saccade Sensitivity	NORMAL
Eye Tracking	
Pupil Size	AREA
Fixation Update Interval	50
Fixation Update Accumulate	50
Auto Calibration Message	☒

Experiment Builder Project Check List

The screenshot displays the SR Research Experiment Builder software interface. The title bar reads "SR Research Experiment Builder (Document Version 2.3.1)". The interface is divided into a left sidebar with a tree view and a main content area on the right.

Left Sidebar (Tree View):

- Experiment Node Exporting
- Experiment Node Importing
- Building an Experiment
- Cleaning an Experiment
- Test-running an Experiment from EB Application
- Deploying an Experiment
- Running an Experiment for Data Collection
- Converting Projects between Windows and Mac OSX
- Running Experiments in EB 2.3
- Experiment Builder Graphical User Interface
 - Overview
 - Project Explorer Window
 - Graph Editor Window
- Application Menu Bar and Toolbar
- Designing an Experiment in Experiment Builder
 - Overview
 - Hierarchical Organization
 - Experiment Graph: Flow Diagram
 - Adding Components to an Experiment
 - Linking Experiment Components
 - Linking Rules
 - Actions
 - Triggers
 - Other Node Types
 - Sequence
 - References and Equations
 - Clearing Trigger Input Queue
 - Experiment Graph and Components
 - Overview
 - Graph Editing
 - Components
 - Screen Builder
 - Overview
 - Resources
 - Movement Patterns
 - Interest Areas
 - Resource Operations
- Data Source
- References
 - Overview
 - Using References
 - Entering in Values
 - Entering in References
 - Entering in Equations
 - Reference Manager
- EyeLink Data Viewer Integration
- Custom Class
- Examples
 - Experiment Builder Project Checklist
- Preference Settings
- Revision History

Main Content Area:

Experiment Builder Project Checklist (version 2.3.1)

Users may refer to the following checklist to prevent some common problems in creating and running an Experiment Builder project.

If this is an EyeLink experiment

- Is there a [recording sequence](#) in your EyeLink Enabled project?
When you check the "Record" property for a sequence in an EyeLink project, Gaze data will be recorded for the duration of that sequence (i.e., a command will be sent to the eye tracker to start recording when the sequence begins and a command will be sent to the eye tracker to stop recording when the sequence ends). This should typically only be enabled for the innermost sequence in the project. Given that recording sequences should only be used to control eye tracker recording and should not be used for looping purposes, the Iteration Count of recording sequences should always be set to 1 and there should never be a Data Source associated with a recording sequence.
- Does the project use the "hierarchical organization" concept of experiment design?
Employing a hierarchical design helps prevent redundancy and reduces overhead by allowing you to reuse the same trial structures to present multiple trials. For instance, sequences allow you to loop through the same sequence of nodes multiple times, while referencing values in the sequence's Data Source to change the properties of experimental events that need to change one trial to the next (e.g., to change the trials' images or sounds or to change the duration of timers from one trial to the next). Please see the Experiment Builder Video Tutorial Series for detailed instructions on how best to utilize hierarchical organization in your project. As a general rule, your project should have a single data source attached to the trial-level sequence. If your project has multiple data sources, or separate sequences/Data Sources for practice vs experimental trials, then it can make project editing and data analysis more difficult than they need to be.
- Has the 'Message' property of the critical nodes (e.g., [triggers](#) and [actions](#) used in the [recording sequence](#)) been filled out?
It is absolutely critical that you check through all the nodes in your recording sequence and make sure that all the important action and trigger nodes have appropriate text in the Message properties. Experiment Builder writes these messages to the EDF file to mark when these important events occur. Without these messages it may be impossible to align the gaze data with stimulus events accurately during data analysis or to use some Data Viewer features such as interest periods. It helps to use messages that will be readily interpretable at the analysis stage - e.g. STIMULUS_ONSET for the relevant display screen node, and TRIAL_END for the final display screen node etc. Please see the Experiment Builder examples for illustrations of the kinds of messages to send.
- Have you checked the Use for Host Display property of one (and only one) display screen node in your [recording sequence](#)?
You will not be able to see your stimuli on the Host PC recording unless you check this property for the most important display screen node in your recording sequence and set the "Draw To EyeLink Host" property of your prepare sequence to "image". Keep in mind only a single Display Screen action's contents can be transferred per trial. [Contents -> Experiment & Graph Components -> Components -> Actions -> Prepare Sequence]
- Has a [Recording Status Message](#) been written to the tracker screen to report progress of experiment testing?
The EyeLink Record Status Message property of a recording sequence allows you to pass a message to the Host PC to provide feedback to the experimenter during data collection. The message will appear in the bottom right of the Record screen on the Host PC, and can be used to provide information about the trial number, trial condition, etc. [Contents -> EyeLink to Data Viewer Integration -> Recording Status message]
- Has a [PREPARE_SEQUENCE](#) action been added before each [recording sequence](#)?
The prepare sequence node preloads stimulus resources (images, video, audio) for the upcoming recording sequence, transfers one display screen action's contents to the Host PC for experimenter feedback during the trial, and reinitializes the nodes of the upcoming sequence. It should be placed immediately before the drift correct action that precedes the recording sequence or immediately before the recording sequence if a drift correct is not used. Prepare sequences should not be placed at any higher levels in the experimental structure.
- Have you prepared [interest areas](#) for screen resources which you intended to analyze later?