



Flying Whale

xCBM: Color Blindness Master

for Unity®

User Guide



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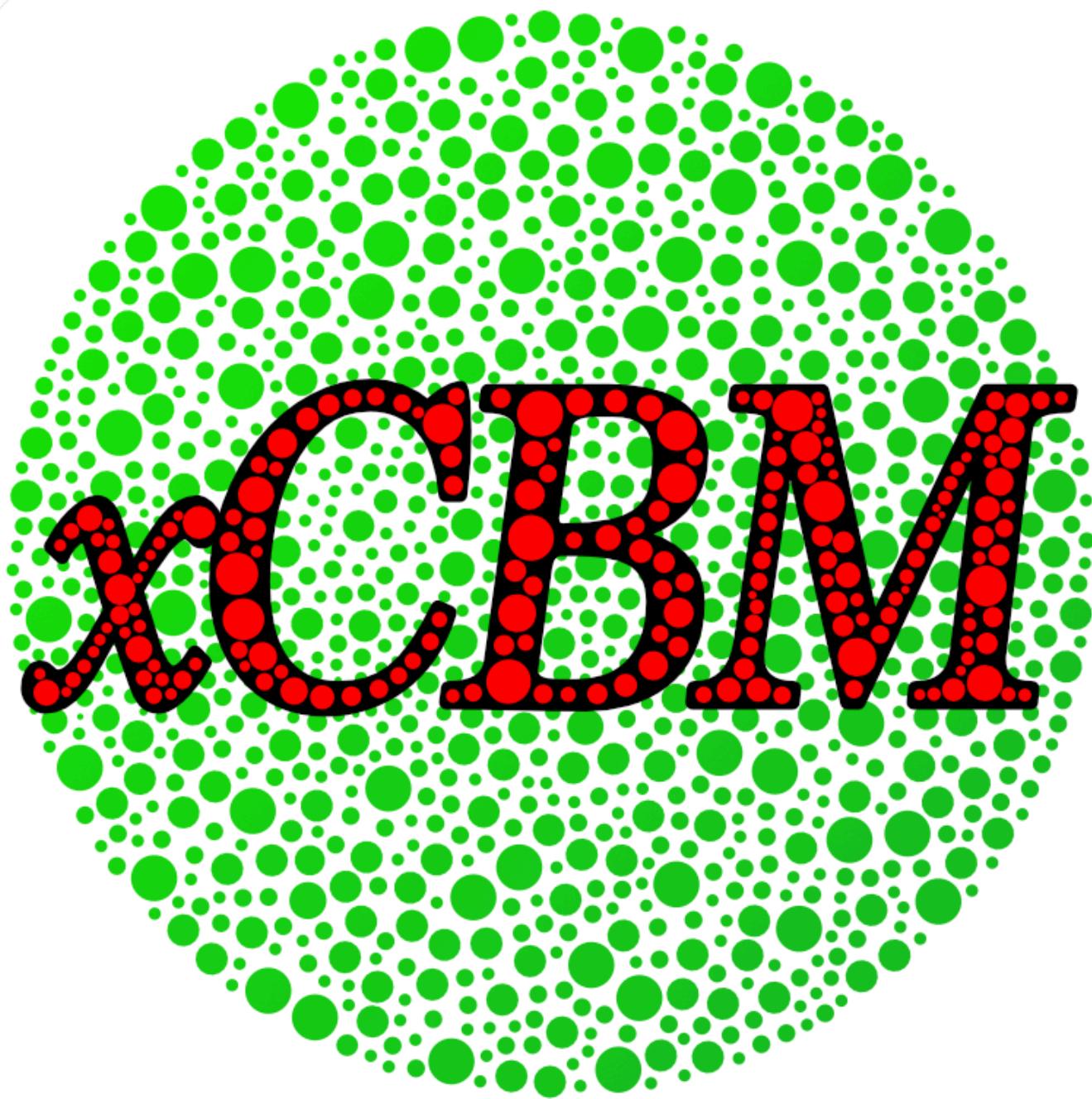
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Although all information were compiled with great care accuracy of information can not been guaranteed.

xCBM: Color Blindness Master can not simulate every aspect of color blindness and color vision deficiency, therefore previews may differ from what an individual person with color blindness or color vision deficiency sees.

xCBM: Color Blindness Master requires one license per seat.

xCBM at a Glance



Thanks for purchasing xCBM and thereby feeding an indie developer!

I'd highly appreciated if you support xCBM with a Review in the Unity Asset Store®.
<https://www.assetstore.unity3d.com/#/publisher/4046>

Overview



With „xCBM: Color Blindness Master“ you've got the powerful and easy-to-use Unity® Editor Extension that helps you to make your game ready for color blind players.

It contains the tools „xCBM Preview“ and „xCBM Gallery“ to give you previews of your game with different types of color blindness. With these tools you can easily see what needs to be changed and what not. xCBM's Delegates can be used to hook your own color blind modes and test them.

All relevant types of color blindness are included („ScreenCaps“). Every ScreenCap comes with additional information to help you to get an overview.

xCBM supports all other Unity Editor Extensions (e.g. GUI, 2D, etc.).

Contact

If you have any problems, questions, feedback or feature requests please contact me.

Email:

support@flyingwhale.de

Unity® Forum:

<http://forum.unity3d.com/threads/xcbm-color-blindness-master.396978/>

Stay up to date

Twitter (@ThavronFW):

<https://twitter.com/ThavronFW>

YouTube:

<https://www.youtube.com/channel/UC2CU8aCaWcIJ5C6dOQFzdVg>

All assets by Flying Whale:

<https://www.assetstore.unity3d.com/#/publisher/4046>

See chapter „Support & Contribution“ for a complete list of contact details and links.

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Getting Started



Learn all the basics on how to setup and use „xCBM: Color Blindness Master“.
You'll also get a basic overview of all xCBM windows.

Import

Follow these steps to import xCBM after purchasing it:

1. Open „Asset Store“ window of Unity
2. Login with your Unity Asset Store® account
3. Open „Download Manager“
4. Find the xCBM entry under Packages
5. Click on „Download“ if the package wasn't downloaded yet
6. Click on „Import“ and ensure everything is selected
7. Now there is a new folder named „xCBM“ in your Project

After import all xCBM windows can be found in Unity's menu bar under „Window/xCBM“. Reopen Unity if that's not the case.

Note: It is not recommended to move the „xCBM“ folder to another location. If you want to move it nevertheless ensure it's NOT located under the folder „Editor“.

Basic Setup

To get started select the ScreenCaps (color blindness types) you'd like to preview.

ScreenCap Selection

In xCBM a ScreenCap is a combination of a type of color blindness and additional informations.

1. In xCBM Options (Unity's menu bar: Window/xCBM) goto to section „ScreenCaps“.

Color Blindness Previews ('ScreenCaps')					
Active	Medical Name	Colloquial Name	Stats (% Male)	Stats (% Female)	Description
<input checked="" type="checkbox"/>	Normal	unaltered	91.2%	99.57%	Unaltered rendering result
<input checked="" type="checkbox"/>	Deuteranomaly	green deficiency	5%	0.35%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Protanopia	red blind	1.3%	0.02%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Protanomaly	red deficiency	1.3%	0.02%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Deutanopia	green blind	1.2%	0.01%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Tritanopia	blue blind	0.001%	0.03%	Difficulties: blue vs green and yellow vs red/violet
<input checked="" type="checkbox"/>	Tritanomaly	blue deficiency	0.0001%	0.0001%	Difficulties: blue vs green and yellow vs red/violet
<input checked="" type="checkbox"/>	Achromatopsia	color blind	n/a	n/a	Very rare. Difficulties: distinguish between colors
<input checked="" type="checkbox"/>	Achromatomaly	color deficiency	n/a	n/a	Very rare. Difficulties: distinguish between colors

2. Activate the ScreenCaps you'd like to preview.

Tips:

- You can sort the list by clicking on the column headers. The sorting does also effect all other xCBM windows.

Basic Use

After you've imported xCBM and done the basic setup you can now use it.

1. Open xCBM Preview or xCBM Gallery (Unity's menu bar: Window/xCBM) and position the window as you like.
2. xCBM is now ready. You can manually update xCBM Preview and xCBM Gallery by clicking on „1x“ or activate auto update in Edit mode by toggling „Edit“ in its toolbar.

Notes:

- xCBM adds a xCBMProxy GameObject to the Hierarchy (see chapter „FAQ“ for details).

Basic Overview

Here you'll get a basic overview of the xCBM windows.

xCBM Preview

Use xCBM Preview to focus on one type of color blindness. You can quickly switch between ScreenCaps by using the dropdown.

You can manually update the displayed ScreenCap or activate auto update in Edit, Pause and Play mode.

Note: See chapter 3 „xCBM Preview“ for a detailed description.

xCBM Gallery

Use xCBM Gallery to display and compare several ScreenCaps at the same time.

You can manually update all ScreenCaps or activate auto update in Edit and Pause mode.

Note: See chapter 4 „xCBM Gallery“ for a detailed description.

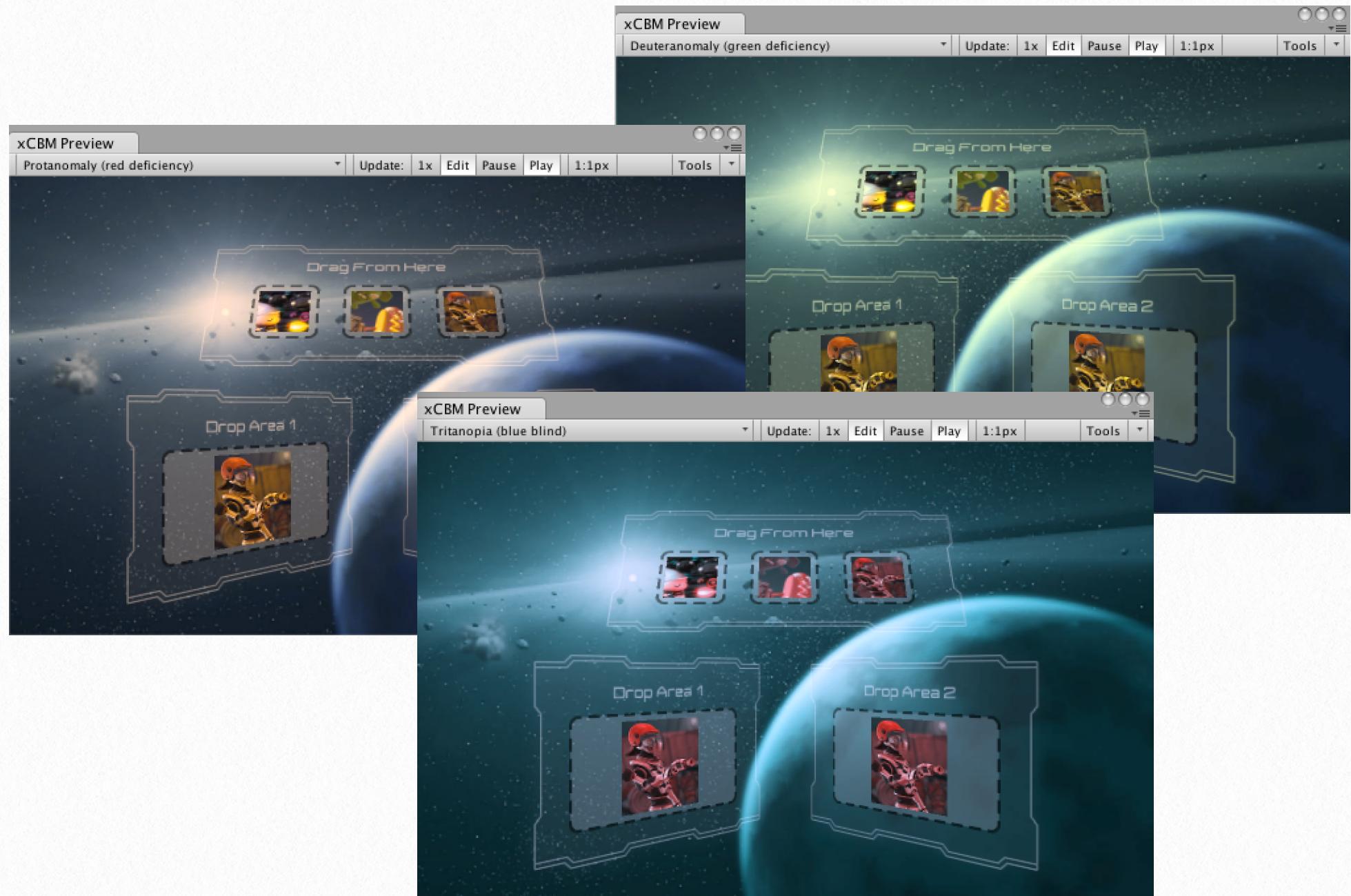
xCBM Options

Use xCBM Options to setup xCBM and select the ScreenCaps you'd like to preview.

Note: See chapter 5 „xCBM Options“ for a description of all options

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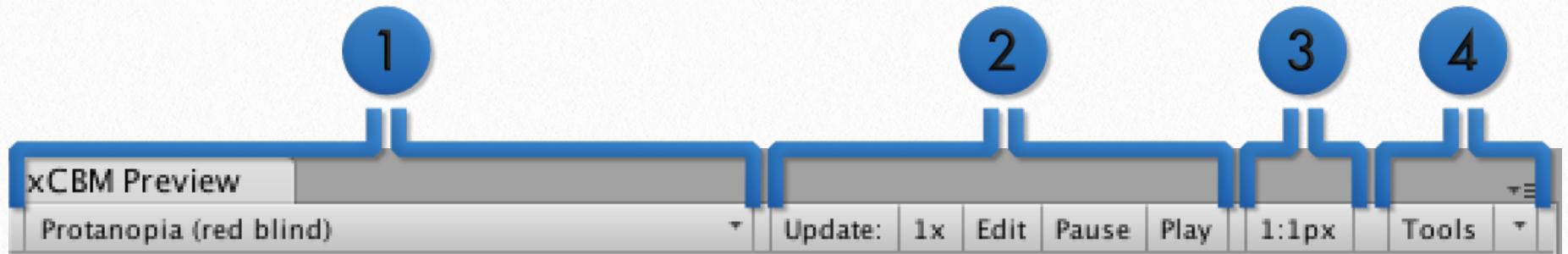
xCBM Preview



Use xCBM Preview to focus on one ScreenCap and see how the color blindness type affect your game.

xCBM Preview's Toolbar

xCBM Preview's toolbar consists of three sections:



1. ScreenCap List

The list contains all ScreenCaps you've activated in xCBM Options.

Just pick the one you'd like to preview.

Tip: ScreenCap order can be changed by sorting in xCBM Options.

2. Update

Here you can control when xCBM Preview updates the ScreenCap.

You've four update options:

1. 1x

Use the „1x“ button to do a manual update whenever you like. Manual update does work in all modes.

2. Edit

Activate „Edit“ mode update to automatically update whenever the scene has changed. Does not update in Pause and Play mode.

3. Pause

Activate „Pause“ mode update to automatically update whenever you pause or step the game. Does not update in Edit and Play mode.

Tip: You can use Unity's hotkeys to pause (CTRL/CMD+SHIFT+P) and step (CTRL/CMD+ALT+P) the game and instantly update the ScreenCap.

4. Play

Activate „Play“ mode update to automatically update while playing the game.

It gives a Live Preview. Does not update in Edit and Pause mode.

3. Preview Mode

Two preview modes are available:

- 1. Scaled**

If „1:1px“ is not activated the ScreenCap is displayed in Scaled mode to fit in the xCBM Preview window. You can even preview ultra high resolutions in this mode without messing up your Editor layout.

- 2. 1:1px (pixel perfect)**

Activate „1:1px“ mode to get a pixel perfect preview.

Every pixel of the ScreenCap is displayed as one pixel on your screen.

4. Tools

The Tools list contains the following entries:

- 1. Options**

Opens xCBM Options window.

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xCBM Gallery



Use xCBM Gallery to display and compare several ScreenCaps.

With xCBM Gallery you can easily check multiple different ScreenCaps at the same time for legibility issues and instantly see results of changes.

xCBM Gallery's Toolbar

xCBM Gallery's toolbar consists of three sections:



1. Update

Here you can control when xCBM Gallery updates all active ScreenCaps.

You've three update options:

1. 1x

Use the „1x“ button to do a manual update whenever you like. Manual update does work in all modes.

2. Edit

Activate „Edit“ mode update to automatically update whenever the scene has changed. Does not update in Pause and Play mode.

3. Pause

Activate „Pause“ mode update to automatically update whenever you pause or step the game. Does not update in Edit and Play mode.

Tip: You can use Unity's hotkeys to pause (CTRL/CMD+SHIFT+P) and step (CTRL/CMD+ALT+P) the game and instantly update all ScreenCaps.

4. Play

Activate „Play“ mode update to automatically update while playing the game.

It gives a Live Preview. Does not update in Edit and Pause mode

Notes:

- If needed you can use xCBM's Delegates (see chapter „Custom Code“) to freeze your game while updating the ScreenCaps to capture the exact same state in all ScreenCaps.

2. ScreenCaps per row slider

Control how many ScreenCaps are displayed per row.

By default all ScreenCaps are automatically scaled to fill available space.

Note: You can specify a fixed size in xCBM Options.

3. Tools

The Tools list contains the following entries:

1. Options

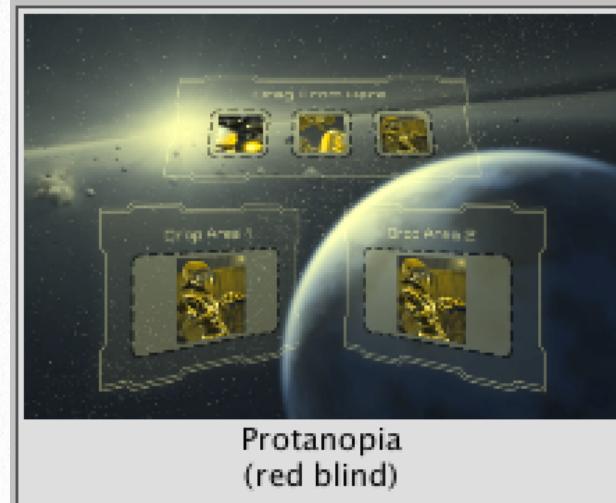
Opens xCBM Options window.

xCBM Gallery's Content

xCBM Gallery displays all active ScreenCaps at the same time.

If you click on one of the ScreenCaps it's automatically selected in xCBM Preview.

Tip: ScreenCap order can be changed by sorting in xCBM Options.



All active ScreenCaps displayed in xCBM Gallery are labeled as follows:

1. ScreenCap Info

The ScreenCap info is composed as follows:

1. Medical Name

The medical expression of the simulated color blindness type.

2. Colloquial Name

The colloquial expression of the simulated color blindness type.

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xCBM Options

The screenshot shows the 'xCBM Options' application window. The left sidebar has sections for 'Contact' and 'Options' (which is expanded, showing 'Global Options', 'xCBM Preview Options', and 'xCBM Gallery Options'). The main area is titled 'Color Blindness Previews ('ScreenCaps')' and contains the following text: 'Select the color blindness types you like to preview.' Below this is a table with the following data:

Active	Medical Name	Colloquial Name	Stats (% Male)	Stats (% Female)	Description
<input checked="" type="checkbox"/>	Normal	unaltered	91.2%	99.57%	Unaltered rendering result
<input checked="" type="checkbox"/>	Protanopia	red blind	1.3%	0.02%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Protanomaly	red deficiency	1.3%	0.02%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Deuteranopia	green blind	1.2%	0.01%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Deuteranomaly	green deficiency	5%	0.35%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Tritanopia	blue blind	0.001%	0.03%	Difficulties: blue vs green and yellow vs red/violet
<input checked="" type="checkbox"/>	Tritanomaly	blue deficiency	0.0001%	0.0001%	Difficulties: blue vs green and yellow vs red/violet
<input checked="" type="checkbox"/>	Achromatopsia	color blind	n/a	n/a	Very rare. Difficulties: distinguish between colors
<input checked="" type="checkbox"/>	Achromatomaly	color deficiency	n/a	n/a	Very rare. Difficulties: distinguish between colors

Use xCBM Options to select the ScreenCaps you'd like to preview and to configure xCBM to fit your needs.

xCBM Options Overview

xCBM Options consists of two main sections both with some subsections:

The screenshot shows the xCBM Options application window. The left sidebar has a tree view with nodes: Contact, Options, Global Options, xCBM Preview Options, and xCBM Gallery Options. The main area is titled 'Color Blindness Previews ('ScreenCaps')' and contains a table with 10 rows of color blindness types. The columns are Active (checkbox), Medical Name, Colloquial Name, Stats (% Male), Stats (% Female), and Description.

Active	Medical Name	Colloquial Name	Stats (% Male)	Stats (% Female)	Description
<input checked="" type="checkbox"/>	Normal	unaltered	91.2%	99.57%	Unaltered rendering result
<input checked="" type="checkbox"/>	Protanopia	red blind	1.3%	0.02%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Protanomaly	red deficiency	1.3%	0.02%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Deutanopia	green blind	1.2%	0.01%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Deutanomaly	green deficiency	5%	0.35%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Tritanopia	blue blind	0.001%	0.03%	Difficulties: blue vs green and yellow vs red/violet
<input checked="" type="checkbox"/>	Tritanomaly	blue deficiency	0.0001%	0.0001%	Difficulties: blue vs green and yellow vs red/violet
<input checked="" type="checkbox"/>	Achromatopsia	color blind	n/a	n/a	Very rare. Difficulties: distinguish between colors
<input checked="" type="checkbox"/>	Achromatomaly	color deficiency	n/a	n/a	Very rare. Difficulties: distinguish between colors

1. Options

In the Options section you can configure xCBM.

It's subdivided into Global, xCBM Preview and xCBM Gallery specific sections.

2. ScreenCaps

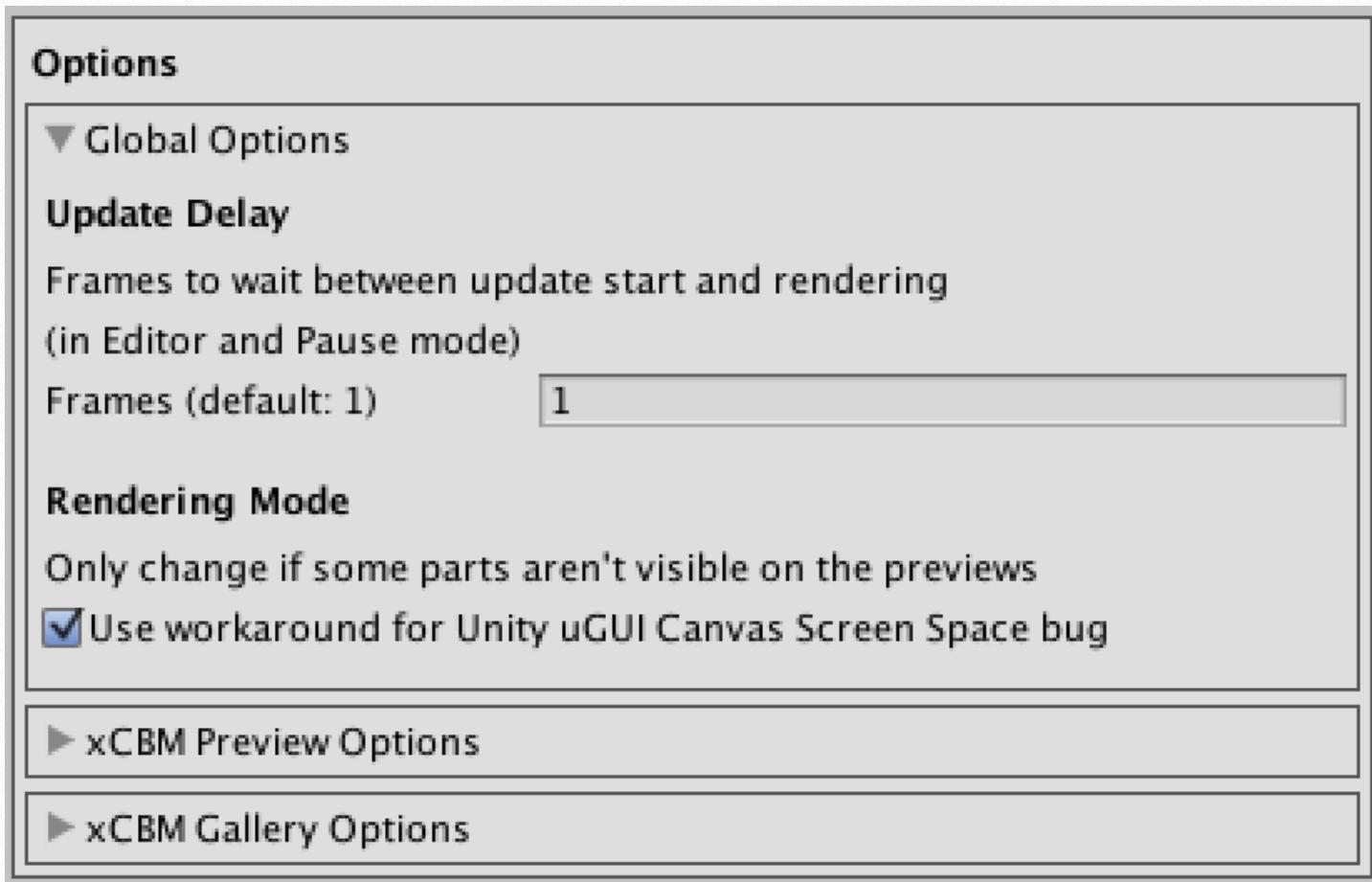
In the ScreenCaps section you can activate the ScreenCaps you'll like to preview.

Note: All Settings are saved under „ProjectSettings/xCBMSettings.xml“.

Options

The Options section is subdivided into three subsections:

„Global Options“, „xCBM Preview Options“ and „xCBGallery Options“



1. Global Options

The Global Options subsection holds all xCBM wide settings.

1. Update Delay

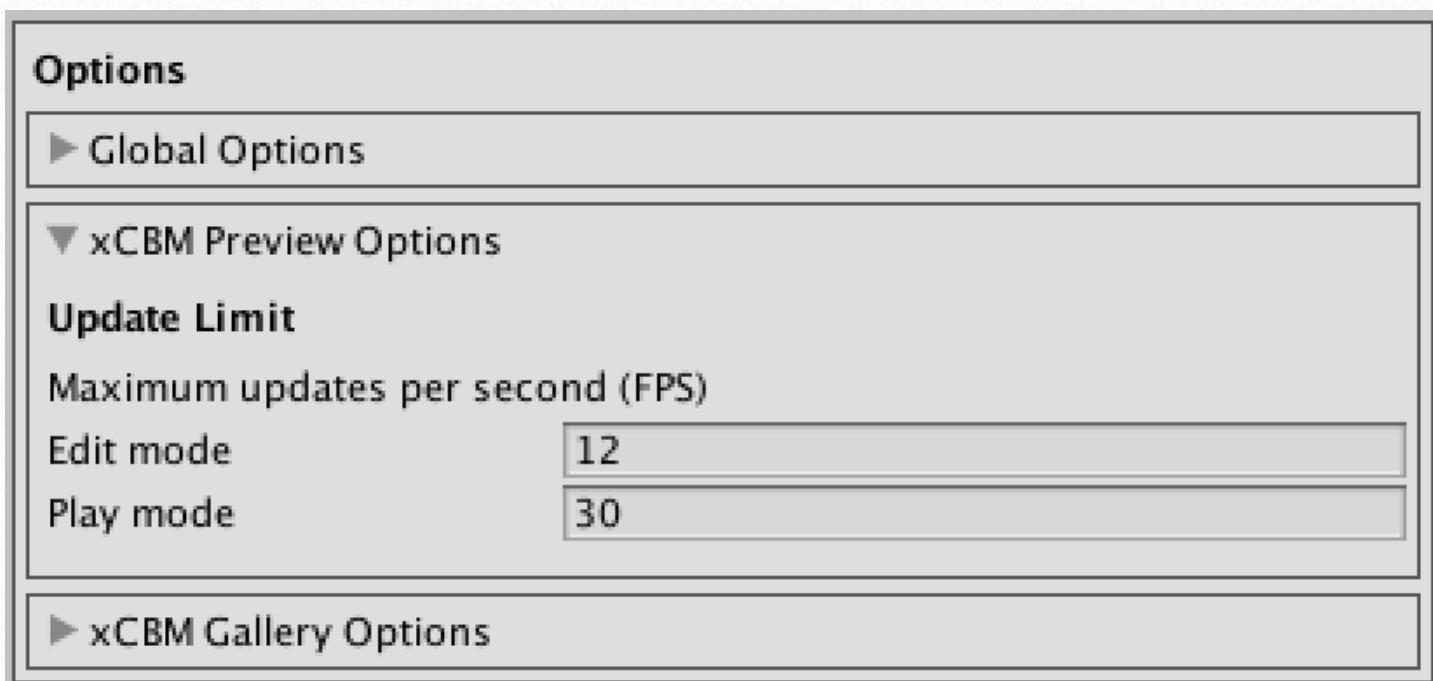
Specify how many frames xCBM should wait between resolution change and ScreenCap update (in Edit and Pause mode).

In most cases one frames should be sufficient.

Note: If the ScreenCaps show incorrect or incomplete renderings try a higher Update Delay.

2. Rendering Mode

If the default Rendering Mode gives incorrect or incomplete renderings use another mode. Changing the Rendering Mode may also increase performance depending on the use case.



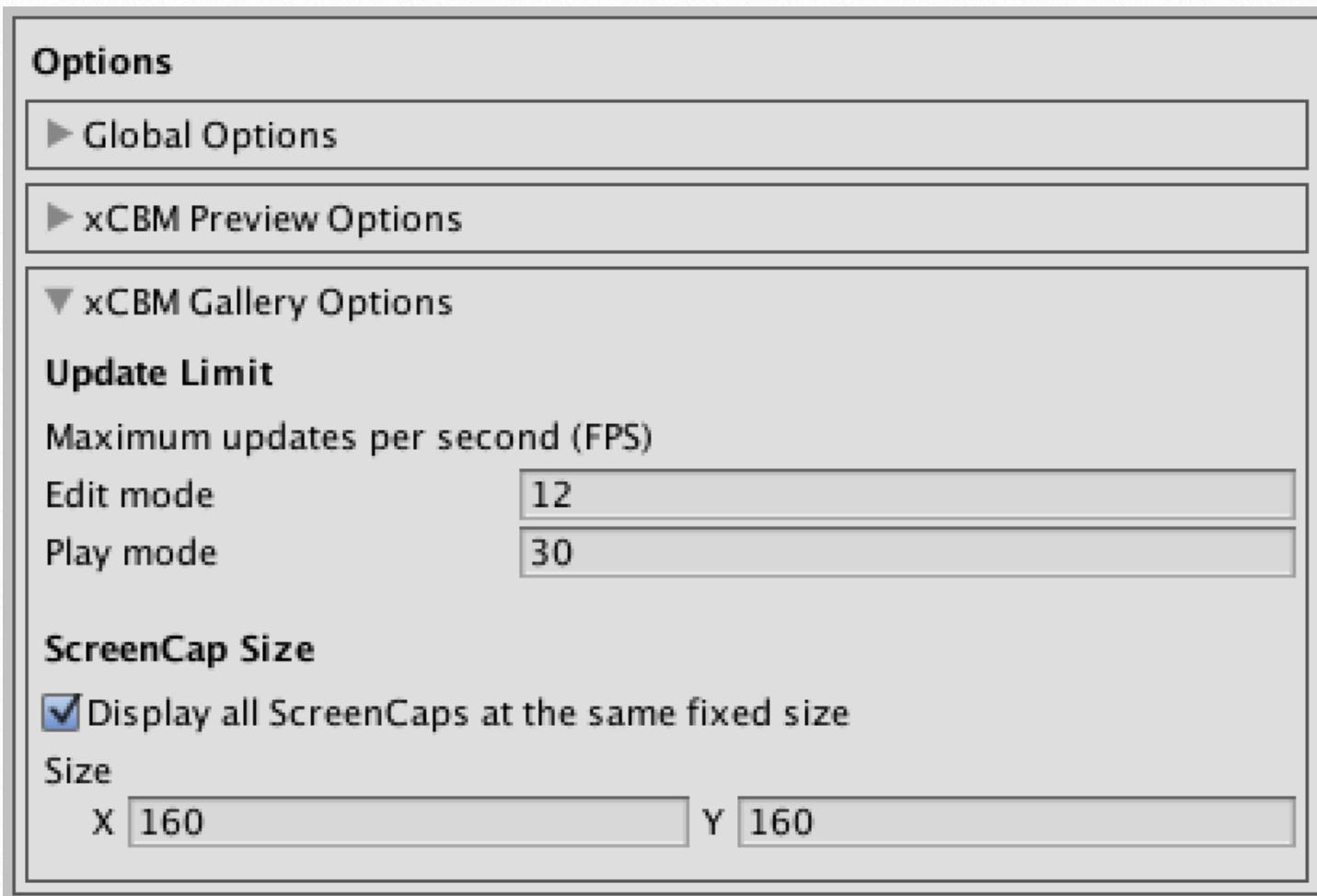
2. xCBM Preview Options

This section holds all xCBM Preview specific settings.

1. Update Limit

Specify the maximum ScreenCap updates per second for Edit and Play mode.

You can use this setting to control the ScreenCap update smoothness and performance impact.



3. xCBM Gallery Options

This section holds all xCBM Gallery specific settings.

1. Update Limit

Specify the maximum ScreenCap batch updates per second for Edit and Play mode. You can use this setting to control the ScreenCap update smoothness and performance impact.

2. ScreenCap Size

Activate „Display all ScreenCaps at the same fixed size“ to specify the ScreenCap display size manually.

If deactivated all ScreenCaps are automatically scaled to fill available space.

ScreenCaps

In the ScreenCap section you can select the Color Blindness Types you'd like to preview.

Color Blindness Previews ('ScreenCaps')					
Select the color blindness types you like to preview.					
Active	Medical Name	Colloquial Name	Stats (% Male)	Stats (% Female)	Description
<input checked="" type="checkbox"/>	Normal	unaltered	91.2%	99.57%	Unaltered rendering result
<input checked="" type="checkbox"/>	Protanopia	red blind	1.3%	0.02%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Protanomaly	red deficiency	1.3%	0.02%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Deuteranopia	green blind	1.2%	0.01%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Deuteranomaly	green deficiency	5%	0.35%	Difficulties: red vs green and blue vs green
<input checked="" type="checkbox"/>	Tritanopia	blue blind	0.001%	0.03%	Difficulties: blue vs green and yellow vs red/violet
<input checked="" type="checkbox"/>	Tritanomaly	blue deficiency	0.0001%	0.0001%	Difficulties: blue vs green and yellow vs red/violet
<input checked="" type="checkbox"/>	Achromatopsia	color blind	n/a	n/a	Very rare. Difficulties: distinguish between colors
<input checked="" type="checkbox"/>	Achromatomaly	color deficiency	n/a	n/a	Very rare. Difficulties: distinguish between colors

ScreenCap List

All ScreenCap list entries contain the following information:

1. Active

Activate the ScreenCap if you like to display it in xCBM Preview or xCBM Gallery.

2. Medical Name

The medical expression of the simulated color blindness type.

3. Colloquial Name

The colloquial expression of the simulated color blindness type.

4. Stats (% Male)

Percentage of affected male persons..

5. Stats (% Female)

Percentage of affected female persons.

6. Description

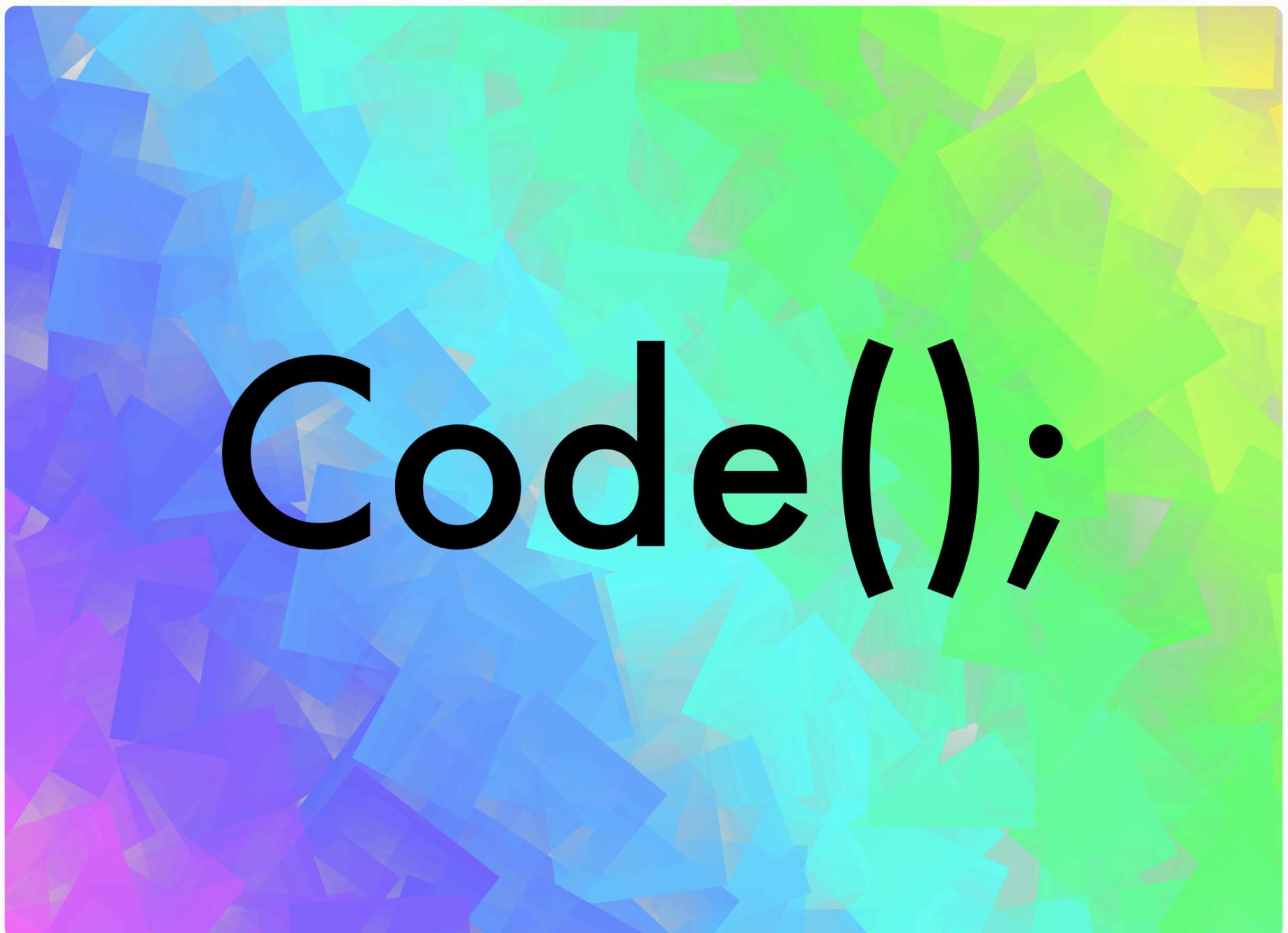
Further information.

Tips:

- You can sort the list by clicking on the column headers. The sorting does also effect all other xCBM windows.

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Custom Code



Feel free to change xCBM's source code to fit your needs, however support is limited to the official versions.

Please contact me if you add something that may also be useful for other xCBM users and I will check if it can be included in a future release (see chapter „Support & Contribution“ for contact details).

Delegates

You can use xCBM's Delegates to hook your custom code.

See „xCBMDelegatesExample.cs“ for an example.

You can use the Delegates e.g. to:

- If your game offers different modes to cover normal and color blind vision you can switch to the appropriate mode while xCBM updates the ScreenCaps
- Freeze your game while ScreenCap update, so that all display the exact same state
You need to implement an in-game pause mode to freeze all animations, etc. and hook it to xCBM's Delegates.
- ...

You can use the following Delegates to hook your code:

1. xCBMManager.OnStartScreenCapUpdate

This Delegate is called once before any ScreenCap is updated.

Tip: Store values to restore them later.

2. xCBMManager.OnPreScreenCapUpdate

This Delegate is called for each updating ScreenCap.

It's called before the Update Delay (see chapter „xCBM Options“) is started and the ScreenCap is updated with a new rendering result.

Tip: Hook your freeze/update/etc. code here.

3. xCBMManager.OnPostScreenCapUpdate

This Delegate is called for each updating ScreenCap right after the ScreenCap is updated with a new rendering result.

Tip: Reset ScreenCap specific changes here.

4. xCBMManager.OnFinalizeScreenCapUpdate

This Delegate is called once after all ScreenCaps are updated.

Tip: Reset all changes here.

Notes:

- Enclose your custom code with the „#if UNITY_EDITOR“ and „#endif“ preprocessor directive to prevent the code becomes a part of your built game.
- Ensure your code is outside of the xCBM folder. Otherwise your changes are lost on xCBM update.

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FAQ



FAQ

Still have questions?

Let's see if you can get the answer here.

FAQ

Q: What is a „ScreenCap“?

A: A ScreenCap represents a simulated preview of a Color Blindness Type and some related informations. In xCBM Options you can activate the ScreenCaps you'd like to display in xCBM Preview and xCBM Gallery.

Q: What is the xCBMProxy GameObject in the Hierarchy?

A: xCBM Preview and xCBM Gallery need a xCBMProxy GameObject in the Hierarchy to operate. You can move it, but don't change it otherwise. If the xCBMProxy is deleted it is instantly recreated as long as one of the xCBM windows is visible. Closing all xCBM windows does also remove the xCBMProxy.

Q: How do I update xCBM?

A: Follow these steps:

1. If applicable ensure to backup all changes made to the xCBM folder. Move (and keep) your custom code files (Delegates) outside of the xCBM folder
2. Remove the xCBM Folder from your Project
3. Import the new xCBM version from the Asset Store
4. Close and reopen Unity, if xCBM's windows are not updated correctly

Q: Why do I get „Cleaning up leaked objects in scene since no game object, component or manager is referencing them ...“ in the Console?

A: Unity sends this message to inform you that some optimizations have been made. You can ignore this message.

No answer found?

Feel free to contact me (see chapter „Support & Contribution“ for contact details).

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Support & Contribution



Feel free to contact me if you need help or have questions.

I'd highly appreciate if you spend a moment to help to improve xCBM by your feedback, feature requests, a Review in the Unity Asset Store, etc.

Contribute to improve xCBM!

I'd highly appreciate if you'd spend a moment to help to improve xCBM.

Here are some things you could do:

- Give a Review in the [Unity Asset Store](#).
- Send [feedback](#) and [feature requests](#).
- Spread the word via your favorite social medium.
- ...

Thanks a lot!

Support & Feedback:

Email:

support@flyingwhale.de

Unity Forum:

<http://forum.unity3d.com/threads/xcbm-color-blindness-master-coming-soon.396978/>

Info & Updates:

Twitter (@ThavronFW):

<https://twitter.com/ThavronFW>

YouTube:

<https://www.youtube.com/channel/UC2CU8aCaWcIJ5C6dOQFzdVg>

Flying Whale Homepage:

<http://www.flyingwhale.de>

All assets by Flying Whale:

<https://www.assetstore.unity3d.com/#/publisher/4046>

