INTRODUCTION

With a single click, CTAA enables all Unity users to achieve next generation off-line Cinematic Render Quality anti-aliasing results in Real-Time. CTAA provides unmatched performance and quality for all platforms such as PC, HTC VIVE & OCULUS

CTAA Utilizes Sophisticated velocity based Temporal (Time/frame based) re-projection & re-reconstruction methods to achieve extreme ' *Temporally Supersampled* ' quality results impossible for other ' *spatial only* ' solutions such as MSAA, FXAA, SMAA and many others.

CTAA works in all render paths and is currently the best solution in deferred mode compared to other solutions such as SMAA, FXAA and standard Unity TXAA (which does not work with VR)

'ROCK STEADY FILM QUALITY RESULTS'

- **No more Specular Shimmer or Aliasing**
- **No more PBS induced high-frequency FLICKERING**
- **No more HDR Bloom FLICKER**
- **No more ROGUE/STRAY Pixel SHIMMER**

:: IMPORTANT GETTING STARTED NOTES ::

PLEASE DELETE ALL PREVIOUS VERSIONS BEFORE INSTALLING THIS VERSION INCLUDING THE PC VERSION

THIS PACKAGE INCLUDES THREE VARIANTS OF CTAA: PC, OCULUS SDK AND THE OTHER FOR OPEN-VR *WHICH MUST BE USED WHEN TARGETING HTC VIVE*

- PLEASE NOTE: LATEST VERSION OF STEAM-VR IS REQUIRED WHEN USING THE OPENVR VERSION (HTC VIVE). PLEASE DOWNLOAD IT FROM THE UNITY ASSET STORE BEFORE USING CTAA IF YOU LIKE TO USE CTAA WITH THE VIVE HMD.

- ONLY USE THE OCULUS VERSION WHEN TARGETING OCULUS RIFT HMD (USING OCULUS WITH OPENVR WILL GIVE WRONG RESULTS)

CTAA 2018 V3 : *WHATS NEW & IMPROVEMENTS*

Thanks again for your purchase and please note CTAA is in constant development to increase visual quality and performance.

- V3 has complete compatibility with Unity 2017.1.1 and above (CTAA is ONLY supported for official Unity final releases, upcoming unity beta versions may not work)

- V3 has significant performance and quality improvements over v2.5

- Compatible with the unity post-processing stack V1 and V2, must be placed under (after) CTAA and make sure NOT to use unity version of temporal AA or FXAA (Please also make sure to Download the LATEST Post effects stack plugin from Unity) . CTAA must be placed in the middle of V2 post-processing stack.

" CTAA works great together with MSAA, if you are using forward render mode, enabling MSAA will provide true offline quality AA at very little performance "

PC DOCUMENTATION

CTAA V3 is compatible with Unity 2017 and above and works with all objects including static, dynamic, Characters (Skinned) and foliage.

CTAA is easy to incorporate and is a single script, it is a 'Temporal' post effect, it should be added to the main camera via the image effects 'Add Component ' section of the main camera under LIVENDA first.

CTAA works in all render paths such as Forward and Deferred and all light spaces, However, the included Demo (in the scenes folder) is designed for Linear Space, so please make sure to

change your color space to Linear before running the demo. CTAA works best in linear color mode.

::THE EFFECTS CHAIN & THE ORDER OF OTHER EFFECTS::

Think of CTAA as a filter in relation to all other effects you would like to add to your scene, for example if you like to add bloom more then likely the best place to add is 'After' CTAA as it will be temporalily stable and will completely eliminate rouge shimmering (looks bad). Effects like SSAO can be added before or after CTAA, the best is to try both as every other third party implents different methods.

::UNITY POST PROCESSING STACK::

CTAA V3 is compatible, please download the latest *V1* of the post process stack from Unity (this is important as earlier versions of the post effect stack will not work). CTAA must be placed BEFORE the stack and Unity version of TAA or FXAA should not be enabled. V2 of the post process stack is a little different and CTAA must be placed in the middle of the stack chain.

::OTHER AA SOLUTIONS TOGETHER WITH CTAA::

CTAA is the Ultimate Anti-Aliasing solution so there is no need to add any other Anti-Aliasing solution either before or after in the effects chain. However, in *Forward* render mode, *MSAA* can be enabled to provide even further sub-pixel anti-aliasing for thin Geometry and thin lines. This is a great option in VR due to a significant increase in quality at little performance cost. 2xMSAA is sufficient to providing AA equivalent to 8xMSAA quality together with all the advantages provided with a temporal solution.

::Multiple Cameras::

If you have multiple cameras and switching between them, you need to add CTAA effect to each one, also make sure your camera switching script disables all other cameras so there is only one active camera.

::SETTINGS::

All the settings can be changed in real-time to suit your scene requirements.

Temporal Stability : Slider defaults to 8 which is great (Sharp and responsive) for most scenes, this can be reduced to obtain faster temporal-convergence (might cause shimmer but sharper) or increased for a more Cinematic effect (*Hint*: You can dynamically change this via scripting depending on your scene) there is no performance impact

Hdr Response : This is a bias value for AA 'temporal-convergence' strength for edges, or rather edges intersecting with greatly varying Dynamic range. This is effective when adjusting required AA when for example, the 'edge' of a wall partially occluding a HDR SKY, where there is a great difference between their edge-pixels and the sky. In a scene where the overall dynamic range is low, this value should be set to a lower amount. For a scene where there is significant changes in dynamic range per-frame, this can be increased to get better AA on edges. (*Hint*: You can dynamically change this via scripting depending on your scene) there is no performance impact

Sharpness : This value will change sensitivity / bias towards edge anti-aliasing.

Adaptive Enhance : This modulates the strength of antialiasing (and a few other internal parameters) based on relative velocity, higher values will yield a sharper image. no impact on performance for any value

Temporal Jitter Scale : Default is 0.5, this value modulates the distance/size of off-axis jitter which is applied to each camera per frame. The larger the value the larger the sampling distance. Default value of 0.5 is great for most General use, if you like a little sharper image this can be decreased for your particular scene requirements (Please note lowering this value will eventually eliminate any Anti-Aliasing). No impact on performance for any value.

- We have also included a Demo to get you started in the Demo folder called Cardemo_CTAA

VR GENERAL

CTAA for VR provides next generation temporal supersampled anti-aliasing for all VR devices at unprecedented quality and performance levels.

It is not a variation of CTAA for PC and is technically & significantly different from design perceptive and integration paradigm.

To get you started we have included Demo Scenes to simplify your understand of the Unique Camera setup required for temporal anti-aliasing processing for VR in Unity. Please do not change i.e. delete or re-order any of the scripts attached to the prefab camera.

CTAA for VR will work in all render paths including Deferred and Forward mode in all light spaces (forward mode is a little faster however not by much, linear light space is preferred).

CTAA is also 100% Compatible with MSAA, so if your project is in forward render mode you can enable 2xMSAA (no need for 4x as this will be overkill and is not required) for even better geometry anti-aliasing.

* Multi Pass VR is the only method supported due to custom per-eye motion vector generation

* Please refer to the PC version information above regarding using CTAA VR together with Unity Post Processing Stack as it has the same requirements.

OCULUS VR
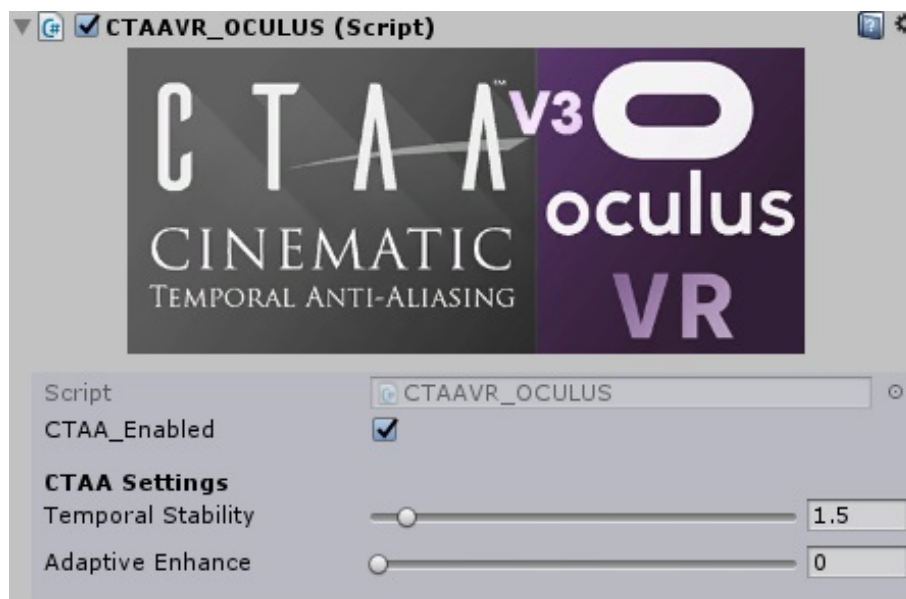
:: **QUICK INTEGRATION** ::

- Drag and drop the [OCULUS_VR_CAMERA] prefab in the VRCAM_PREFAB section into your scene. This Camera Rig is setup to work with CTAA, and that's it! You will notice there are two 'seperate' Cameras, one for the 'Left' eye and the other for the 'Right' eye and each has the CTAA script already attached, including two other required scripts.

Please note: If you modify the settings of CTAA or the Jitter Scale on any camera, make sure to apply the same setting on both. So, if you modify the ' Temporal Stability ' value of CTAA on the Left cam, make sure you apply the same change on Right Camera CTAA.

- To modify the render path or if you like to add further post effects such as bloom/ AO etc , you can open the [OCULUS_VR_CAMERA] hierarchy then open both Left and the Right Cameras and all post effects should be added to both.

" Helper scripts to setup custom VR cameras and controlling CTAA from a single editor window will be available in the next update "

- CTAA has two main adjustments, Temporal Stability & Adaptive Enhance.

Temporal Stability : Slider defaults to 1.5 which is great (Sharp and responsive) for most scenes, this can be reduced to obtain faster temporal-convergence (might cause shimmer but sharper) or increased for a more Cinematic effect (*Hint*: You can dynamically change this via scripting depending on your scene) there is no performance impact

Adaptive Enhance : This modulates the strength of anti-aliasing (and a few other internal parameters) based on relative velocity, higher values will yield a sharper image. no impact on performance for any value

- We have also included two VR Demo Scenes to get you started in the Scenes folder

HTC VIVE OPENVR
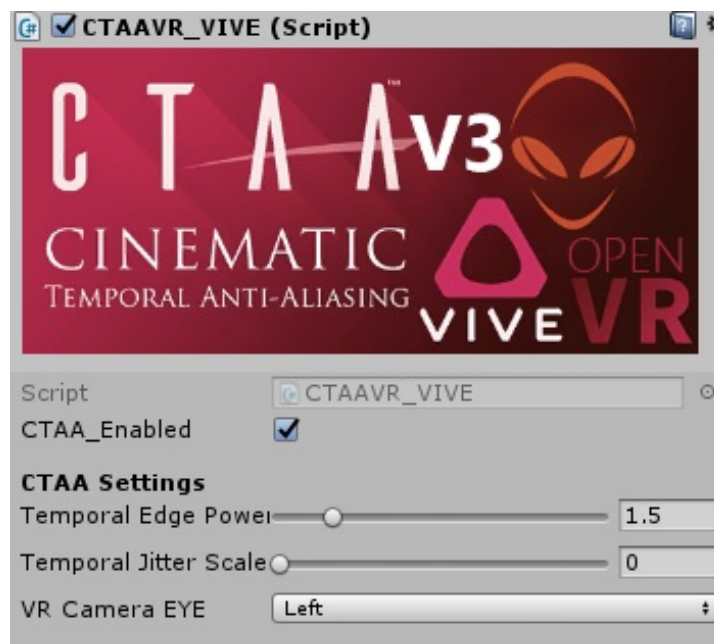
IMPORTANT PLEASE NOTE!: LATEST VERSION OF STEAMVR IS REQUIRED WHEN USING THE OPENVR VERSION (HTC VIVE). PLEASE DOWNLOAD IT FROM THE UNITY ASSET STORE BEFORE USING CTAA

Linear Light Space to be used with CTAA

:: QUICK INTEGRATION ::

- Drag and drop the [CameraRig_CTAA_VIVE] prefab in the VRCAM_PREFAB section into your scene. This is a replica of the standard SteamVR Camera Rig however it is setup to work with CTAA, and that's it! You will notice there are two 'seperate' Cameras, one for the 'Left' eye and

the other for the 'Right' eye and each has the CTAA script already attached.

- Please note: If you modify the settings of CTAA on any camera, make sure to apply the same setting on both. So, if you modify the ' Temporal Edge Power' value of CTAA on the Left cam, make sure you apply the same change on Right Camera CTAA.

- To modify the renderpath or if you like to add further post effects such as bloom/ AO etc , you can open the [CameraRig_CTAA_VIVE] hierarchy then open both Left and the Right Cameras and all post effects should be added to both.

Temporal Edge Power : This is the temporal resolve strength the higher the value the smoother the quality more Cinematic however will take longer to resolve so less anti-aliasing on fast moving scenes/objects. There is no performance impact in any value, 1.5 is a good starting points for VR and can be adjusted to scene requirements.

Temporal Jitter Scale: Default is 0, this value modulates the distance/size of off-axis jitter which is applied to each camera per frame. The larger the value the larger the sampling distance. Default value of 0 is for HTC VIVE do not change!

VR Camera EYE: The corresponding camera selection as since CTAA must be used with two separate cameras, you must specify which camera this script is attached to.

- We have also included a Demo Scene to get you started

FAQ

Does CTAA work with Consoles such as Xbox One, PS4, PSVR?

Yes, please contact us for Console licensing options

Can I use Single Pass Stereo in VR?

Due to current limitations in Unity this version will only work with Multi Pass. CTAA requires precise 'motion vectors' to re-project (shift in screenspace) and blend past frames onto the current frame. In VR native Unity motion vectors cannot be used and hence CTAA generates it's own motion vectors 'per-eye'. Due to extensive testing there is almost no gain in performance between the two in vast majority of scenes and is often slower with single pass. Next upcoming versions of CTAA will support this mode for compatibility.

How do I enable CTAA with VRTK Teleport or locomotion system?

We have included an example VRTK Bezier Teleport prefab in the VRTK folder. This is a zip file, so please unzip to your assets folder to use. The latest version of VRTK must be installed together with the latest Oculus Integration from the Unity Asset store. To use VRTK for HTC VIVE /OpenVR the latest SteamVR must be installed.

SUPPORT CONTACT

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