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Namespace Uralstech. UXR. Quest Camera

Classes

CameraDevice

A wrapper for a native Camera2 CameraDevice.

CameraFrameForwarder

Forwards frame callbacks from the native Kotlin plugin to Unity.

CameraInfo

Wrapper for Camera2's CameraCharacteristics.

CameraSupport

Utility to check if the current Meta Quest device supports the Passthrough Camera API.

<u>CaptureSessionObject<T></u>

Simple class for grouping capture session related components to their GameObject.

ContinuousCaptureSession

A wrapper for a native Camera2 CaptureSession and ImageReader.

OnDemandCaptureSession

A wrapper for a native Camera2 CaptureSession and ImageReader.

<u>UCameraManager</u>

Class for interfacing with the native Camera2 API on Android.

YUVToRGBAConverter

The default YUV 4:2:0 to RGBA converter that uses a compute shader to convert the camera texture to RGBA.

Structs

CameraInfo.CameraIntrinsics

Defines the camera's intrinsic properties. All values are in pixels.

Enums

CameraDevice.ErrorCode

Error codes that can be returned by the native CameraDevice wrapper.

CameraInfo.CameraEye

The camera eye.

CameraInfo.CameraSource

The source of the camera feed.

<u>CaptureTemplate</u>

Capture template to use when recording.

<u>NativeWrapperState</u>

The current assumed state of a native wrapper.

Class CameraDevice

Namespace: <u>Uralstech.UXR.QuestCamera</u>

A wrapper for a native Camera2 CameraDevice.

```
public class CameraDevice : MonoBehaviour
```

Inheritance

object ← CameraDevice

Fields

OnDeviceClosed

Invoked when the CameraDevice is closed.

public UnityEvent OnDeviceClosed

Field Value

UnityEvent

OnDeviceDisconnected

Invoked when the CameraDevice is disconnected.

public UnityEvent OnDeviceDisconnected

Field Value

UnityEvent

OnDeviceErred

Invoked when the CameraDevice encounters an error.

```
public UnityEvent<CameraDevice.ErrorCode> OnDeviceErred
```

Field Value

UnityEvent<<u>ErrorCode</u>>

OnDeviceOpened

Invoked when the CameraDevice is opened.

```
public UnityEvent OnDeviceOpened
```

Field Value

UnityEvent

Properties

Camerald

The ID of the camera being wrapped.

```
public string CameraId { get; }
```

Property Value

string

CurrentState

The current assumed state of the native CameraDevice wrapper.

```
public NativeWrapperState CurrentState { get; }
```

Property Value

<u>NativeWrapperState</u>

IsActiveAndUsable

Is the native CameraDevice wrapper active and usable?

```
public bool IsActiveAndUsable { get; }
```

Property Value

bool

Methods

CreateContinuousCaptureSession(Resolution, CaptureTemplate)

Creates a new repeating/continuous capture session for use.

```
public CaptureSessionObject<ContinuousCaptureSession>
CreateContinuousCaptureSession(Resolution resolution, CaptureTemplate captureTemplate
= CaptureTemplate.Preview)
```

Parameters

resolution Resolution

The resolution of the capture.

captureTemplate CaptureTemplate

The capture template to use for the capture

Returns

<u>CaptureSessionObject</u><<u>ContinuousCaptureSession</u>>

A new capture session wrapper. May be null if the current camera device is not usable.

Remarks

Once you have finished using the capture session, call <u>Destroy()</u> to close the session and free up native and compute shader resources.

CreateOnDemandCaptureSession(Resolution)

Creates a new on-demand capture session for use.

public CaptureSessionObject<OnDemandCaptureSession> CreateOnDemandCaptureSession(Resolution
resolution)

Parameters

resolution Resolution

The resolution of the capture.

Returns

<u>CaptureSessionObject<OnDemandCaptureSession></u>

A new capture session wrapper. May be null if the current camera device is not usable.

Remarks

Once you have finished using the capture session, call <u>Destroy()</u> to close the session and free up native and compute shader resources.

Destroy()

Releases the CameraDevice's native resources, and destroys its GameObject.

public void Destroy()

OnDestroy()

```
protected void OnDestroy()
```

Release()

Releases the CameraDevice's native resources, and makes it unusable.

```
public void Release()
```

WaitForInitialization()

Waits until the CameraDevice is open or erred out.

```
public IEnumerator WaitForInitialization()
```

Returns

IEnumerator

WaitForInitializationAsync()

Waits until the CameraDevice is open or erred out.

```
public Awaitable<NativeWrapperState> WaitForInitializationAsync()
```

Returns

Awaitable < Native Wrapper State >

The current state of the CameraDevice.

Remarks

Requires Unity 6.0 or higher.

_onDeviceClosed(string)

```
public void _onDeviceClosed(string _)
```

Parameters

_ string

_onDeviceDisconnected(string)

```
public void _onDeviceDisconnected(string _)
```

Parameters

_ string

_onDeviceErred(string)

```
public void _onDeviceErred(string errorCodeStr)
```

Parameters

errorCodeStr string

_onDeviceOpened(string)

```
public void _onDeviceOpened(string _)
```

Parameters

_ string

Enum CameraDevice.ErrorCode

Namespace: <u>Uralstech.UXR.QuestCamera</u>

Error codes that can be returned by the native CameraDevice wrapper.

public enum CameraDevice.ErrorCode

Fields

CameraAccessException = 1000

The native code encountered a CameraAccessException.

CameraDeviceError = 4

The camera device has encountered a fatal error.

CameraDisabled = 3

The camera device could not be opened due to a device policy.

CameraInUse = 1

The camera device is in use already.

CameraServiceError = 5

The camera service has encountered a fatal error.

MaxCamerasInUse = 2

The camera device could not be opened because there are too many other open camera devices.

SecurityException = 1001

The native code encountered a SecurityException.

Unknown = 0

Unknown error.

Class CameraFrameForwarder

Namespace: <u>Uralstech.UXR.QuestCamera</u>

Forwards frame callbacks from the native Kotlin plugin to Unity.

```
public class CameraFrameForwarder : AndroidJavaProxy
```

Inheritance

object ← CameraFrameForwarder

Constructors

CameraFrameForwarder()

```
public CameraFrameForwarder()
```

Fields

OnFrameReady

Callback for processing the YUV 4:2:0 frame.

Field Value

Remarks

Parameters	
yBuffer (IntPtr)	Pointer to the buffer containing Y (luminance) data of the frame.
uBuffer (IntPtr)	Pointer to the buffer containing U (color) data of the frame.

Parameters	
vBuffer (IntPtr)	Pointer to the buffer containing V (color) data of the frame.
ySize (int)	The size of yBuffer.
uSize (int)	The size of uBuffer.
vSize (int)	The size of vBuffer.
yRowStride (int)	The size of each row of the image in yBuffer in bytes.
uvRowStride (int)	The size of each row of the image in uBuffer and vBuffer in bytes.
uvPixelStride (int)	The size of a pixel in a row of the image in uBuffer and vBuffer in bytes.

Methods

GetBufferPointer(AndroidJavaObject)

Gets the pointer to a native buffer from a Java ByteBuffer object.

protected static nint GetBufferPointer(AndroidJavaObject byteBuffer)

Parameters

byteBuffer AndroidJavaObject

The Java ByteBuffer object.

Returns

nint

A pointer to the native buffer.

Class CameraInfo

Namespace: <u>Uralstech.UXR.QuestCamera</u>

Wrapper for Camera2's CameraCharacteristics.

```
public class CameraInfo
```

Inheritance

object ← CameraInfo

Constructors

CameraInfo(AndroidJavaObject)

```
public CameraInfo(AndroidJavaObject cameraInfo)
```

Parameters

cameraInfo AndroidJavaObject

Properties

Camerald

The actual device ID of this camera.

```
public string CameraId { get; }
```

Property Value

string

Eye

(Meta Quest) The eye which the camera is closest to.

```
public CameraInfo.CameraEye Eye { get; }
```

Property Value

<u>CameraInfo</u>.<u>CameraEye</u>

Intrinsics

The intrinsics for this camera.

```
public CameraInfo.CameraIntrinsics Intrinsics { get; }
```

Property Value

CameraInfo.CameraIntrinsics

LensPoseRotation

The orientation of the camera relative to the sensor coordinate system.

```
public Quaternion LensPoseRotation { get; }
```

Property Value

Quaternion

LensPoseTranslation

The position of the camera optical center.

```
public Vector3 LensPoseTranslation { get; }
```

Property Value

NativeCameraCharacteristics

The native CameraCharacteristics object.

```
public AndroidJavaObject NativeCameraCharacteristics { get; }
```

Property Value

AndroidJavaObject

Source

(Meta Quest) The source of the camera feed.

```
public CameraInfo.CameraSource Source { get; }
```

Property Value

CameraInfo.CameraSource

SupportedResolutions

The resolutions supported by this camera.

```
public Resolution[] SupportedResolutions { get; }
```

Property Value

Resolution[]

Methods

ToString()

Returns a string that represents the current object.

```
public override string ToString()
```

Returns

string

A string that represents the current object.

Operators

implicit operator string(CameraInfo)

```
public static implicit operator string(CameraInfo camera)
```

Parameters

camera CameraInfo

Returns

string

Enum CameraInfo.CameraEye

Namespace: <u>Uralstech.UXR.QuestCamera</u>

The camera eye.

public enum CameraInfo.CameraEye

Fields

Left = 1

The leftmost camera.

Right = 2

The rightmost camera.

Unknown = 0

Unknown.

Struct CameraInfo.CameraIntrinsics

Namespace: <u>Uralstech.UXR.QuestCamera</u>

Defines the camera's intrinsic properties. All values are in pixels.

public readonly struct CameraInfo.CameraIntrinsics

Constructors

CameraIntrinsics(Vector2, Vector2, Vector2, float)

public CameraIntrinsics(Vector2 resolution, Vector2 focalLength, Vector2 principalPoint,
float skew)

Parameters

resolution Vector2

focalLength Vector2

principalPoint Vector2

skew float

Fields

FocalLength

Focal length in pixels.

public readonly Vector2 FocalLength

Field Value

Vector2

PrincipalPoint

Principal point in pixels from the image's top-left corner.

public readonly Vector2 PrincipalPoint

Field Value

Vector2

Resolution

Resolution in pixels.

public readonly Vector2 Resolution

Field Value

Vector2

Skew

Skew coefficient for axis misalignment.

public readonly float Skew

Field Value

float

Methods

ToString()

Returns the fully qualified type name of this instance.

public override string ToString()

Returns

string

The fully qualified type name.

Enum CameraInfo.CameraSource

Namespace: <u>Uralstech.UXR.QuestCamera</u>

The source of the camera feed.

public enum CameraInfo.CameraSource

Fields

PassthroughRGB = 1

Meta Quest Passthrough RGB cameras.

Unknown = 0

Unknown.

Class CameraSupport

Namespace: <u>Uralstech.UXR.QuestCamera</u>

Utility to check if the current Meta Quest device supports the Passthrough Camera API.

```
public static class CameraSupport
```

Inheritance

object ← CameraSupport

Remarks

Requires the Meta XR Core SDK.

Fields

MINSUPPORTOSVERSION

```
public const int MINSUPPORTOSVERSION = 74
```

Field Value

int

Properties

HorizonOSVersion

Get the Horizon OS version number on the headset

```
public static int? HorizonOSVersion { get; }
```

Property Value

int?

Remarks

Requires the Meta XR Core SDK.

IsSupported

Returns true if the current headset supports Passthrough Camera API

```
public static bool IsSupported { get; }
```

Property Value

bool

Remarks

Requires the Meta XR Core SDK.

Class CaptureSessionObject<T>

Namespace: <u>Uralstech.UXR.QuestCamera</u>

Simple class for grouping capture session related components to their GameObject.

```
public class CaptureSessionObject<T> where T : ContinuousCaptureSession
```

Type Parameters

т

Inheritance

object ← CaptureSessionObject < T >

Fields

CameraFrameForwarder

The camera frame forwarder.

public readonly CameraFrameForwarder CameraFrameForwarder

Field Value

CameraFrameForwarder

Remarks

You can add additional <u>YUVToRGBAConverter</u>s to this to have multiple streams of the same capture session.

CaptureSession

The capture session wrapper.

public readonly T CaptureSession

Field Value

Τ

GameObject

The GameObject containing the <u>CaptureSession</u> and <u>TextureConverter</u> components.

```
public readonly GameObject GameObject
```

Field Value

GameObject

TextureConverter

The YUV to RGBA texture converter.

public readonly YUVToRGBAConverter TextureConverter

Field Value

<u>YUVToRGBAConverter</u>

Methods

Destroy()

Destroys the GameObject to release all native resources.

```
public void Destroy()
```

Enum CaptureTemplate

Namespace: <u>Uralstech.UXR.QuestCamera</u>

Capture template to use when recording.

```
public enum CaptureTemplate
```

Fields

```
Default = 0
```

Default value, do not use.

```
Preview = 1
```

Creates a request suitable for a camera preview window.

Record = 3

Creates a request suitable for video recording.

```
StillCapture = 2
```

Creates a request suitable for still image capture.

```
VideoSnapshot = 4
```

Creates a request suitable for still image capture while recording video.

ZeroShutterLag = 5

Creates a request suitable for zero shutter lag still capture.

Class Continuous Capture Session

Namespace: <u>Uralstech.UXR.QuestCamera</u>

A wrapper for a native Camera2 CaptureSession and ImageReader.

public class ContinuousCaptureSession : MonoBehaviour

Inheritance

object ← ContinuousCaptureSession

Derived

OnDemandCaptureSession

Remarks

This is different from OnDemandCaptureSession as it returns a continuous stream of images.

Fields

OnSessionConfigurationFailed

Called when the session could not be configured.

public UnityEvent<string> OnSessionConfigurationFailed

Field Value

UnityEvent < string >

OnSessionConfigured

Called when the session has been configured.

public UnityEvent OnSessionConfigured

Field Value

OnSessionRequestFailed

Called when the session request could not be set.

public UnityEvent<string> OnSessionRequestFailed

Field Value

UnityEvent<string>

OnSessionRequestSet

Called when the session request has been set.

public UnityEvent OnSessionRequestSet

Field Value

UnityEvent

_captureSession

The native capture session object.

protected AndroidJavaObject _captureSession

Field Value

AndroidJavaObject

Properties

CurrentState

The current assumed state of the native CaptureSession wrapper.

```
public NativeWrapperState CurrentState { get; }
```

Property Value

<u>NativeWrapperState</u>

IsActiveAndUsable

Is the native CaptureSession wrapper active and usable?

```
public bool IsActiveAndUsable { get; }
```

Property Value

bool

Methods

OnDestroy()

```
protected void OnDestroy()
```

Release()

Releases the CaptureSession's native resources, and makes it unusable.

```
public void Release()
```

WaitForInitialization()

Waits until the CaptureSession is open or erred out.

```
public IEnumerator WaitForInitialization()
```

Returns

IEnumerator

WaitForInitializationAsync()

Waits until the CaptureSession is open or erred out.

```
public Awaitable<NativeWrapperState> WaitForInitializationAsync()
```

Returns

Awaitable < Native Wrapper State >

The current state of the CaptureSession.

Remarks

Requires Unity 6.0 or higher.

_onSessionConfigurationFailed(string)

```
public void _onSessionConfigurationFailed(string reason)
```

Parameters

reason string

_onSessionConfigured(string)

```
public void _onSessionConfigured(string _)
```

Parameters

_ string

_onSessionRequestFailed(string)

```
public void _onSessionRequestFailed(string reason)
```

Parameters

reason string

_onSessionRequestSet(string)

```
public void _onSessionRequestSet(string _)
```

Parameters

_ string

Enum NativeWrapperState

Namespace: <u>Uralstech.UXR.QuestCamera</u>

The current assumed state of a native wrapper.

public enum NativeWrapperState

Fields

Closed = 2

The native wrapper failed with an error, was disconnected or was closed normally.

Initializing = 0

The native wrapper is still initializing.

Opened = 1

The native wrapper is open and ready.

Class OnDemandCaptureSession

Namespace: <u>Uralstech.UXR.QuestCamera</u>

A wrapper for a native Camera2 CaptureSession and ImageReader.

public class OnDemandCaptureSession : ContinuousCaptureSession

Inheritance

object ← <u>ContinuousCaptureSession</u> ← OnDemandCaptureSession

Inherited Members

ContinuousCaptureSession.CurrentState, ContinuousCaptureSession.IsActiveAndUsable,

ContinuousCaptureSession.OnSessionConfigured,

ContinuousCaptureSession.OnSessionConfigurationFailed,

ContinuousCaptureSession.OnSessionRequestSet, ContinuousCaptureSession.OnSessionRequestFailed,

ContinuousCaptureSession. captureSession, ContinuousCaptureSession.OnDestroy(),

<u>ContinuousCaptureSession.WaitForInitialization()</u>,

<u>ContinuousCaptureSession.WaitForInitializationAsync()</u>, <u>ContinuousCaptureSession.Release()</u>,

ContinuousCaptureSession. onSessionConfigured(string),

ContinuousCaptureSession. onSessionConfigurationFailed(string),

<u>ContinuousCaptureSession.</u> onSessionRequestSet(string),

ContinuousCaptureSession. onSessionRequestFailed(string)

Remarks

This is different from <u>ContinuousCaptureSession</u> as it only returns a frame from the native plugin when required. This is recommended for single-image capturing or on-demand capturing where you don't need a continuous stream of images.

Why does <u>OnDemandCaptureSession</u> inherit from <u>ContinuousCaptureSession</u>? Because under the hood, both do the same thing - a repeating capture session. A true on-demand capture results in a black image, so <u>OnDemandCaptureSession</u> runs a repeating capture request running on an dummy texture natively, and reads the actual image through an ImageReader only when requested to do so. This means that while the <u>ContinuousCaptureSession</u> processes each and every frame sent to it, converting it to RGBA, <u>OnDemandCaptureSession</u> only does it when required.

Methods

RequestCapture(CaptureTemplate)

Requests a new capture from the session.

public bool RequestCapture(CaptureTemplate captureTemplate = CaptureTemplate.StillCapture)

Parameters

captureTemplate CaptureTemplate

The capture template to use for the capture

Returns

bool

If the capture request was set successfully, <u>true</u> ☑, otherwise, <u>false</u> ☑.

Class UCameraManager

Namespace: <u>Uralstech.UXR.QuestCamera</u>

Class for interfacing with the native Camera2 API on Android.

```
public class UCameraManager : DontCreateNewSingleton<UCameraManager>
```

Inheritance

object ← UCameraManager

Fields

HeadsetCameraPermission

The permission required to access the Meta Quest's cameras.

```
public const string HeadsetCameraPermission = "horizonos.permission.HEADSET_CAMERA"
```

Field Value

string

YUVToRGBAComputeShader

The compute shader to use to convert the camera's YUV 4:2:0 images to RGBA.

```
public ComputeShader YUVToRGBAComputeShader
```

Field Value

ComputeShader

Properties

Cameras

Returns all available cameras and their characteristics. This is a cached value.

```
public CameraInfo[] Cameras { get; }
```

Property Value

CameraInfo[]

Methods

Awake()

```
protected override void Awake()
```

GetCamera(CameraEye)

Gets a camera device by the eye it is closest to.

```
public CameraInfo GetCamera(CameraInfo.CameraEye eye)
```

Parameters

eye <u>CameraInfo.CameraEye</u>

The eye.

Returns

CameraInfo

The camera's <u>CameraInfo</u>, <u>null</u> dif not found.

OnDestroy()

protected void OnDestroy()

OpenCamera(string)

Opens a camera device for use.

public CameraDevice OpenCamera(string camera)

Parameters

camera string

The ID of the camera. You can get it from Camera or GetCamera(CameraEye).

Returns

CameraDevice

A new camera device wrapper. May be null if the current object is disposed/unusable.

Remarks

Once you have finished using the camera, either destroy its GameObject or call <u>Release()</u> to close the camera and free up native resources.

Class YUVToRGBAConverter

Namespace: <u>Uralstech.UXR.QuestCamera</u>

The default YUV 4:2:0 to RGBA converter that uses a compute shader to convert the camera texture to RGBA.

public class YUVToRGBAConverter : MonoBehaviour

Inheritance

object ← YUVToRGBAConverter

Fields

OnFrameProcessed

Called when a frame has been converted from YUV 4:2:0 to RGBA.

public UnityEvent<RenderTexture> OnFrameProcessed

Field Value

UnityEvent < RenderTexture >

Shader

The shader used to convert YUV 4:2:0 to an RGBA RenderTexture. Uses <u>YUVToRGBAComputeShader</u> if not specified here.

public ComputeShader Shader

Field Value

ComputeShader

_uComputeBuffer

Pointer to the buffer containing U (color) data of the frame being processed.

protected ComputeBuffer _uComputeBuffer

Field Value

ComputeBuffer

_vComputeBuffer

Pointer to the buffer containing V (color) data of the frame being processed.

protected ComputeBuffer _vComputeBuffer

Field Value

ComputeBuffer

_yComputeBuffer

Pointer to the buffer containing Y (luminance) data of the frame being processed.

protected ComputeBuffer _yComputeBuffer

Field Value

ComputeBuffer

Properties

CameraFrameForwarder

The native camera frame forwarder.

```
public CameraFrameForwarder CameraFrameForwarder { get; }
```

Property Value

<u>CameraFrameForwarder</u>

FrameRenderTexture

The RenderTexture which will contain the RGBA camera frames.

```
public RenderTexture FrameRenderTexture { get; }
```

Property Value

RenderTexture

Methods

Awake()

```
protected void Awake()
```

CopyNativeDataToComputeBuffer(ref ComputeBuffer, nint, int)

Copies native (unmanaged) byte data to a compute buffer.

```
protected static void CopyNativeDataToComputeBuffer(ref ComputeBuffer computeBuffer, nint
nativeBufferPtr, int nativeBufferSize)
```

Parameters

computeBuffer ComputeBuffer

The buffer to copy to.

nativeBufferPtr nint

The memory to copy from.

nativeBufferSize int

The number of bytes to copy.

OnDestroy()

protected void OnDestroy()

Callback for CameraFrameForwarder.

protected virtual void OnFrameReady(nint yBuffer, nint uBuffer, nint vBuffer, int ySize, int uSize, int vSize, int yRowStride, int uvRowStride, int uvPixelStride)

Parameters

yBuffer nint

Pointer to the buffer containing Y (luminance) data of the frame.

uBuffer nint

Pointer to the buffer containing U (color) data of the frame.

vBuffer nint

Pointer to the buffer containing V (color) data of the frame.

ySize int

The size of yBuffer.

uSize int

The size of uBuffer.

vSize int

The size of vBuffer.

yRowStride int

The size of each row of the image in yBuffer in bytes.

uvRowStride int

The size of each row of the image in uBuffer and vBuffer in bytes.

uvPixelStride int

The size of a pixel in a row of the image in uBuffer and vBuffer in bytes.

Release()

Releases the ComputeBuffers and RenderTextures associated with this converter.

```
public void Release()
```

SendFrameToComputeBuffer(int, int, int)

Sends the camera frame stored in the compute buffers to the compute shader and dispatches it.

```
protected virtual void SendFrameToComputeBuffer(int yRowStride, int uvRowStride,
int uvPixelStride)
```

Parameters

yRowStride int

The size of each row of the image in <u>yComputeBuffer</u> in bytes.

uvRowStride int

The size of each row of the image in <u>uComputeBuffer</u> and <u>vComputeBuffer</u> in bytes.

uvPixelStride int

The size of a pixel in a row of the image in <u>uComputeBuffer</u> and <u>vComputeBuffer</u> in bytes.

SetupCameraFrameForwarder(CameraFrameForwarder, Resolution)

Sets the camera frame forwarder.

public virtual void SetupCameraFrameForwarder(CameraFrameForwarder cameraFrameForwarder, Resolution textureResolution)

Parameters

cameraFrameForwarder CameraFrameForwarder

textureResolution Resolution