# ApplicationSettings

## Functionality

The applicationSettings script holds the settings fort he ArchiVR application. It also loads these settings from a presistent file xxx.data in the Apllicatin’s persistent data folder. Upon application shutdown ita lso stores the currently active settings to that file, The settings for the Application are persistenly stored in between excutions of the ArchiVR pplication. ApplicationSettings is composed of GraphicsSettings and ControlsSettings.

## GraphicsSettings

The GraphicsSettings is composed of:

* Quality Level (String)
* Dynamic Vegetation (bool, default: on)
* Fog (bool, default: on)

### Quality Level

#### Functionality

The quality level defines the quality of graphical rendering of the application. For each platform a default quality level is defined in the Unity editor. The quality level can be changed at runtime however.

Quality levels vary from very high quality (ultimate) to very low (very low). Every quality level implies a certain tradeof between graphical quality and performance. The higher the quality levels can only be run on high-power systems, while the lower-quality levels can still run smoothly on lower-powered systems, albeit at the expense of a decrease in graphical quality.

## ControlsSettings

ControlsSettings define how the user interacts with the application.

ControlsSettings is composed of:

* NavigationMode (One of: FPS, Fly, TelePort, Tracked, VuforiaAR)
* TrackingSystem
  + WMTracker
    - Enabled (default: false)
    - IP
    - Port
  + WindowsXRTracker
    - Enabled (default: false)
    - ???

Navigation modes FPS, Fly and Teleport all support following input modes:

* TranslationInput
  + Mouse
  + Keyboard
  + Gamepad
  + Touch (Virtual gamepad, Tap, Swipe)
  + GearVRController
* RotationInput
  + Mouse
  + Keyboard
  + Gyro
  + Gamepad
  + GearVR Touchpad
  + Touch (Virtual gamepad, Tap, Swipe)
  + XXXTracker
  + GearVRController

By default, when the application starts up for the first time, or after a reset of the application setting,

The application starts up in VR mode if supported:

* GearVR
  + Default rotation control: FromGyro
  + Default translation control
    - Gamepad
    - GearVRGamepad
    - GearVRTouchpad
* Tracking
  + MicrosoftXRTracker
    - Default rotation control: FromGyro
    - Default translation control
      * Tracking
      * Gamepad
  + WMTracker
    - Default rotation control:
      * FromGyro
        + option ‘used tracking for absolute correctness’
    - Default translation control
      * Tracking
      * Gamepad

All suitable and supported Input modes are enabled

## DebugSettings?

The DebugSettings is composed of:

* Debug level

The DebugSettings option is only visible when debugging is enabled.

## How to use the ApplicationSetting

Every main scene in the Application needs to have an active ‘empty’ root gameobject with the ‘ApplicationSettings’ script attached to it.

The Applicationsettings is a singleton. It is also persistent during the execution of the Application: Once it is created, it sets itself as ‘DoNotDestroyOnLoad’, which makes that this instance stays alive when transitioning between scenes.

# Project

## Prerequisite Unity scene layout:

* World
  + Phases
    - Begin
      * WorldBounds
      * Construction
        + MeshImportedFromSketchup
      * Furniture
        + Layer\_Terrain
        + Layer\_FloorL0
        + FloorL1
    - Final
      * WorldBounds
      * Construction
        + Mesh
      * Furniture
        + Layer\_Terrain
        + FloorL0
        + FloorL1
* Application
* UIManager
* …

## Layers

The scene content can be arranged into several layers.

#### Adding a GameObject to a layer

To add a GameObject to a layer in the unity editor, name it in accordance with this naming convention:

|  |
| --- |
| “Layer\_” + insertLayerNameHere |

SomeExample names for GameObjects that belong to a specific layer in a typical layer setup:

* Layer\_Terrain
* Layer\_Facade
* Layer\_Furniture
* Layer\_FloorB1
* Layer\_FloorL0
* Layer\_FloorL1
* Layer\_FloorL2
* ‘Layers’ menu
* ‘Layers’ menu

#### ‘Layers’ Menu

The layers in a project can be en/disabled in the ‘Layers’ menu. (Main Menu > Layers)

It shows a button for each Layer defined in the current project scene. A layer button shows a dynamic caption that visualizes the ‘enabled’ state of the layer. Caption format:

|  |
| --- |
| (isLayerEnabled() ? “V ” : “X ”) + enterLayerNameHere |

TODO:

Refine to accomodate for displaying of bigger amounts of layer buttons simultaneously:

* rescale layer buttons
  + (use icons?)
* scrolling area to contain layer buttons

# RenderLayers

The scene content is arranged into several Render layers:

1. Sky
2. Celestial objects
3. Horizon
4. World
5. UI-VR
6. UI

The layers are rendered in the order in which they are listed above. This is achieved by managing the layers in Unity (via TODO > TODO >)

The layers are managed in Unity editor. A GameObject can be assigned to a Render Layer by setting the ‘Layer’ field of the Gameobject in the ‘inspector’ pane.

## Layer ‘Sky’

Contains the skydome.

Clears both dept hand color buffer (with a solid color).

## Layer ‘Celestial objects’

Contains the celestial objects like sun and moon.

Only clears depth buffer.

## Layer ‘Horizon’

Contains the horizon dome.

Only clears depth buffer.

## Layer ‘World’

Contains the virtual environment and objects in it.

* Terrain
* Buildings
* Furniture
* ? World-space interactive items
  + Light switches
  + …
* …

Only clears depth buffer.

## Layer ‘UI-VR’

Contains the world-space UI components that are attached to the player for VR mode.

Only clears depth buffer.

## Layer ‘UI’

Contains the screen-space UI components for non-VR mode.

Only clears depth buffer.

# Procedures

## Procedure: Add a construction project

1. Import assets
   1. model of building (Sketchup v2015), into Assets/KS/Model/ProjectXXX folder.
   2. Project preview image, as 2D/Sprite, into Assets/Resources/ProjectPreview/ folder.
2. Create project scene
   1. Named ‘ProjectXXX’, in folder ‘Assets/Scenes’
   2. Hint: Copy-Rename-Modify an existing, functional project scene.
3. Add Lighting to project scene
   1. World/Lighting
      1. LightgroupXXX
      2. Light01
      3. Light02
      4. …
4. Add POI to project scene
   1. POI.Default
      1. L0Leefruimte
      2. …
5. Add project selection button to the Home state’s Project Selection menu
   1. This could be automated, so project selectionn scene buttons are dynamically creadted and arranged according tot he project scenes available.

### Define dynamic vegetation

### Define construction lighting

Under the ‘Construction Lighting’ Gameobject below the concened ‘Construction Phase’ GameObject, create a hierarchy of GameObjects that is equal tot he Layer hierarchy, eg:

* Lighting
  + B0
    - Stair
    - Bicyle Room
    - Main Storage
    - Technical Room
    - …
  + L0
    - Entrance
    - Kitchen
    - Living Room
    - Dining Room
    - Toilet
    - Stair
    - …
  + L1
    - BathRoom
    - Toilet
    - Bedroom 1
    - …

Then add a GameObject for each LightGroup into the corresponding room’s GameObject, eg:

* Lighting
  + LO
    - Living Room
      * Lightgroup Plafond
      * Lightgroup Wall
      * Lightgroup Standing lamp

Then add lights to the lightgroup GameObjects. A collection of light fixture prefabs (wit hand without corresponding Unity Light object) are readily available in the assets folder ‘Models’.

### Define POI

Points-Of-Interest are defined using the Unity editor. Add a new POI as follows:

1. Add a new ‘Camera’ beneath the ‘POI collection’ GameObject (eg POI.default)
2. Rename the POI to a descriptive name (eg ‘Kitchen’, ‘Bedroom 1’, …)
3. Remove the ‘SoundListener’ component from the camera
4. Put the POI in the correct location:
   1. Translate and rotate it into the correct location, while reviewing the POI resulting view in the Unity editor ‘Game’ window.
   2. To make the Unity editor show the POI view result, have only the concerned POI’s Camera component active – disable all other cameras in the scene.
5. When the POI is correctly located, make sure the POI GameObject is enabled, but disable its ‘Camera’ component.

## Procedure: Remove a construction project

Remove the project scene

Remove the project preview Sprite asset.

Remove the project selection button from Home state’s Project Selection menu.

# Development tools

## Monitoring application performance

The FPS can be investigated using the FPS counter widget and exported file.

## Developing/debugging a project scene

When making a lot of successive changes to a project scene, the easiest way to review and debug those changes is to set the ‘InitialProjectName’ setting on the PlayApplicationState. This makes the Play state start up with the designated scene loaded right away.

# TODO:

## Code implementation

* Get camera navigation rotation Gyro mode working again
  + Implement option ‘Gyro’ in ‘Settings>Controls’ menu.
* Implement generating screenshots
  + Use specified resolution (1920\*1080)
  + Activate best available graphics quality setting.
* Properly implement and document a way to generate POI.
  + Shortcut key = ?
  + To File (path:???)
* Add proper lighting to P006
* Align P006 With World Axes. This will enable using terrains more easily
  + Fix terrain for Tuin Achter
  + Add Terrain(s) in tuin voor
  + Add terrain(s) for tuin links/rechts)
    - Zet beplanting als ‘mesh’ details
* Add proper lighting to P008
* Add proper lighting to P011
* Add proper lighting to P024
* Add proper lighting to P025
* Add proper furniture to P011
* Review and finalize reusable lighting components as prefabs
* Initialize lighting in project 008 and 001 properly
* Load reusable ‘furniture’ components as prefabs.
  + Set material settings.
* Create ‘Furniture-less’ version of model for each project (skp v2015)
* Use furnitureless model in project scenes
* Prepare furniture in projects, using tweaked unity furniture
* Sky: Implement Clouds
  + Based on perlin noise?
  + Add heightmap for extra visual ‘depth’
* SkyDome : Implement Fog
* SkyDome : Implement Finegrained control over Sky gradient.
  + Shader: add property \_SkyLight1InfluenceRangeAngle
* SkyDome Shader: implement properly support for arbitrary number of celestial objects.
* Sky behavior: use SkyDome Shader support for arbitrary number of celestial objects, to properly represent both sun and moon.
* SkyDome : Implement making rendering ground optional.
* SkyDome : Implement timed ‘Ground Colors’