# General

Archi-VR is an application to preview architectural projects in <virtual Reality (VR) on the Oculus Quest device. The application can be built with a set of Archi-VR projects.

# Archi-VR project

An Archi-VR project represents a snapshot of an architectural design for a physical construction project.

## Examples

Some examples of ArchiVR projects are:

* ProjectKS046
* ProjectKS003Before
* ProjectKS003 After
* ProjectKS069OptionA
* ProjectKS069OptionB

## Project scene structure

Each Archi-VR project is defined in its own Unity scene.

The structure of an Archi-VR project scene looks as follows:

* Project
  + Model
    - Model Anchor
  + POI
    - ...
    - Terras
    - Living
    - ...
  + Lighting
    - ...
    - KitchenPlafond01Point
    - LivingPlafond02Point
    - ...

### Project GameObject

The root object for the project scene.

### Model GameObject

The game object that contains the project-specifig geometry.

### Model Anchor GameObject

This game object represents the conceptual ‘anchor point’ around which the model will rotate in maquette mode.

### Lighting GameObject

# Archi-VR build types

## Single-project build

For a single construction project, several project can be prepared and included in a single Archi-VR build for that construction project.

Original/Before  
Cleanup/Teardown  
Construction Phase RuwBouw  
Construction Phase Technieken  
…  
Construction Phase Final

This is called a ‘single project build’

## Portfolio build

Likewise, several Archi-VR projects for different construction projects can be added to a single Archi-VR build.

Project 001  
Project 002

This is called a ‘portfolio build’

Archi-VR Trainstation

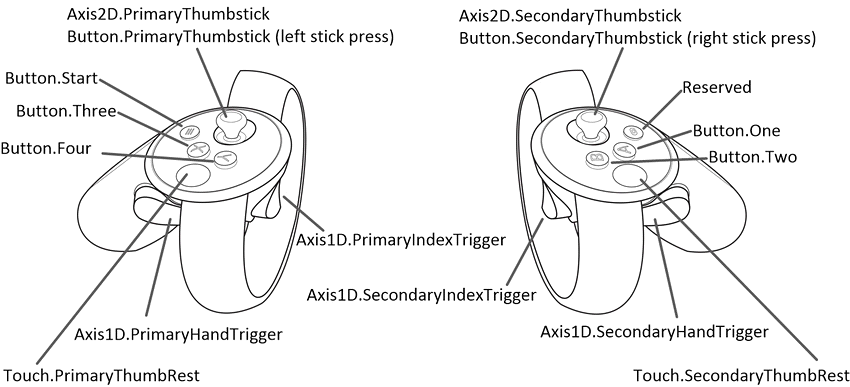
* Projects
* Original State
* Proposal A
* Proposal B
* Proposal C

The Archi-VR application has the concept of an ‘active project’ this is the project currently being previewed. The user can toggle between the active project by cycling the projects included in the build.

When switching to a new project, and the project contains a POI with the same name as the active POI, then that POI is automatically activated.

Input

When run on an Oculus Quest, all input is perfomed via the Oculus Quest’s Touch Controllers:



When running in VR, the controllers are visualised on their real-world location. UI like menu’s and flyouts can be attached to the controllers. When running in the editor, the controllers can be visualised optionally. (as an aid for debugging the controller-attached UI) When running in the editor, controllers are located at a fixed offset in the current view.

Startup

Application starts up in Walkthrough in the following way:

* immersion mode ‘Walkthrough’ activated
* first Project (if available) activated
* first POI (if available) activated

Immersion mode

Immersion mode can be toggled using the left index trigger.  
  
Immersion modes:

* Walkthrough mode
* Maquette mode

The application is said to ‘run in the active immersion mode’. The active immersion mode can be toggled between ‘walkthrough’ and ‘maquette’ mode.

Walkthrough mode

The project is represented in real scale in Virtual Reality. The user can toggle between Points-Of-Interest included in the project.

When switching to a new POI, the tracking space is ofsetted to counter-act the offset from the tracking center position. This assures that the user always lands on the intended POI position, thereby avoiding ‘awkward’ teleportations into walls, thin air, or above staircases. Downside is that the volume in which the userr can walk freely, can be malaligned tot he POI – leaving too much room for movement at one side, too little room of movement on the opposing side. When teleporting, the screen first fades to black, then fades in again. This improves the comfort level for the user.

Controls

|  |  |  |
| --- | --- | --- |
| Command | Touch |  |
| Toggle immersion mode | Left index trigger |  |
| Next POI | X Button | Left arrow |
| Prev POI | Y Button | Right arrow |
| Next project | A Button |  |

Maquette mode

In maquette mode, the model is rescaled to 1/25 scale (the usual scale for physical architectural maquettes). When entering this mode, the tracking space is located at it’s default location (around the model. The model is scaled 1/25, and resides at a height of 1m 20 cm, with no rotation.

In maquette mode, the ‘maquette preview context’ scene is visible. It is a real-scale context in which the maquette is located, in order to make the process of previewing a model feel more natura lto the user(It does not feel natural to float in thin air without something to stand on). On top of that, some info is displayed in the preview context. The preview context consists of the following:

* A platform/room on which the model is centered.
* A 3D text couting ‘KS-architect’
* A 3D tekst couting the name of the project being previewed.

Toggle model layer visibility

The user can toggle different parts of the model visible/invisible as follows:

* Touch the part with the left controller, so that it (or it’s outline/bbox) becomes highlighted.
* ‘Click’ the part with the left controller index button.

Manipulate model location

The model location can be manipulated using the as follows:

* Left Thumb horizontal: Rotate model around up vector.
* Left Thumb vertical: Translate model along up vector.
* Left Thumb Click: Reset model to its default location (no rotation, y=1m 20cm)

Movement

In any immersion mode, the position of the tracking space (and hence viewpoint) can be manipulated as follows:

* Move forward: Translate along ‘forward’ viewing direction.
* Move backward: Translate along ‘backward’ viewing direction.
* Move left: Translate along ‘left’ viewing vector
* Move right: Translate along ‘right’ viewing vector
* Move up: Translate along ‘up’ viewing vector
* Move up: Translate along ‘down’ viewing vector

In VR, the controls are mapped to he Right controller as follows:

* Thumb Up -> Forward
* Thumb Down ->Backward
* Thumb Left -> Left
* Thumb Right ->Right
* Index Trigger -> Up
* Hand Trigger ->Down

# Editor input

While running in the Unity editor, the touch controls are not available. Therefore, the inputs are mapped on the keyboard an mouse as follows:

Left Controller:

|  |  |  |
| --- | --- | --- |
| X Button | F1 |  |
| Y Button | F2 |  |
| Index Trigger | R |  |
| Hand Trigger | F |  |
| Thumstick click | A |  |
| Thumbstick left | Q |  |
| Thumbstick Right | D |  |
| Thumbstick Up | Z |  |
| Thumbstick Down | S |  |
| Start Button | F11 |  |

Right Controller:

|  |  |  |
| --- | --- | --- |
| A Button | F3 |  |
| B Button | F4 |  |
| Index Trigger | LMB |  |
| Hand Trigger | ? |  |
| Thumstick click | ? |  |
| Thumbstick left | Left Arrow |  |
| Thumbstick Right | Right Arrow |  |
| Thumbstick Up | Up Arrow |  |
| Thumbstick Down | Down Arrow |  |

The view can be rotated by pressing LShift while moving the mouse.

# How to prepare a Sketchup model for import in Unity

In order to be suited for import in Unity, a Sketchup model must comply to the rules below:

## Materials with textures

* The material name MUST match the texture file name exactly.
* Material/Texture names MUST NOT contain spaces
* ~~Use Pascal Casing? (eg. VloerTegel512x512, Boom2D256x512) for material/texture names~~
* ~~Use only JPG? (or is png also fine?)~~

## Face orientation

Face orientation must be consistent and correct, ie. there should NOT be any reversed faces in the model.

Having inconsistent face orientation in the model will result in the following problems when using the model in Unity:

* Bad/Incorrect lightmapper results.
* When importing a model with ‘generate back faces’ turned off in the imprt settings, will result in ‘holes’ in the model where reverse faces are present. (because faces will be invisible from their back side).Face orientation

### Tip

In Sketchup, use **Edit>Face Style>Monochrome** to check face orientation.

# How to prepare a Sketchup model for usage in Archi-VR

* Model
  + Surroundings (Street, garden,…)
  + Roof
  + Floor2
    - Walls topside
  + Floor 1
    - Walls topside
  + Groundfloor
    - Walls topside
  + Basement
    - Walls topside
  + …

### Tip

Use outliner to divide model into the entities that should be visiblility-togglable in Maquette mode.

# How to create an ArchiVR project

* Copy-paste-rename an existing ArchiVR project
* Open it
* Remove the content of the ‘Model’ node
* (create a new folder under assets/Projects/ProjectName to store the necessary assets fort he ArchiVR project in.
* Import the assets
* Drag in model under the ‘Model’ node.
* Add colliders for layers.
* Select a mesh (or multiple meshes) for each layer, and add collider to it (or them).
* Select imported models root entity, and set 'staic' flag to 'contribute GI' recursively.
* Select all entities that need not contribute to GI and unset static flag on them. Also disable cast/receive shadow.
* Adjust the POI.
* Add/Edit/Remove POI to match the project.
* Tip: Create additional POI by copy/paste/rename existing POI. (start from an original on the same level)
* Relocate the a POI by selecting it (not its children!), and dragging it to the correct position/orientation.
* Adjust the lighting
* Make sure thate scene global lighting mode is set to 'baked'
* Add/Edit/Remove lights to match the project.
* Tip: Create additional Lights by copy/paste/rename existing lights. (start from an original on the same height level)
* Make sure there is only one directional light (name it 'Sun'), and that it has a sensible orientation (usually 60,30,0)
* Make sure all lights are set to 'Mixed' mode.