CS325 Group Project

EZAR

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EZAR - Ez Architecture

The Ez Architecture (EZAR) is a Scene Configuration platform designed for Professional Urban Planners, allowing them to quickly and easily place virtual objects into digital recreations of real environments to help them develop pans for the use of land and revitalization of urban zones.

Design Goals

Our Design for the Application aims to have a simple and user friendly architecture in 3 ways

- Big buttons with icons
    - Eliminate fat finger error and make the entire UI look easy and learnable at one glance, such that the user will not be freaked out by the unknown functionalities on the scene.
- Lots of short-cut keys
    - Hidden and Displayed shortcut keys to make the development process fast and controllable.
- Visible States of user control
    - Users should be able to see the obvious immediate effect of his change for data visualisation and user system synthesizability.

User Analysis

Our target users for EZAR are Professional Urban Planners, working in the AR industry with basic technical knowledge and familiarity with similar software such as Unity & Maya.

Below is the **persona** we've created for our target user:

Name: Bob Boberson
Age: 32
Occupation: Professional Urban Planner
Previous Experience: ● Worked in the IT Industry, AR sector for at least 3 years. ● Proficient in Unity
Notes: Busy with other freelance work, don't have much time to spend editing scenes.

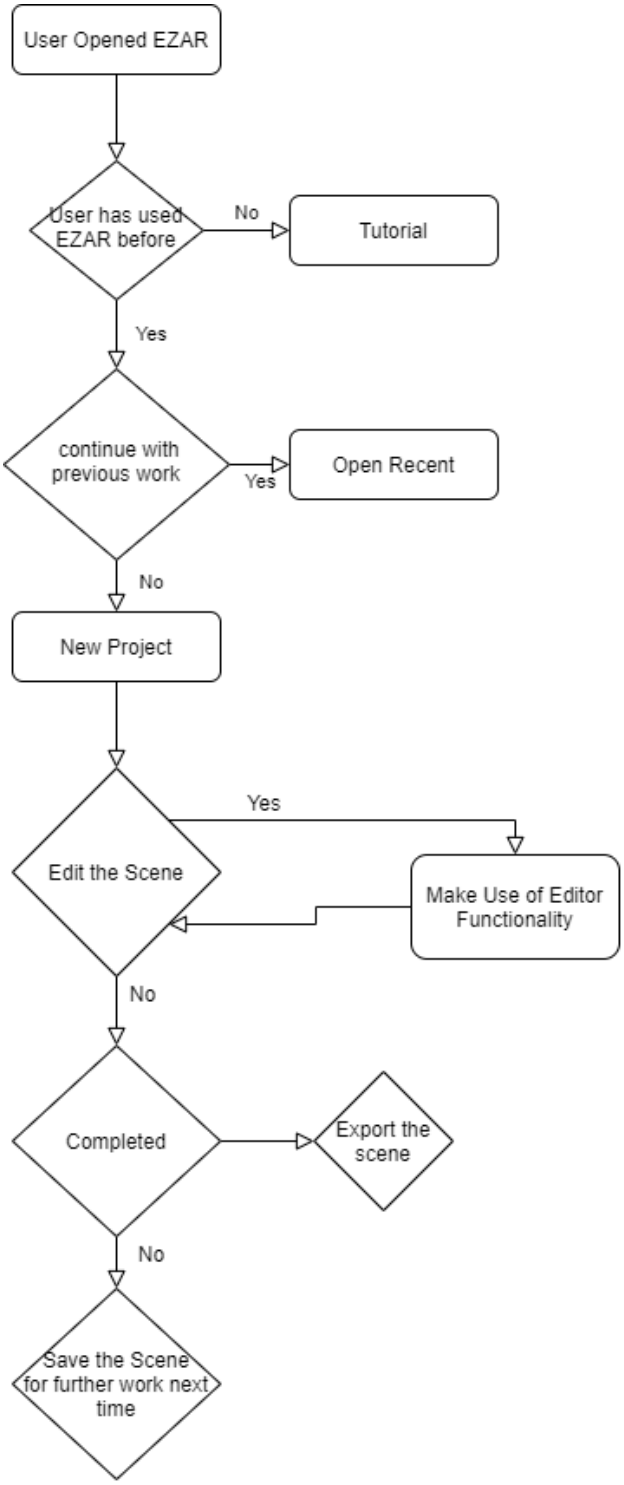
Task Analysis

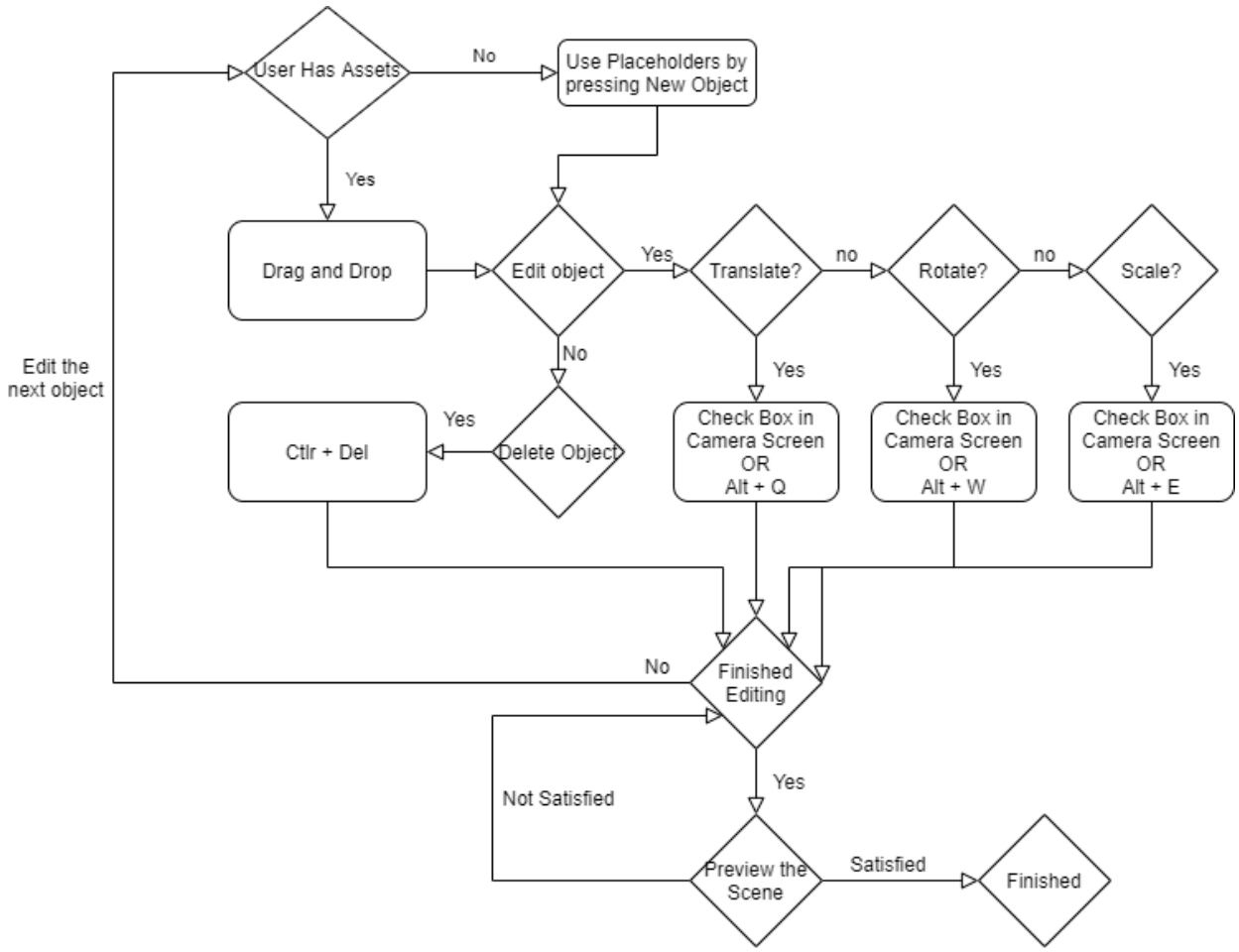
Below are some of the tasks that must be able to be accomplished with EZAR

User Tasks

• Users need to be able create, edit, open and view configurations files.
• Virtual Objects Add, Edit, Delete
• Export into AR system configuration file.

User Flow Diagram





Task Outlines

Open Configuration 1. Go to menu bar and click “File” then “Open” 2. Select file that you want to open in the pop up then open
Save Configuration 1. Go to menu bar and click “File” 2. Click “Save” or “Save As” a. Select the file type in the pop up if you click “Save As”
Add Virtual Object 1. Go to menu bar and click “File” then “Import” a. Select the virtual object that you with to import in the pop up 2. Drag and drop the object file into the scene
Delete Virtual Object 1. Click on the virtual object you want to delete 2. Press “Del” key on the keyboard

Export Configuration

1. Go to menu bar and click “File”
2. Under “File”, click on “Export”
3. Select the folder you want to export the file in and click “Export”

Edit Scene Configuration

1. Add (Drag & Drop), Cut, Copy, Paste, Delete objects in hierarchy list and Camera View Editor
2. Drag, scale, rotate object in Camera View Editor
3. Key in transform values directly from Property Inspector

Help

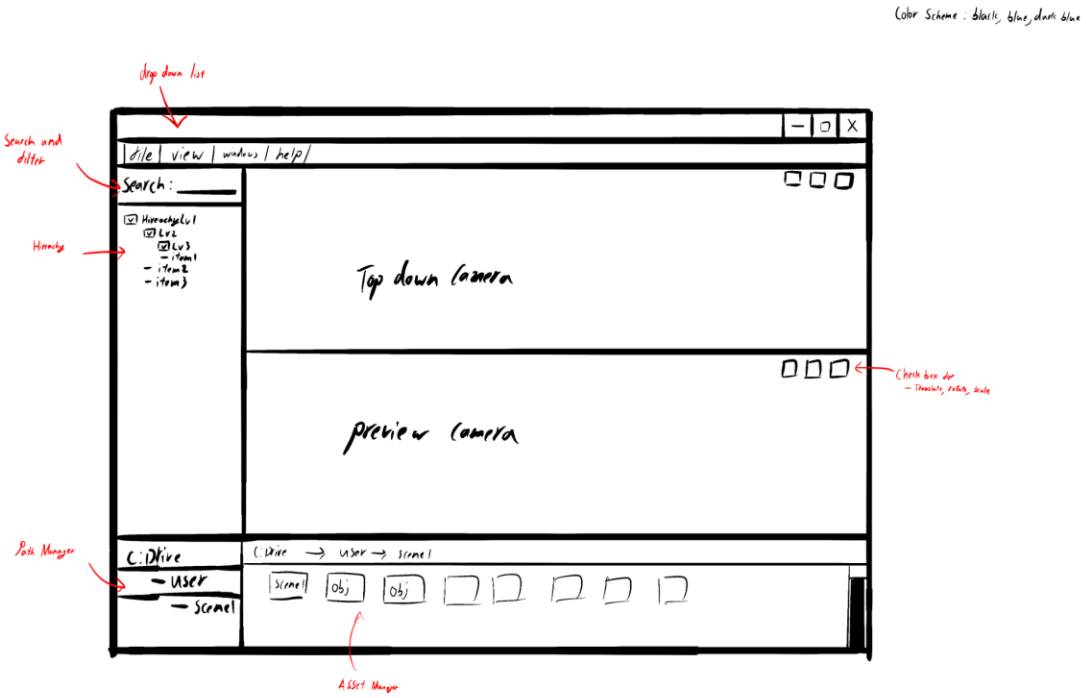
1. Go to menu bar and click “Help”
    a. Read documentation by selecting “Documentation”
    b. Enable tooltips by selecting “Tool Tips”
2. Minor help in value acceptance range
    a. e.g. “Key in x coordinate here”

Important Assumptions

- Assume that no special behaviour will be made through EZAR like Application Logic.
    - E.g. Something will be spawned when a virtual button is pressed.
    - EZAR is strictly to place objects needed in a single virtual scene.
- Assume that the configuration will be able to be read by the AR system.
- Assume that objects the editor deals with are preset objects and cannot be changed in any way except to place them into different areas into the scene.
    - E.g. A virtual object cannot be changed/edited to have a different shape but can be translated, scaled and rotated to any values.
    - Note: Inspector Window might not be needed as there will only be transform values to adjust. Therefore, it doesn't need to take the whole right screen as it doesn’t need much space.

Lo-Fi Prototype 1

1st Iteration of Lo-Fi Prototype



This is the 1st iteration of the Lo-Fi Prototype for EZAR. The main focuses of this prototype are the following:

1. Symmetrical overall layout and placement of buttons, widgets and windows with regularity.
2. Size of buttons, widgets and windows.

Description of Individual Sections

The Layout is split into 4 main sections:

1. *Menu Bar (Top)*
    - From the top, we have a Menu Bar that contains buttons which when pressed, will produce a drop down list of options.

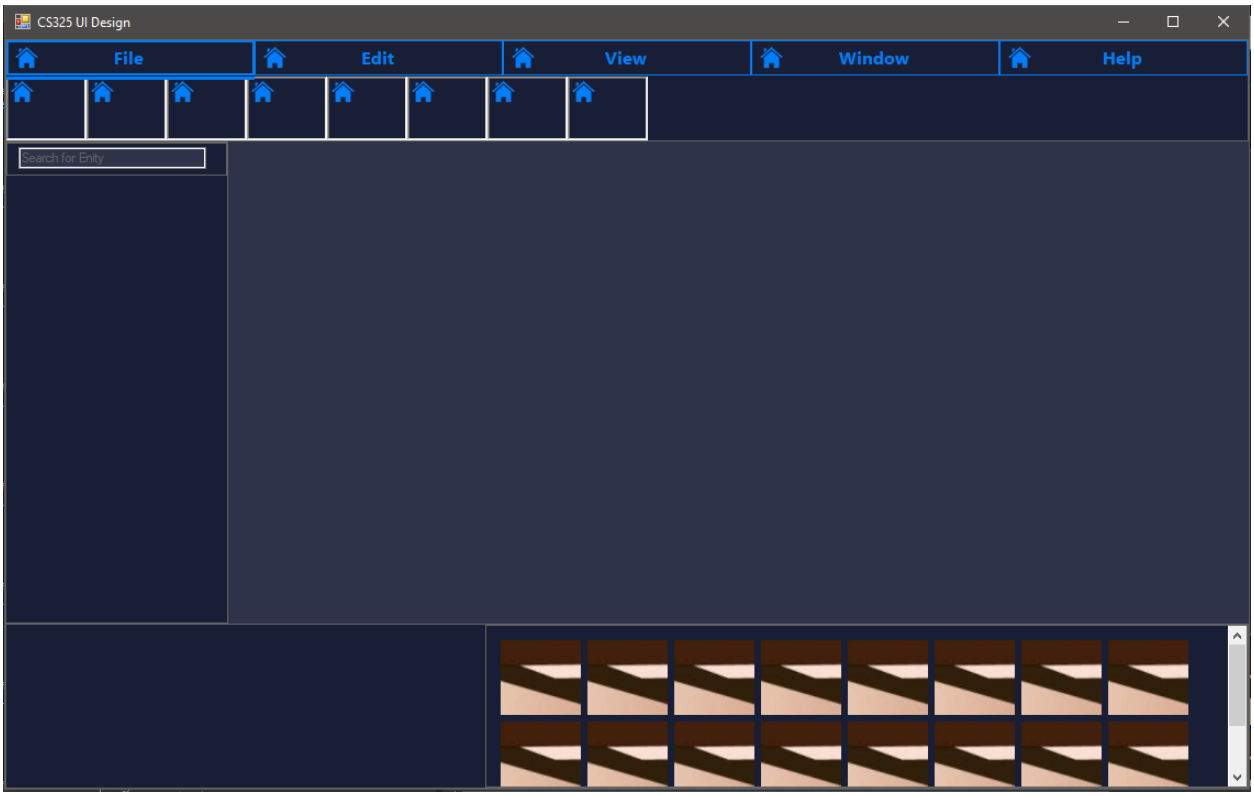
2. *Hierarchy Window (Left)*
    - To the left, we have a Hierarchy List for the objects in the current scene as well as a Search bar to quickly find and filter specific objects in the Hierarchy List.

3. *Asset Manager (Bottom)*
    - On the bottom, we have the Path Manager as well as the Asset Manager to view the objects stored in the selected path.

4. *Scene Windows (Center)*
    - Finally, in the center, we have 2 windows. One for the top down camera for better and more precise object placement, and one for the preview camera, to allow the user to roam around the virtual environment. Both windows have 3 smaller buttons at the top right hand corner to “Minimize”, “Maximize” or “Close” the window.

Lo-Fi Prototype 2

2nd Iteration of Lo-Fi Prototype



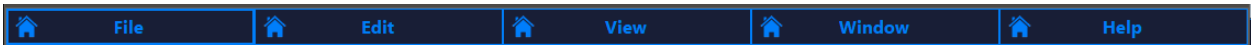
This is the 2nd iteration of the Lo-Fi Prototype for EZAR. The main focuses of this prototype are the following:

1. Made with C#.net
2. Implemented Dark Blue colour scheme
3. Improvements to layout

Changes to Individual Sections

The Layout is now split into 5 main sections, below are the changes made from the 1st iteration:

1. *Menu Bar (Top)*



   - There are some changes to the menu bar from Iteration 1. The buttons are now designed to be horizontally long to make use of the top screen edge border limit. It was made narrowly tall to ensure that it does not take more screen space as necessary.
   - Clicking on any of these buttons will now make the Bookmarks Bar popup instead of a drop down list.

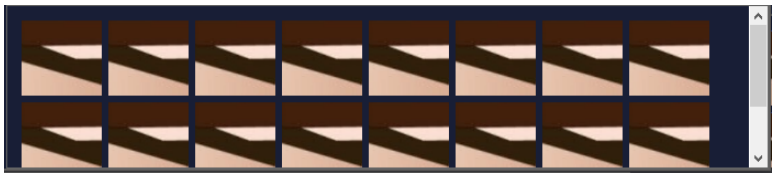
2. *Bookmarks Bar*

   - For this 2nd prototype, we changed the drop down list to a bookmark bar as users will respond better to huge icons rather than just a drop down list of worded buttons.
   - Using steering law, we made these elements taller than the Menu Bar to allow for easier navigation horizontally while within the Bookmarks Bar.
   - These elements use a square design so as to better make use of icons.
   - Also made sure each of the buttons have a meaningful title that is self-explanatory.

3. *Hierarchy Window (Left)*

   - From user analysis, we determined that the user is familiar with Unity. In order to make it familiar for the user, we designed a similar hierarchy window which displays objects in the scene similarly.

4. *Asset Manager (Bottom)*



   - Designed to be similar to Unity's assets explorer window. Makes use of boxes to allow for use of icons.

5. *Scene Window (Center)*
    - The half split between the windows from iteration 1 has also been changed for this 2nd iteration. Though testing, we found that splitting the window in 2 was not effective as the user could not see as much as they should.
    - Currently, it displays the preview window by default, and the top-down view window is still accessible via the Bookmarks bar and will switch the preview window into a top-down view window.

Below is further elaboration of each specific UI section.

Application layout:

Menu Bar

File
- New
    - New a project scene
- Open
    - Open a project scene from file
- Open most recent project
    - Quickly open a recent project scene
- Save
    - Save the current scene
    - Hot-Key Ctrl + S
- Save as - Copy
    - Save as another Scene Document
- Import(import assets, scene)
    - A Drag N Drop Alternate version
    - External Explorer Into Asset Manager
    - Asset Manager Into Scene
    - Packages
- Export
    - Export the current project to a configuration file

Edit
- Select All
    - Select all objects in the scene
- Undo
    - Undo the last action
- Redo
    - Redo the Previous Action
- Cut
    - Cut the current Targeted Object
- Copy
    - Copy the current Targeted object
- Paste
    - Paste the current Targeted object
- Preferences
    - Open a interactable window that allow the user to toggle project preference
- Project Settings
    - Open a interactable window that allow the user to toggle project Settings

<u>View</u> ● 2D Top down view ○ Enable the 2D top down View ● 3D View ○ Enable the 3D editor view ● Show Grid/Hide Grid ● Scene Preview ○ Toggle the camera to preview the Scene ○ Show what the user will see in AR configuration	<u>Windows</u> ● Main Camera ○ Open and close the main camera window ● Hierarchy ○ Open and close the Hierarchy window ● Asset Manager ○ Open and close the asset manager window ● Inspector ○ Open and close the inspector window
<u>Help</u> ● About ○ A link to the company webpage ● Documentation ○ A link to documentation webpage ● Tutorial ○ Enable Tutorial mode ● Tooltips ○ Enable/disable Tooltip ● Check for Updates ○ Check for application update ● Release Notes ○ Notes for the new update ● Licenses ○ A link to licence webpage ● Contact Us ○ A link to the contact us webpage	

Camera view screen

<table>
<tr>
<td>Behaviour

Spawn a User in the middle of the screen by default
Selected object will be highlighted with red border
Selected object will have translate/rotate/scale UI appear on them according to edit mode
Invisible shortcuts
Drag and drop assets into camera view

</td>
<td>Hotkeys

Ctrl + Q

Translate edit mode

Ctrl + W

Rotate edit mode

Ctrl + E

View edit mode

Ctrl + X

Cut object

Ctrl + C

Copy object

Ctrl + V

Paste object

On right click on an open space, open drop down list

New Object
Paste

On right click on an entity, open drop down list

Cut Object
Copy Object
Delete Object

</td>
</tr>
<tr>
<td>Camera Controls

Alt + LMB

Camera Rotation

Alt + Middle Mouse Button

Camera Translation

Alt + Mouse Wheel

Camera Zooming

</td>
<td>Visible shortcuts

Shortcuts checkbox

Show/Hide Grid
Translate Mode
Rotate Mode
Scale Mode
Preview Mode

Shortcut drop down list

Snapping Size

100,200,300…..

Camera Translate Speed
Camera Rotate Speed

</td>
</tr>
</table>

Hierarchy

- View all objects in the scene here
    - Has Parent and child
        - Child object will follow the parent object's movement

Asset manager

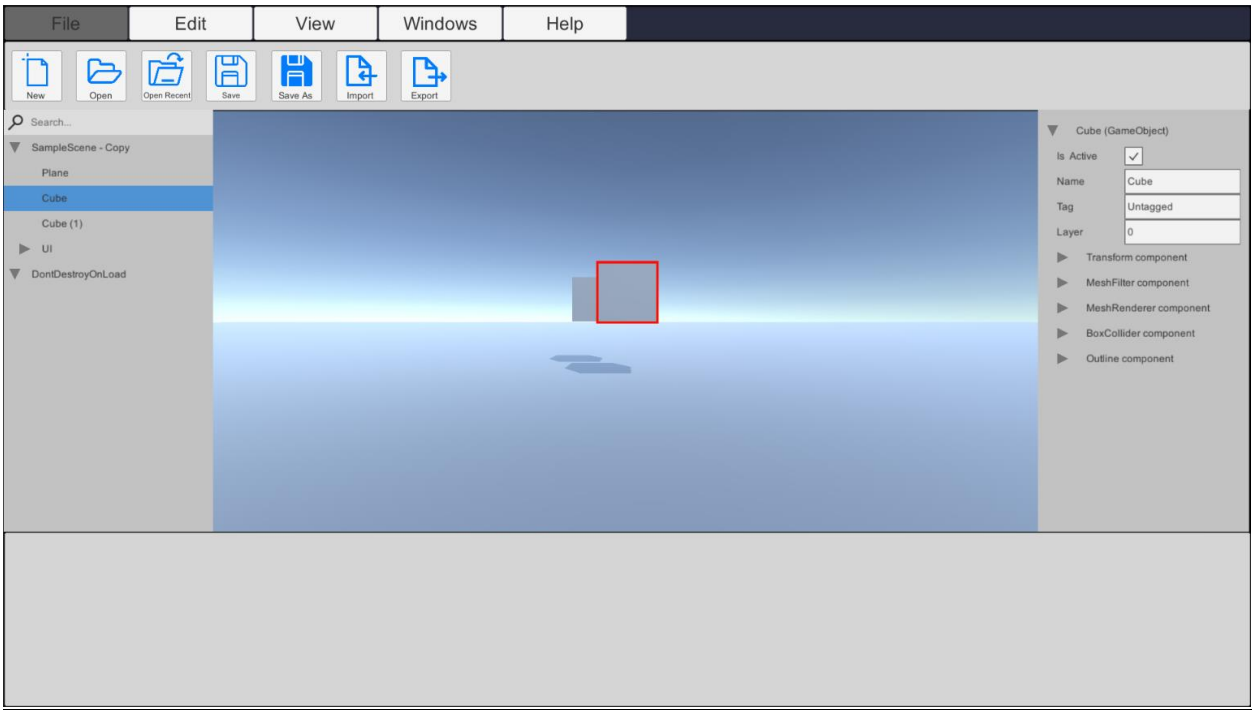
- View imported objects here
    - AR objects
        - Drag and drop to import to scene
    - Scene File
        - Drag and drop to load scene

Entity property Inspector

- Adjust all variable properties for a entity
    - Transform
        - Adjust position, scale and rotation

Hi-Fi Prototype

1st Iteration of Hi-Fi Prototype



The Hi-Fi Prototype Iteration 1 was created with the Unity Game Engine.
The main focuses of this prototype are the following:

1. Functionality from the Lo-Fi Prototype 2 is implemented further.
2. More changes do the UI design based on feedback & research.

Major Changes from Lo-Fi Prototype

Colour Scheme - After collecting feedback from some BAGD students, we found that lighter colour schemes are more widely accepted among designers. As such, the colour scheme is changed to light grey with light blue buttons.

Icons - Placeholder buttons have been replaced with proper icons with the appropriate colour scheme.

Platform Change - The reason for the switch from .Net to Unity was due to concerns over creating viewports in .Net.

Changes to Individual Sections

Similar to Lo-Fi Prototype 2, the layout design remains split into 5 main sections. Below are some of the changes made to them:

1. *Menu Bar (Top)*
    - Selected Panel is now more obvious to the user, instead of highlighting, it is filled up with darker color.

2. *Bookmarks Bar*
    - View
        - 2D Top Down View
            - Switch to a satellite view on the XZ plane with grids
        - 3D View
            - Switch to a 3D scene view
        - Show Grid/Hide Grid
        - Scene Preview (Open another window to show only the scene)

    - Windows
        - Users can open and close windows to expand the size of the camera section in the middle.
        - Users can toggle between Camera view and User view for the main camera section in the middle.
            - Camera View
                - This view is the default top down editor view for the user to edit the scene.
            - User View
                - This is the view of the user when the scene is loaded into the AR application.

3. *Hierarchy Window (Left)*
    - Triangles to show parent and child relationships

4. *Asset Manager (Bottom)*
    - Asset Manager prototype not done.

5. *Scene Window (Center)*
    - Removed user preview window, and replaced with a scene preview
    - Selected objects will be highlighted with a red outline and silhouette. This allows the user to quickly see their current selected object quickly as there would only be 1 such highlighted object.
    - Objection selection is flexible in that it can be selected directly from this view screen or from the Hierarchy Window

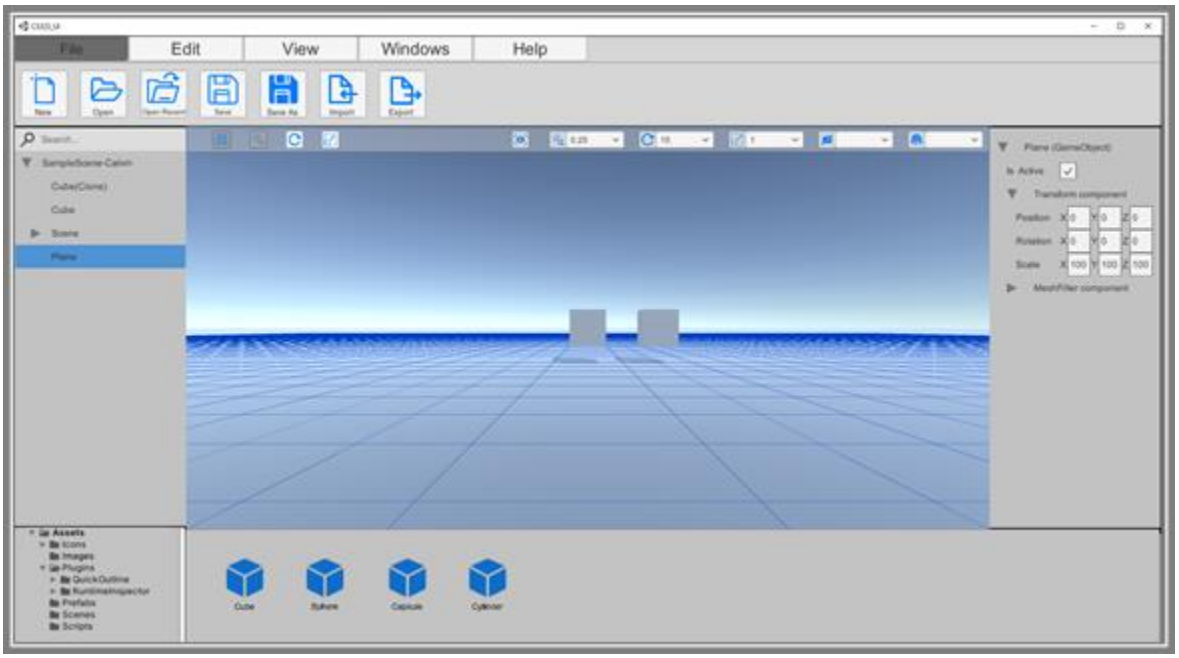
    (Note: Selecting from scene view only colours the Hierarchy item, it doesn't actually select it. Selecting from Hierarchy Window will not update scene view.)

    - Right Click Drop Down List
        - New Object
        - Cut
        - Copy
        - Paste
        - Delete Object
    - When Click on object, the following functions will be available
        - Cut
        - Copy
        - Paste
    - Click on open Space, the following functions will be available
        - New Object
        - Paste

      Functions that are not available will be set to translucent.

Final Prototype

2nd Iteration of Hi-Fi Prototype



The final prototype focus on 3 parts of improvements:

- More shortcuts
- More Polished
- Improved user experience

Major Changes

Pop-up dialogue box - Pop-up dialogue boxes have been added for loading, notifications and interaction.

New Tool Bar in Main Camera Zone - Even more shortcuts keys, also the user's current's editor. To prevent the user from misunderstanding the icons, users can see the label of each icon in the tool-bar by hovering their mouse over it.

Adjustable window size - Windows size is now made adjustable such that the user can have a smaller editor, it enables multi-tasking.

New Camera Movement- Make Sure the Mouse is always in the middle when moving the camera, our user will be able to get use to the camera movement easily because of its consistent behavior.

Changes to Individual Sections

A new subsection is added into the scene view section

Scene Window (Center)

- Tool-Bar
  - Show/hide Grid
    - Grid definitely helps with designing the scenes, but it will also spoil the preview. Our target user might want to switch the grid on and off for constant preview purposes.
  - Translate , Rotate, Scale mode radio button
    - Same as grid, just another short-cut key for the to toggle and view which mode he is at right now
  - Translate, rotate, Scale Snapping drop down list
    - Snapping functionality that allows the user to craft their scene easily. We made it into a drop down list so that the user doesn't have to decide about the number for 1 grid or half a grid, but just use the preset value.
  - Camera Rotate and translate speed
    - Controls the Camera rotation and translation speed to allow the user to move their camera faster or slower.
    - Player can move slower when editing smaller scene and move faster while editing bigger scene

Asset Manager

- Asset Manager added.
- Supports “drag” & “drop”.
- Icons loaded.

Pop-Up dialogue box

- 2 set of dialogue boxes that separates the notification dialogue box and interactable dialogue box.
  - Notification Dialogue Box
  - Interactable Dialogue Box
  - Loading Dialogue Box

- Both have significant differences so users are able to identify each.
- Loading dialogue bar to improve data visualization and synthesizability.

Team Contribution

Calvin Boey Siu Hoe

- Task Analysis
- User Analysis
- Crafting the First Hi - Fi Prototype
- Camera Implementation
- Grid Implementation
- Assisting in Final Hi-Fi Prototype Design Changes
- Shortcut key Implementation
- Bookmark Bar Implementation
- Gizmo Functionality
- Redo,Undo, Copy, Cut, Paste, Delete Functionality
- Shortcut Panel Functionality Implementation
- Scene New, Open, Open Recent, Save, Save as functionality.
- Bug fixes

Leong Jun Ming

- Collection of user feedback
- Feedback analysis and updates
- Right-Click dropdown Script
- User analysis
- Task Analysis
- Crafting Slides
- Folder View

Asset Manager View

Wang Yidi

- Setting and updating overall Design Direction, Flow and Goals
- Editor Design
- Crafting the draft prototype and low fi prototype
- Toolbar Design
- User flow diagram crafting and designing
- Personal Crafting and Designing
- User analysis
- Task Analysis
- Functionality and Behaviour Design
- Crafting Slides
- Crafting Documentations
- Tooltip Implementation

Brandon Ng Jun Jie

- Crafting final Hi - Fi Prototype
- Hierarchy Manager
- Inspector Manager
- 2D 3D camera changing
- Asset Manager Script
- View Bookmark Bar button logic
- Edit Bookmark Bar button logic
- PopUp menu and logic

Wong Zi Feng

- Crafting Icons
- Assist with Bookmark Bar implementation
- User analysis
- Task Analysis
- Slides formatting
- Documentation formatting
- Crafting misc. Images

References

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https://assetstore.unity.com/packages/tools/gui/runtime-inspector-hierarchy-111349

HiddenMonk, CyrilBoucher - Unity3DRunTimeTransformGizmo
https://github.com/HiddenMonk/Unity3DRuntimeTransformGizmo
https://github.com/cyrilBoucher/Unity3DRuntimeTransformGizmo/tree/feature/upm-package

GILES- Generic In-Game Level Editor System
https://github.com/Unity-Technologies/giles