Augmented Reality Based Location & Navigation System

What is Augmented Reality

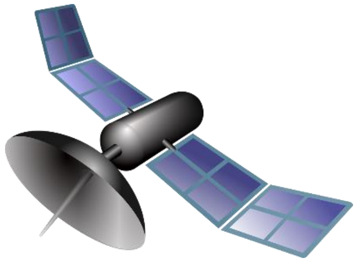
In augmented reality (AR), objects in a real-world environment are enhanced by computer-generated data, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory, and olfactory.

Uses of augmented reality technology

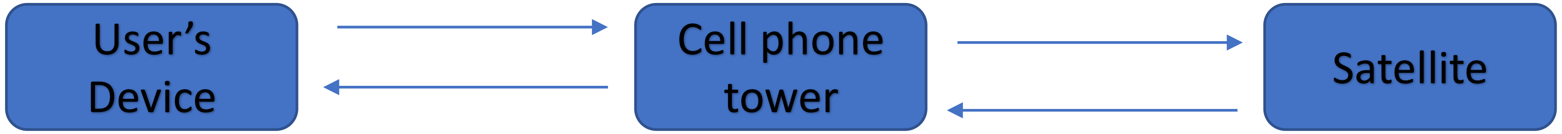
- AR In medical industry
- In Education field
- Retail marketing
- Arch Viz
- Gaming Industry
- Robotics

AR tech for navigation

- Allow User to visualize their surroundings in their mobile phones
- Allow them to search their desired location
- Save and share their last visited locations
- Post remarks about that location



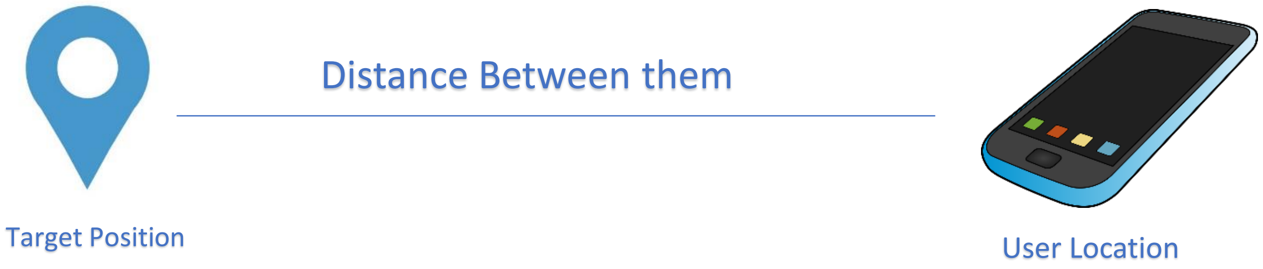
Cell phones with GPS receivers communicate with units from among the 30 global positioning satellites in the GPS system. The built-in receiver trilaterates your position using data from at least three GPS satellites and the receiver.



User’s Device

Cell phone tower

Satellite



Distance Between them

Target Position

User Location

$$3\text{D}: \sqrt{(x_1 - x_0)^2 + (y_1 - y_0)^2 + (z_1 - z_0)^2}$$

Longitude and Latitude

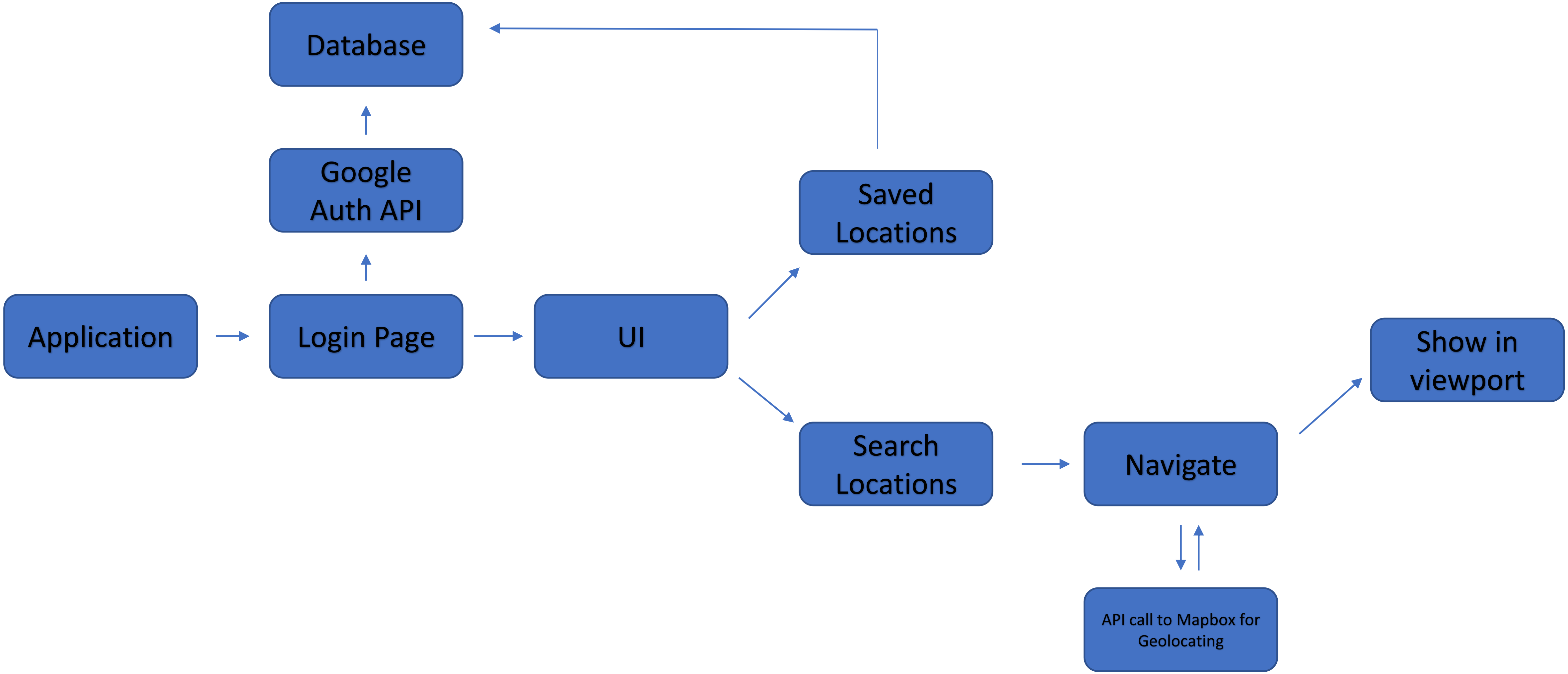
```
If (user_location==target_position)
{
   Do Something();
}
```

unity

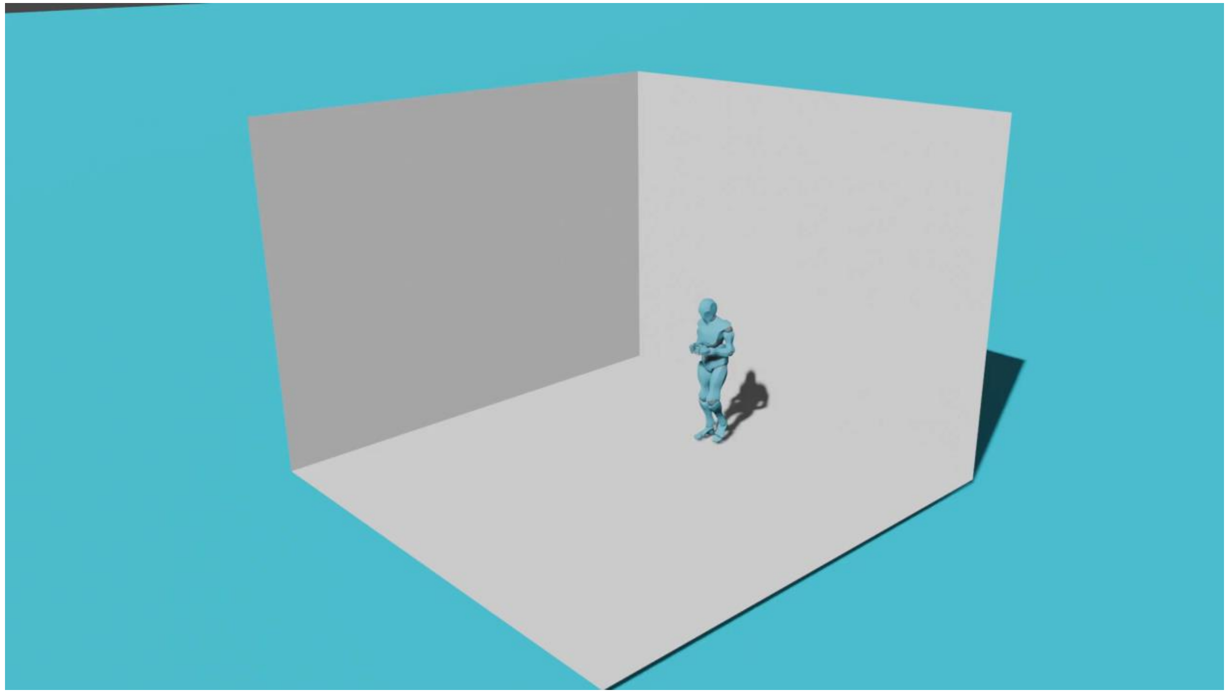
ARCore

Unity3D is a powerful cross-platform 3D engine
and a user-friendly development environment.

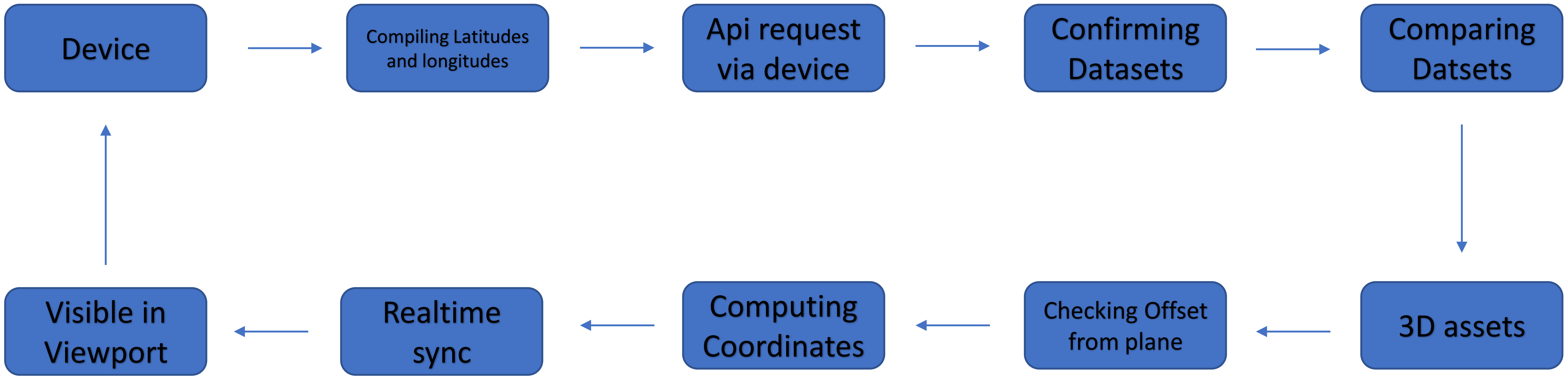
ARCore is Google's platform for building augmented reality experiences.
Using different APIs, ARCore enables your phone to sense its
environment, understand the world and interact with information.


Database
Google Auth API
Saved Locations
Application
Login Page
UI
Show in viewport
Search Locations
Navigate
API call to Mapbox for Geolocating

Methodology



In the following sections will get in detail on how to use this component to create location-based AR experiences with navigation, how to create custom routes to places not mapped by Geolocation, and how to customize everything by creating scripts to build your unique experience.



Device

Compiling Latitudes and longitudes

Api request via device

Confirming Datasets

Comparing Datsets

3D assets

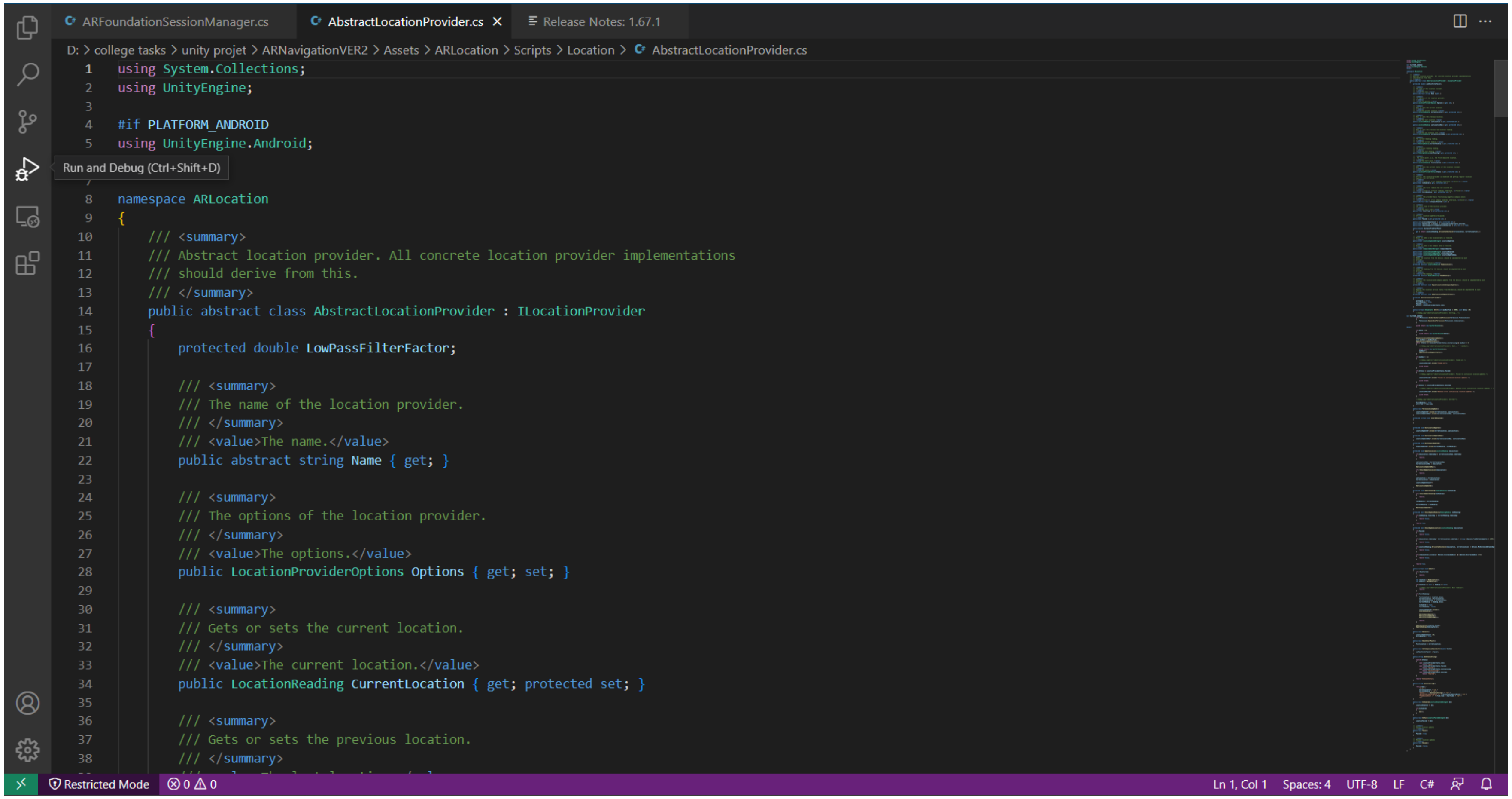
Checking Offset from plane

Computing Coordinates

Realtime sync

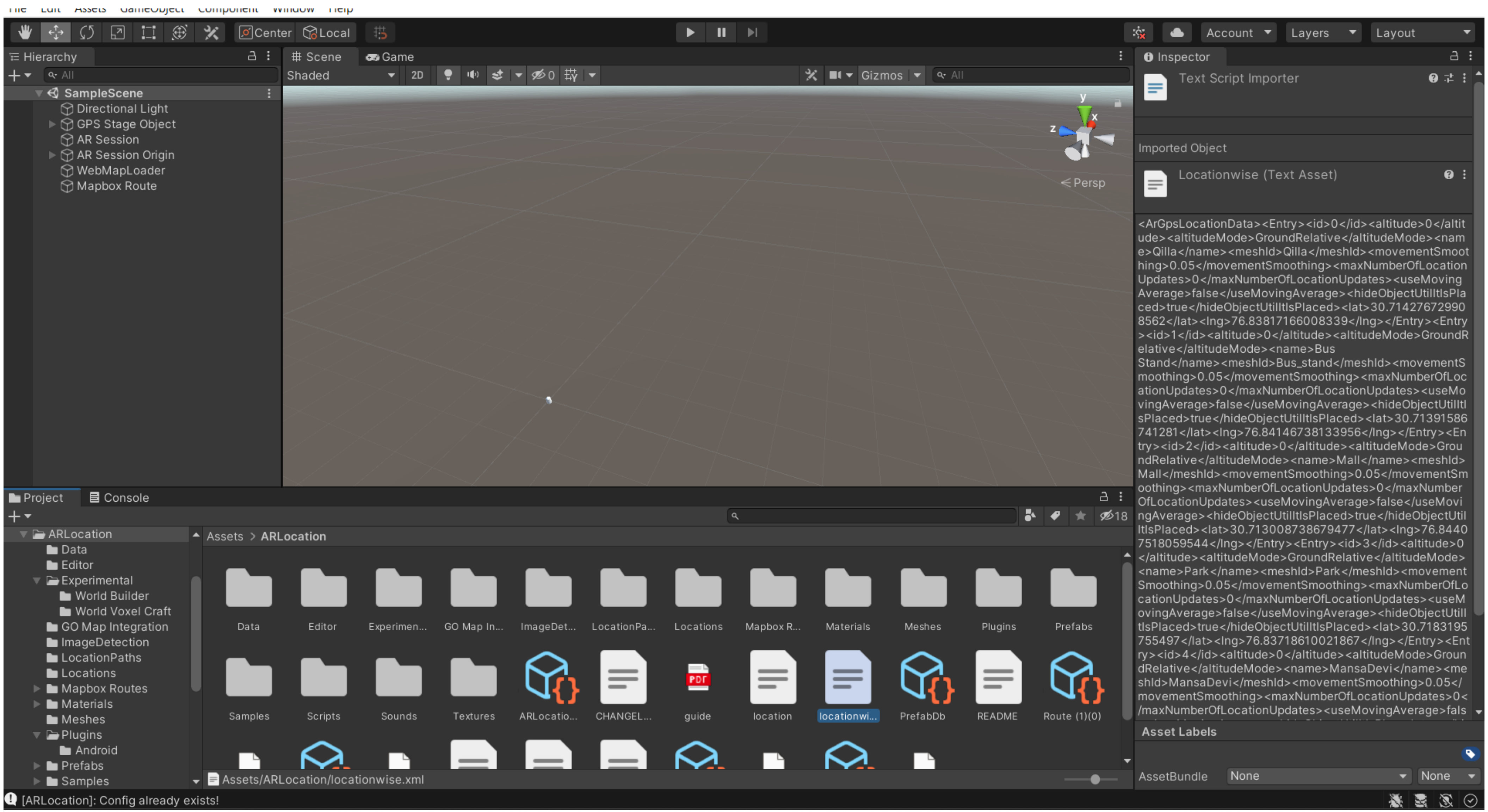
Visible in Viewport

Code:



ARFoundationSessionManager.cs
AbstractLocationProvider.cs
Release Notes: 1.67.1
D: > college tasks > unity projet > ARNavigationVER2 > Assets > ARLocation > Scripts > Location > AbstractLocationProvider.cs
Run and Debug (Ctrl+Shift+D)
Restricted Mode
0 0
Ln 1, Col 1
Spaces: 4
UTF-8
LF
C#

```
using System.Collections;
using UnityEngine;

#if PLATFORM_ANDROID
using UnityEngine.Android;


namespace ARLocation
{
    /// <summary>
    /// Abstract location provider. All concrete location provider implementations
    /// should derive from this.
    /// </summary>
    public abstract class AbstractLocationProvider : ILocationProvider
    {
        protected double LowPassFilterFactor;

        /// <summary>
        /// The name of the location provider.
        /// </summary>
        /// <value>The name.</value>
        public abstract string Name { get; }

        /// <summary>
        /// The options of the location provider.
        /// </summary>
        /// <value>The options.</value>
        public LocationProviderOptions Options { get; set; }

        /// <summary>
        /// Gets or sets the current location.
        /// </summary>
        /// <value>The current location.</value>
        public LocationReading CurrentLocation { get; protected set; }

        /// <summary>
        /// Gets or sets the previous location.
        /// </summary>
```

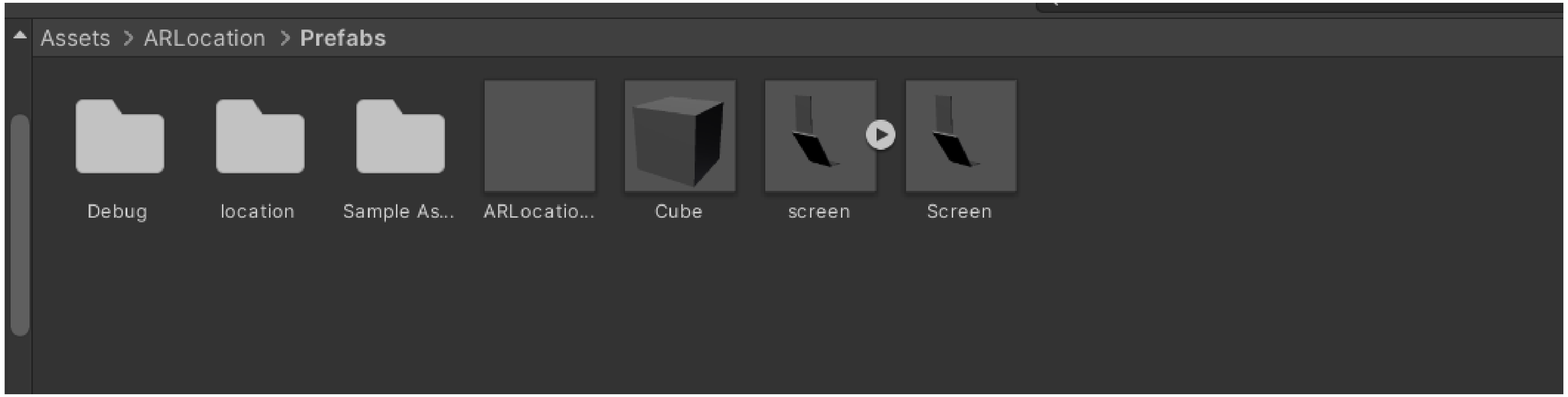


```
<ArGpsLocationData><Entry><id>0</id><altitude>0</altit
ude><altitudeMode>GroundRelative</altitudeMode><nam
e>Qilla</name><meshId>Qilla</meshId><movementSmoot
hing>0.05</movementSmoothing><maxNumberOfLocation
Updates>0</maxNumberOfLocationUpdates><useMoving
Average>false</useMovingAverage><hideObjectUtilItIsPla
ced>true</hideObjectUtilItIsPlaced><lat>30.71427672990
8562</lat><lng>76.83817166008339</lng></Entry><Entry
><id>1</id><altitude>0</altitude><altitudeMode>GroundR
elative</altitudeMode><name>Bus
Stand</name><meshId>Bus_stand</meshId><movementS
moothing>0.05</movementSmoothing><maxNumberOfLoc
ationUpdates>0</maxNumberOfLocationUpdates><useMo
vingAverage>false</useMovingAverage><hideObjectUtilItI
sPlaced>true</hideObjectUtilItIsPlaced><lat>30.71391586
741281</lat><lng>76.84146738133956</lng></Entry><En
try><id>2</id><altitude>0</altitude><altitudeMode>Grou
ndRelative</altitudeMode><name>Mall</name><meshId>
Mall</meshId><movementSmoothing>0.05</movementSm
oothing><maxNumberOfLocationUpdates>0</maxNumber
OfLocationUpdates><useMovingAverage>false</useMovi
ngAverage><hideObjectUtilItIsPlaced>true</hideObjectUtil
ItIsPlaced><lat>30.713008738679477</lat><lng>76.8440
7518059544</lng></Entry><Entry><id>3</id><altitude>0
</altitude><altitudeMode>GroundRelative</altitudeMode>
<name>Park</name><meshId>Park</meshId><movement
Smoothing>0.05</movementSmoothing><maxNumberOfLo
cationUpdates>0</maxNumberOfLocationUpdates><useM
ovingAverage>false</useMovingAverage><hideObjectUtilI
tIsPlaced>true</hideObjectUtilItIsPlaced><lat>30.7183195
755497</lat><lng>76.83718610021867</lng></Entry><Ent
ry><id>4</id><altitude>0</altitude><altitudeMode>Groun
dRelative</altitudeMode><name>MansaDevi</name><me
shId>MansaDevi</meshId><movementSmoothing>0.05</
movementSmoothing><maxNumberOfLocationUpdates>0<
/maxNumberOfLocationUpdates><useMovingAverage>fals
```

Assets/ARLocation/locationwise.xml

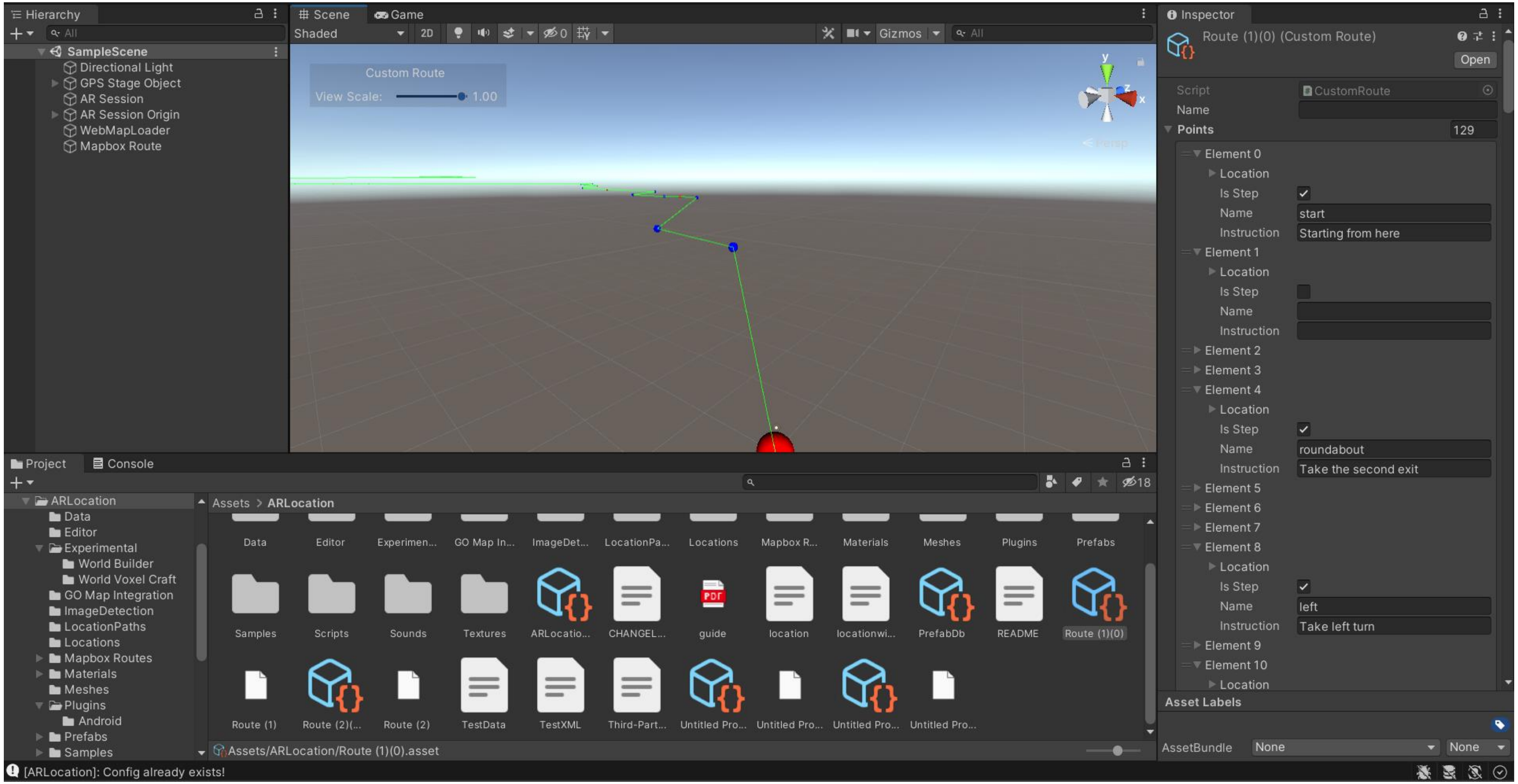
[ARLocation]: Config already exists!

Prefabs:



Assets > ARLocation > **Prefabs**

Routes and navigation



Route (1)(0) (Custom Route)

Script: CustomRoute

Name:

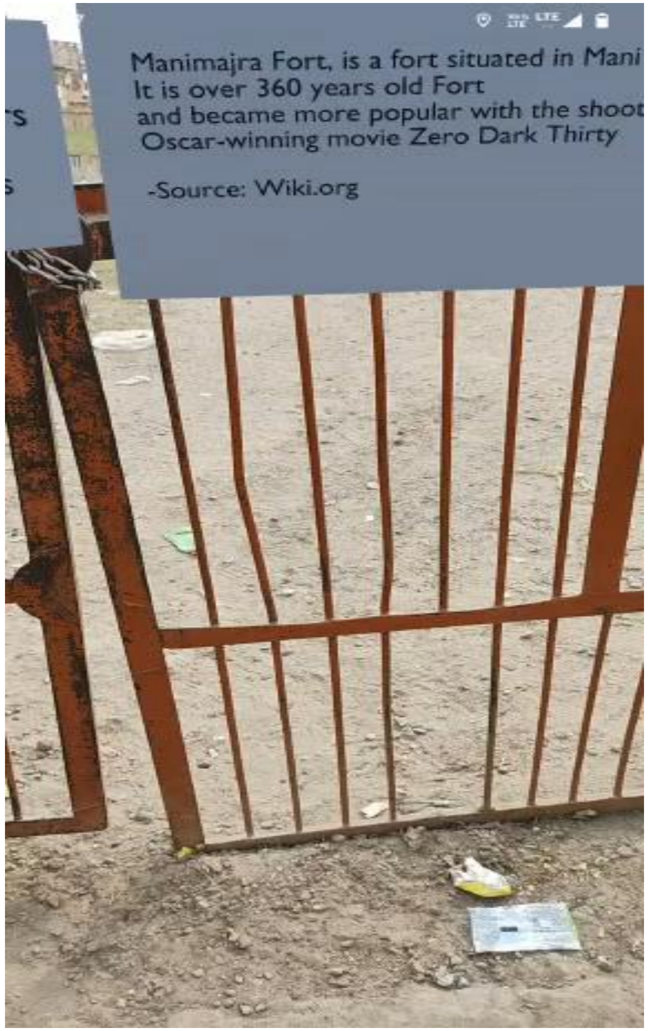
Points: 129

- Element 0
  - Location
  - Is Step: ☑
  - Name: start
  - Instruction: Starting from here
- Element 1
  - Location
  - Is Step: □
  - Name:
  - Instruction:
- Element 2
- Element 3
- Element 4
  - Location
  - Is Step: ☑
  - Name: roundabout
  - Instruction: Take the second exit
- Element 5
- Element 6
- Element 7
- Element 8
  - Location
  - Is Step: ☑
  - Name: left
  - Instruction: Take left turn
- Element 9
- Element 10
  - Location

Assets/ARLocation/Route (1)(0).asset

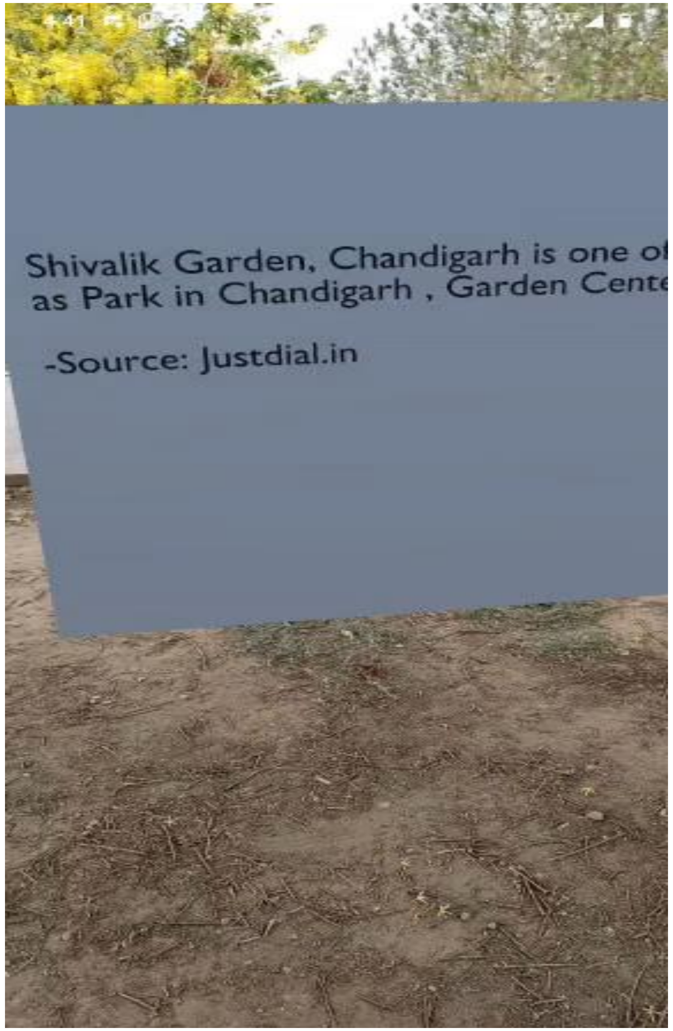
[ARLocation]: Config already exists!

The Application:



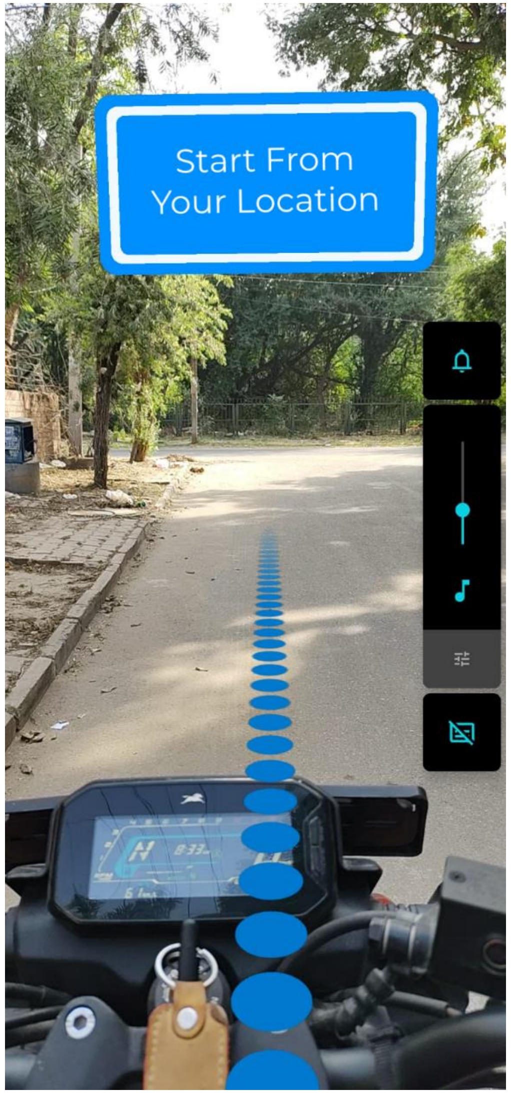
Manimajra Fort, is a fort situated in Mani
It is over 360 years old Fort
and became more popular with the shoot
Oscar-winning movie Zero Dark Thirty

-Source: Wiki.org

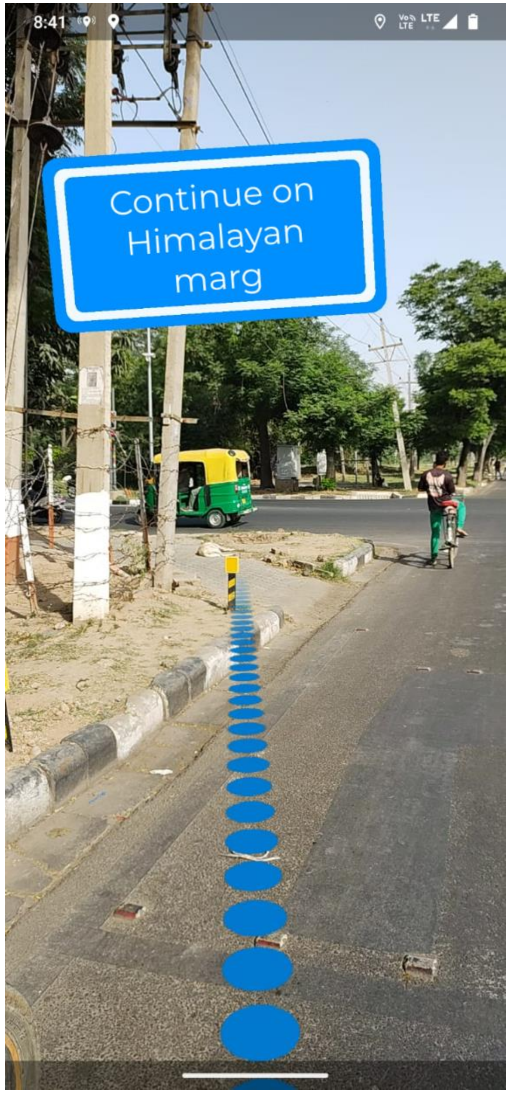


Shivalik Garden, Chandigarh is one of
as Park in Chandigarh , Garden Cente

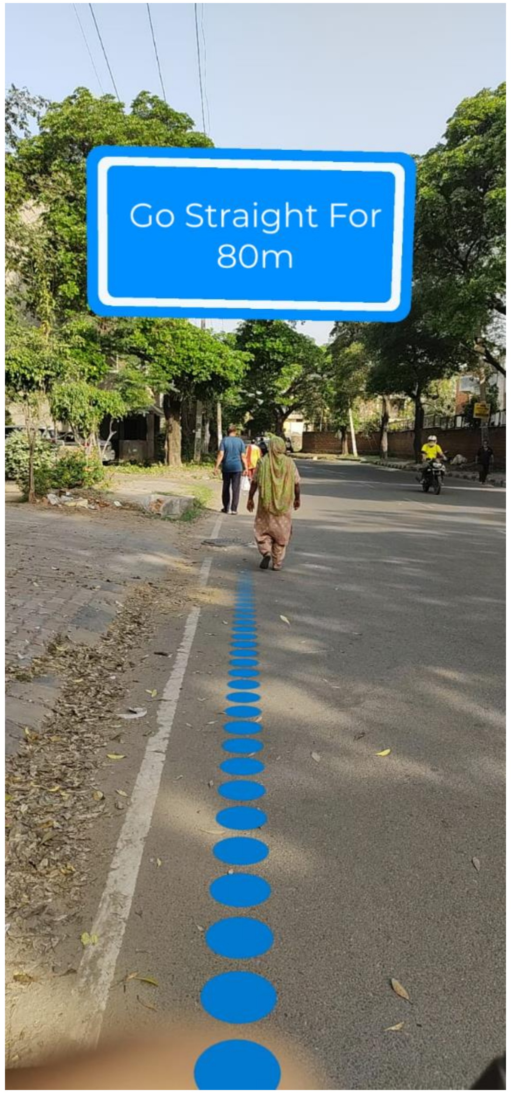
-Source: Justdial.in



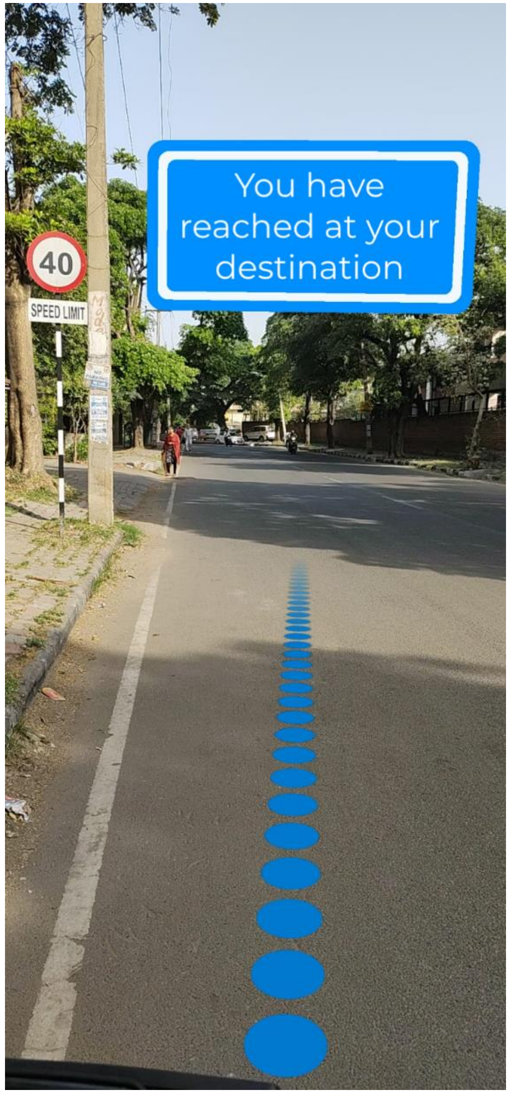
Start From Your Location



Continue on Himalayan marg

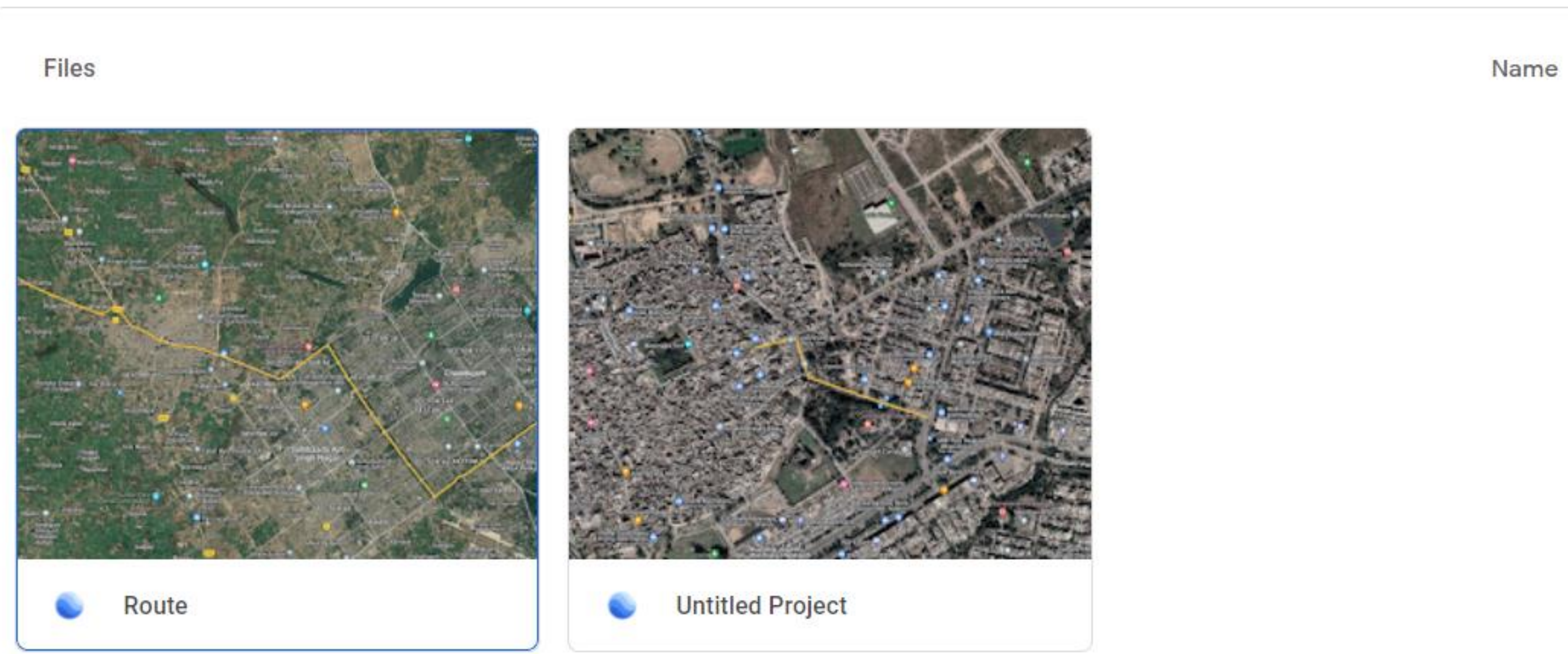


Go Straight For 80m



You have reached at your destination

Saved locations in Google drive



Main Features

- Place 3D Objects in geographical positions defined by their latitude, longitude and altitude
- AR Hotspots that are activated when the user is near a given location.
- Place 3D Text markers on real-world points of interest (example using OpenStreetmaps is included)
- Smooth movements on device location and heading updates.
- Move objects or place them along paths (Catmull-rom splines) on the map
- Augmented reality floor shadows
- General purpose Catmull-rom curves and splines

Minimum Requirements

- For AR Foundation, a iOS device with ARKit support, or a Android device with ARCore support *(Click to see the AR Core device list here)*
- For Vuforia, a device with ground plane support *(Click here to see the list of devices here)*
- The device must have functioning magnetic and GPS sensors
- For better performance, a working gyroscope is also recommended

Limitations

- Altitude information is usually very imprecise so, currently, it's best to use heights relative to the device position or relative to detected ground planes
- Landscape mode does not work well on many Android devices, due to a problem with tilt-compensation on the magnetic sensor data
- There are limits due to the GPS precision. So, on good conditions precision can range from 2 to 5 meters, and on bad conditions from 10 to 20meters.
- Does not work well on indoors

Hardware Compatibility
Android build (7.0 nought or higher)
ETC2 fallback BUILD 32 bitRun device compatibility (3mm notch)
Compatible devices :
https://developers.google.com/ar/devices#google_play
Compression method: LZ4
Tested Devices: Motorola one fusion+

Softwares used:
Unity 3D
Blender
Visual studio
Flutter
Android studio
Languages used:
C#
C++
XML
Javascript

References

1. https://arxiv.org/abs/1708.05006
2. https://mobidev.biz/blog/augmented-reality-indoor-navigation-app-developement-arkit
3. https://developers.google.com/maps/documentation
4. https://www.youtube.com/watch?v=HwAxvUkmzcg
5. https://www.youtube.com/watch?v=Db_PUwXF0SA