Project Pangeo

User Manual

Version 1.0

April 24th, 2020

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1 Introduction

This manual covers the installation of the Pangeo project and its supporting software. This includes software that supports the development and rendering of a VR application and the database application for storing application data.

Also included is a description of how to set up the Unity environment, namely, how to configure the project, build the application, and check the validity of the existing tests.

Lastly, use cases are included to guide the user through basic tasks and familiarize them with the application.

2 Installation Prerequisites

2.1 Hardware Requirements

You will need a computer that meets the following hardware requirements:

Component	**Recommended System Requirements**	**Minimum System Requirements**
Processor	Intel Core i5-4590/AMD FX 8350	Intel Core i5-4590/AMD FX 8350
GPU	NVIDIA GeForce GTX 1070/Quadro P5000 equivalent or better, AMD Radeon Vega 56	NVIDIA GeForce GTX 970, AMD Radeon R9 290
Memory	8GB of RAM 1TB available storage space	8GB of RAM 1TB available storage space
Video Output	DisplayPort 1.2	DisplayPort 1.2
USB Port	1x USB 3.0	1x USB 3.0

To find out if your computer is ready for VR, download and run the Vive Quick Compatibility Check.

You will also need the following hardware:

- HTC Vive Headset
- Vive Controllers
- Link Box
- Vive Base Stations

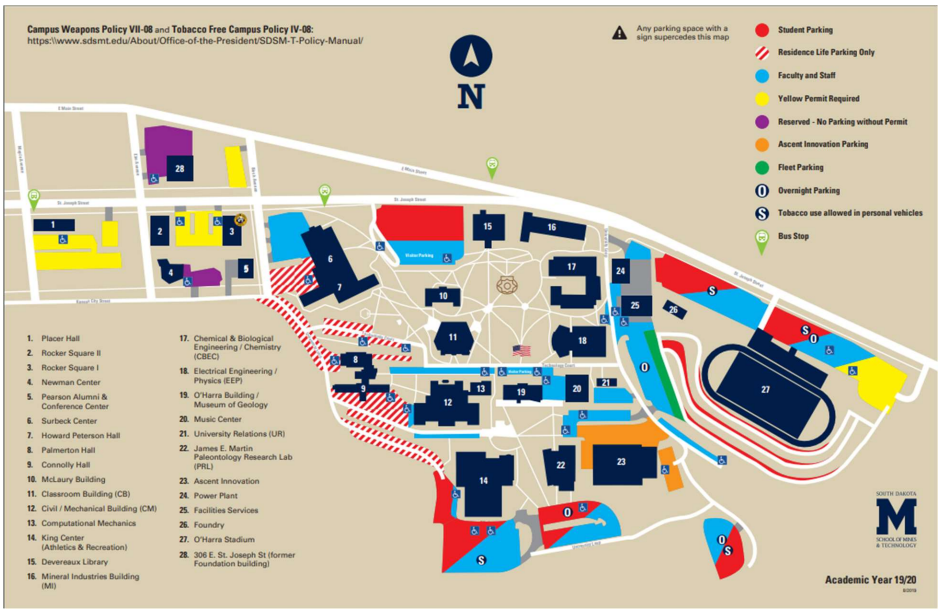
2.2 Software Requirements

Component	Requirement
Operating System	Microsoft Windows 10

3 Access to Development Area

3.1 SD Mines VR Lab

The Virtual Reality lab at the School of Mines and Technology houses the computer and VR equipment used for the development of Project Pangeo. It is located in the former Foundation Building at 306 E. St. Joseph St (#28 on the map below).



3.2 System Accounts

You should receive a document with the list of system accounts used for the development of the project on the SDSM&T campus.

4 Environment Set-Up

4.1 Software Set-Up

4.1.1 Steam

Download the latest version of Steam, which can be found here:

https://store.steampowered.com/about/

After installing the Steam launcher on your computer, please find and download the SteamVR tool from the Steam store. The tool is free and may already be in your Steam library, but it does still need to be installed on your machine to be used.

4.1.2 Vive Wireless

Download the latest version of Vive Wireless, which can be found here:

https://www.vive.com/us/support/wireless-adapter/category_howto/installing-vive-wireless-app.html

4.1.3 Unity Hub

Download the latest version of Unity Hub, which can be found here:

https://unity3d.com/get-unity/download

- **NOTE**: You will need to sign up for a free license to use Unity.

4.1.4 Unity

Once you have the latest version of Unity Hub downloaded, download Unity version 2019.12f1.

1. Launch Unity Hub and navigate to Installs.
2. Click Add and find Unity 2019.2.12f1.

4.1.5 MySQL

Download MySQL Community, version 8.0 or above, which can be found here:

https://dev.mysql.com/downloads/mysql/

Use the SQL file to set up the database using MySQL Workbench. If you have different credentials than specified in the config file, please replace them as needed. If you need assistance, please watch the MySQL_Setup video in the Google Drive at https://drive.google.com/open?id=1khK1HgOwmV1avxWJkgtdkJmUR8aNFKqO.

To test your setup, run the DBTest.py script, available in Assets/Tests/DatabaseTests/. Make sure that you have mysql.connector installed for python and that your database credentials have been added to your configuration file.

4.1.6 Bing Maps REST API

Create an account with Bing Maps REST API Developer Zone and create a basic key. Place this key in the config file. If assistance is needed, look at the Configuring_Unity video available in the Google Drive at https://drive.google.com/open?id=1khK1HgOwmV1avxWJkgtdkJmUR8aNFKqO.

4.2 Hardware Set-Up

The environment for the VR equipment will need to be set up. Full instructions including how to set up the base stations and the play area can be found on the Vive website:

https://www.vive.com/eu/support/vive/

5 Installing the Pangeo Software

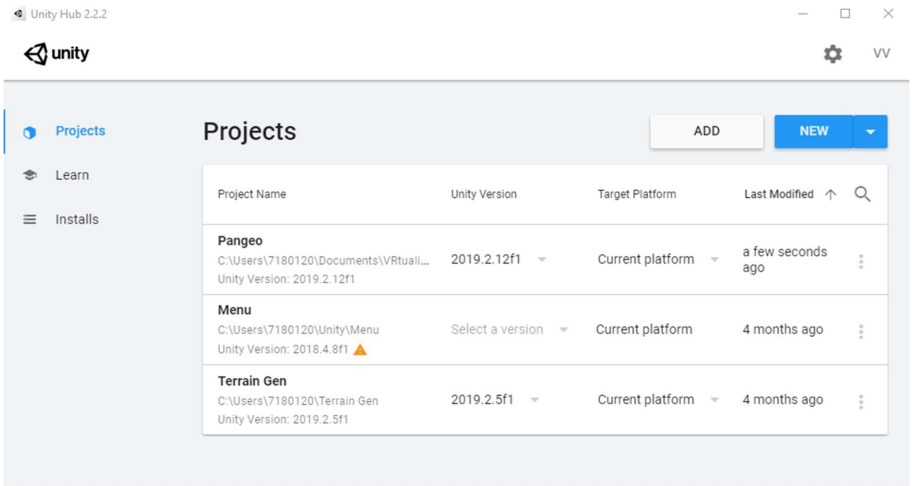
5.1 Configuring Credentials

There should be an empty config file inside Pangeo/Assets/ that you can fill with a Bing Maps API Key and your database credentials to get up and running. If you need assistance, please look at our Configuring_Unity video in the Google Drive at https://drive.google.com/open?id=1khK1HgOwmV1avxWJkgtdkJmUR8aNFKqO.

For your Bing Maps API Key, go to https://www.bingmapsportal.com/ and create an account to get a free basic key to run the program with.

5.2 Launching the Project

1. Clone the Pangeo project from https://github.com/VRtualize/VRtualize-Pangeo.git.
2. Launch Unity Hub and click “Add”.



3. Navigate to the Pangeo folder and set the Unity Version to 2019.2.12f1.
4. Click on the project name to launch the Unity editor.

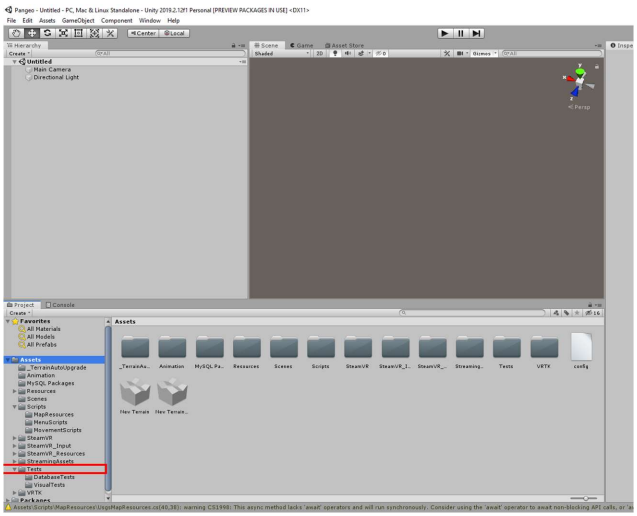
5.3 Building the Project

1. Go to File -> Build.
2. Create an Assets folder in root and add config file (found in GitHub pull).
3. Add the following to the Plugins folder:
    a. BouncyCastle.Crypto.dll
    b. Google.Protobuf.dll
    c. I18N.dll
    d. I18N.West.dll
    e. MySqlData.dll
4. Change API Compatibility level under project settings -> Player -> Other settings to Net 4.x.

    If any assistance is needed or you need a visual, reference the Build_Project video, available in the Google Drive at https://drive.google.com/open?id=1khK1HgOwmV1avxWJkgtdkJmUR8aNFKqO.

5.4 Running Tests

All tests for the project can be found in the Assets/Tests directory.



The Tests are broken into three different types, VisualTests, DatabaseTests, and NUnit Tests. Each is in its own respective directory, except NUnit tests which are in the root directory.

5.4.1 DatabaseTests

1. Navigate to the Assets/Tests/DatabaseTests directory in a python terminal.
2. Ensure that all dependencies in the requirements.txt are installed, to do so, run:

   `$ pip install -r requirements.txt`
3. Run DBTest.py and ensure that all tests pass. To run:

   `$ python DBTest.py`
4. Check that all tests pass.

5.4.2 NUnit Tests

1. With the project explorer in Unity, navigate to the Assets/Tests directory.
2. Open up the Test Runner with: Window > General > Test Runner.
3. In the window that opens, click on the Play Mode Button.
4. Press the Run All button.
5. Check that all tests pass.

5.4.3 VisualTests

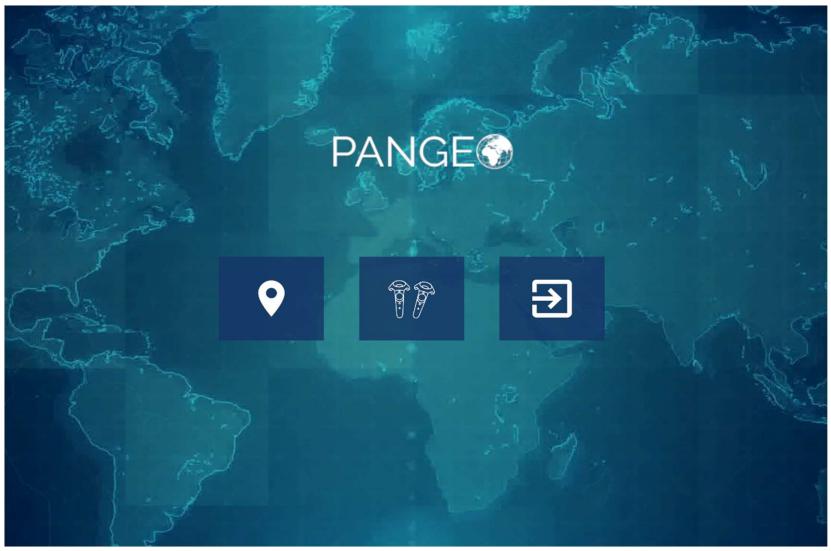
1. Navigate to the Assets/Tests/VisualTests directory.
2. These tests are Excel documents that contain steps that must be completed manually .
3. Follow the instructions and check that all tests pass.

5.5 Application Layout

The application is divided into two separate scenes, the Main Menu and World Scene.

5.5.1 Main Menu

The application opens up in the Main Menu, which gives you the following options:

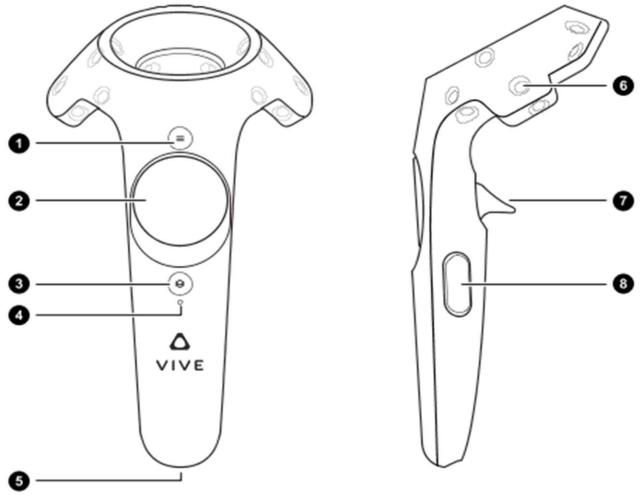
- Coordinates - allows the user to enter a specific longitude/latitude coordinate for the application to render.
- Controls - shows a diagram of the VR controls.
- Exit - closes the application when built, but in Play mode it will only make the application hang.
- 

5.5.2 World Scene

After the specified coordinates have been entered, the application will transition to the World Scene where you are able to view and explore the rendered terrain.

5.6 Controls

5.6.1 VR Controls



Controller Component	Action
1 - Menu Button	Opens the Menu screen
2 - Trackpad	Left - Move camera forward/backward and left/right Right - Move camera up/down
3 - Home Button	Opens the SteamVR menu
4 - Indicator Light	Indicates the status of the controller
5 - Micro USB Port	Charging port for the controller
6 - Tracking Sensors	Used for VR tracking
7 - Trigger	Menu - Click menu buttons World - Toggles coordinate information menu
8 - Bumper Buttons	Toggles controller tooltips

5.6.2 Keyboard Controls

The following is a list of all keyboard controls if VR equipment is not available.

Command	**Action**
'ESC' Key	Opens Main Menu
'E' Key	Toggles Location Display
'W' Key	Go forward
'A' Key	Go to the right
'D' Key	Go to the left
'S' Key	Go backward
Space bar	Fly up
CTRL Key	Fly down
Mouse	Camera follows the direction of mouse movement Click on menu buttons to interact with them

6 Use Cases

6.1.1 Traveling to a Coordinate

1. Click the Longitude input field to activate the keyboard and enter "39.5" by manually clicking the on-screen keypad.
2. The North and South coordinates symbols will be activated when the Longitude input field is active. Click on the "N" symbol.
3. Click the Latitude input field and enter "106.5" by manually clicking the on-screen keypad.
4. The East and West coordinates symbols will be activated when the Longitude input field is active. Click on the "W" symbol to add a negative sign to the coordinate.
5. Click on the "Go to Coordinates" button to travel to and render the requested coordinates.

- **NOTE:** When interacting with the menu using the VR hardware, you will see a ray casting from the left controller to the menu, this will act as a pointer. Pressing the trigger on either controller will interact with the menu UI elements.

6.1.2 Survey a Landmark

1. Enter 36.1136 N, 113.9959 W in the Coordinates Menu. The application will open the World scene, rendering the terrain of the Grand Canyon..
2. Press the 'E' button (or Trigger on the VR controller) to open the Location Panel. This will show you the current longitude/latitude coordinates of the player.
3. If using keyboard controls, moving the mouse around the game screen will change the orientation of the camera. If using VR, the camera will follow natural head movements.
4. For keyboard, press the 'WSAD' keys to move forward, back, left, and right. For VR, use the left trackpad to move the player's current location.
5. To increase and decrease the player's altitude, press 'SHIFT' and 'SPACE BAR'. The right trackpad will adjust the altitude when using VR.