CIS 6600: Advanced Topics in Computer Graphics and Animation

Homework Assignment 4 (Spring 2025)

L-System Plug-in with Houdini Development Kit

Due: Wed, Feb. 26, 2025

The goal of this assignment is to learn how to use the Houdini Development Kit (HDK) to create C++ plugins for Houdini. In this assignment, the same LSystem.cpp file you used in the development of the Maya Plugin will be used in the creation of the Houdini plugin.

1. Setting up Visual Studio for Houdini (20 points)
If you haven't done so already, download the Houdini Apprentice Installer from https://www.sidefx.com/products/houdini-apprentice/ and install Houdini on your machine. The HDK is included with the Houdini install and is usually configured for the version of Visual Studio that was used to build Houdini. For example, for Houdini 20.5 the last 5 characters of the installer ("vc143") means it was built using Visual Studio 2022. As a result, you are recommended to use Visual Studio 2022 and Houdini 20.5 when developing your Houdini plugin for this assignment.

Note: Most of the Visual Studio settings are automatically setup in the project files provided with this assignment. Before starting, make sure that you set the following Windows environment variables: H20_PATH, H20_VERSION, CUSTOM_DSO_PATH, HOUDINI_DSO_PATH. Follow the instructions in **Appendix A** to set up your configurations.

For more details on the Houdini HDK and creating custom plugins see the Getting Started documentation at:
https://www.sidefx.com/docs/hdk/_h_d_k__intro__getting_started.html

2. Creating the Houdini L-System Node (80 points)
Once you have your development environment setup and working properly, the next step is to create a custom node using the Houdini Development Kit. The functionality of your Houdini node should be similar to the one that was created for the Maya plugin. This can be accomplished by following the instructions contained in the LsystemPlugin.c file of your Houdini Visual Studio project and completing all sections of the code where it says:

"PUT YOUR CODE HERE".

Note: The Houdini Development Kit (HDK) comes with a lot of examples located in the folder: C:\Program Files\Side Effects Software\Houdini 20.5.487\toolkit\samples

For this assignment, all the examples in the SOP folder, especially SOP_star, and SOP_PointWave are very helpful.

3. Extra credit (Maximum 50 points)
By default Houdini comes with an L-System node. Play around with the features of the default Houdini L-System node and compare it with the custom node you created. You will see a number of helpful features and options implemented inside the default L-System node. Try to recreate those features and options and incorporate them into your custom L-System node. You will receive 10 points for each new option and/or feature created, up to a maximum of 50 additional points.

Appendix A:

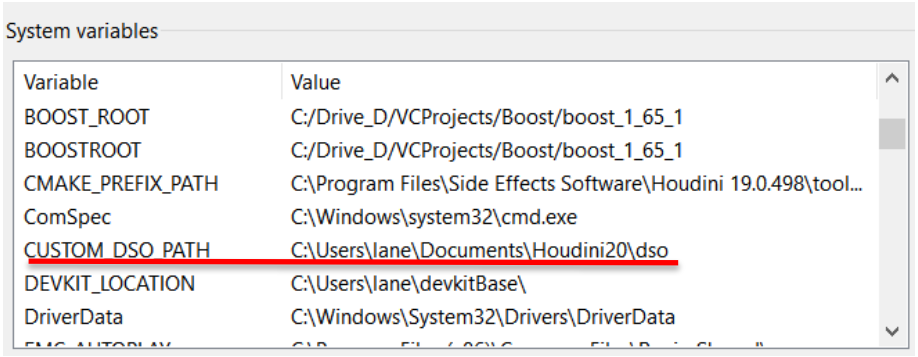
Setting up the HDK for Houdini 20.5 with Visual Studio 2022

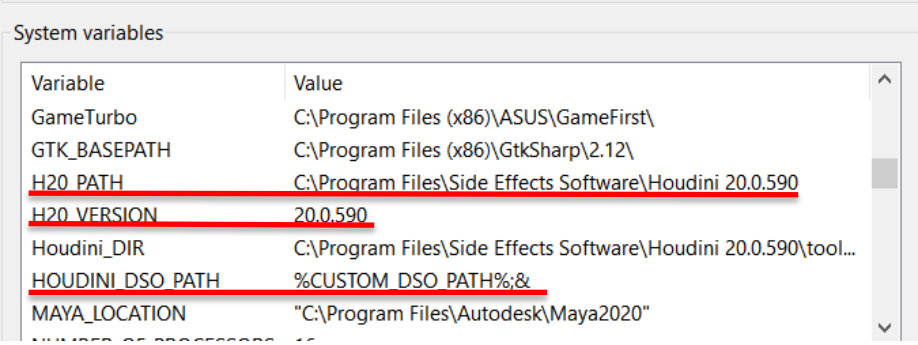
1. Download and install Houdini 20.5 and Visual Studio 2022

2. Setup the following Windows Environment Variables

- H20_PATH: C:\Program Files\Side Effects Software\Houdini %H20_VERSION% (i.e. the path to where Houdini is installed)
- H20_VERSION: 20.5.487 (i.e. this should correspond to the version of Houdini you are actually using)
- CUSTOM_DSO_PATH: C:\Users\YOUR_USRNAME\Documents\Houdini20\dso (i.e. this should represent the path to where your Houdini plugin dsos will be stored)
- HOUDINI_DSO_PATH: %CUSTOM_DSO_PATH%;& (extends the default dso path)

After this step, you should have following four variables:

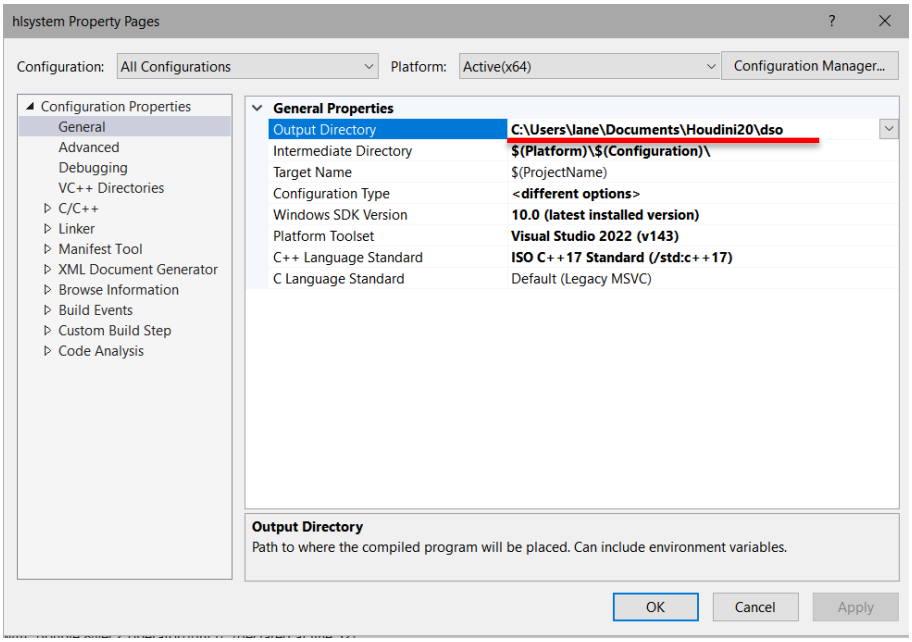




3. Download the file "Houdini Plugin Framework - H20 VS2022.rar" from the CIS6600 Canvas site

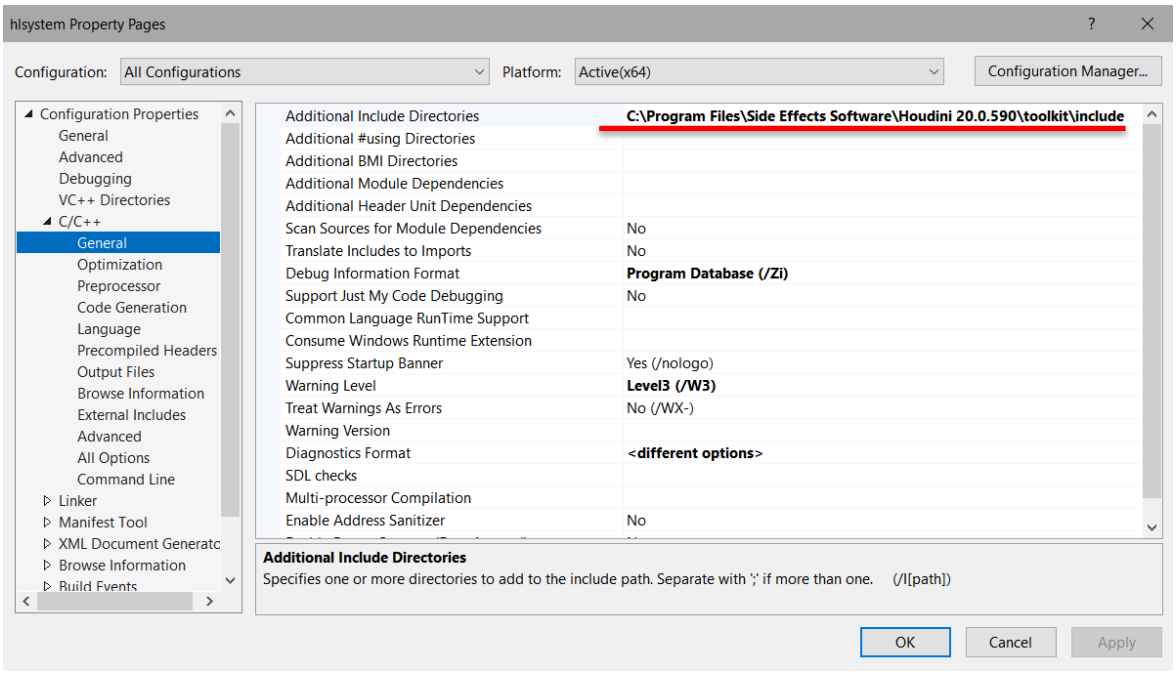
- Unzip the file to your project folder
- Use CMake 3.24 or above to configure and generate the Visual Studio solution with the following steps
    - Open the Windows command prompt window
    - Change to the directory where you have downloaded the Houdini Plugin code frame work
    - At the Windows command prompt run the command
        - cmake -G "Visual Studio 17 2022" -A x64 -S .\ -B .\Build

4. **Open the VS solution file "hlsystem.sln" in the Houdini Plugin framework folder**
   - Right click on the hlsystem project and select "Properties"**.**
   - Change the path in the Output Directory (for example, C:\Users\Lane\Documents\Houdini20\dso) to the path where your Houdini plugin dsos will be stored



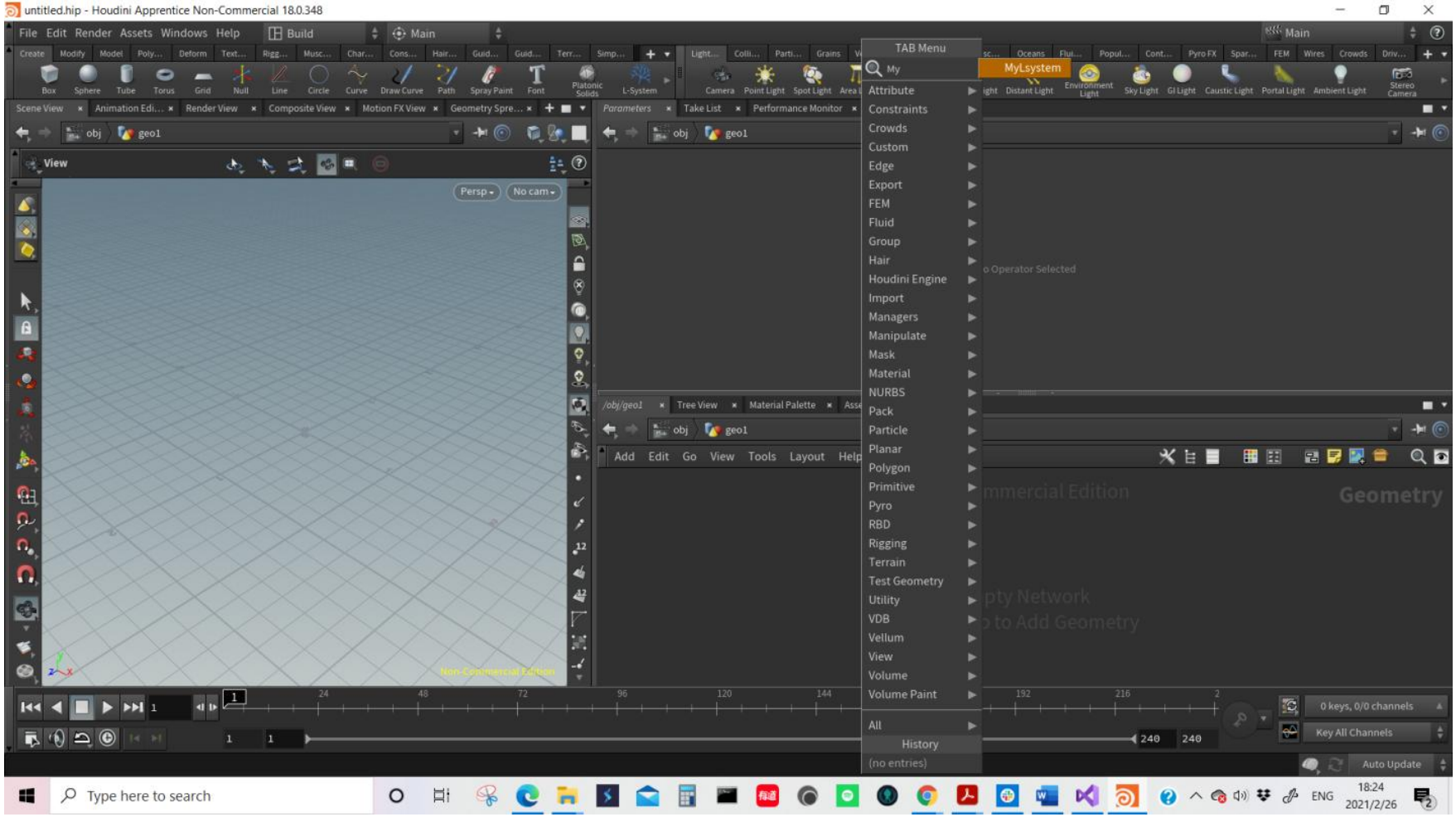
   - Make sure the build configuration is set to **Release64** and **x64**.

In C++->General check the Additional Include Directory path properties to make sure it corresponds to where the Houdini toolkit include directory is located on your computer:



Loading your Houdini Plugin

1. **How to load your custom Houdini plugin?**
    - Move the cursor to the lower right panel in Houdini (Network Editor) and press the Tab key
    - Type "Geometry" then choose the geometry object.
    - Click to place in the Network Editor window.
    - Double-click the new geometry node to go into it.
    - Press Tab again in the Network Editor window and type "MyLsystem" (your plugin node).
    - Click to place. You should see inputs listed in the property window (upper-right panel). Changing these inputs should dynamically update your Lsystem.
2. **Reloading your plugin**
    - After recompiling your project you need to to close Houdini and reopen it again before in order to reload the plugin. Otherwise, you will see a compilation error.
3. **Extra Notes**
    - You need to use VS2022 to create plugins for Houdini 20.5. If you are using another version of Visual Studio (or Houdini) it will not work.
    - Houdini loads plugins in its default search path. For more details, please check this: https://www.sidefx.com/docs/hdk/_h_d_k__intro__creating_plugins.html
    - The basic plugin project should give you a SOP node called MyLsystem that can be found in the picture below.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File Edit Render Assets Windows Help
Build
Main
TAB Menu
My
MyLsystem
Attribute
Constraints
Crowds
Custom
Edge
Export
FEM
Fluid
Group
Hair
Houdini Engine
Import
Managers
Manipulate
Mask
Material
NURBS
Pack
Particle
Planar
Polygon
Primitive
Pyro
RBD
Rigging
Terrain
Test Geometry
Utility
VDB
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