

CityExploder | Python Programming

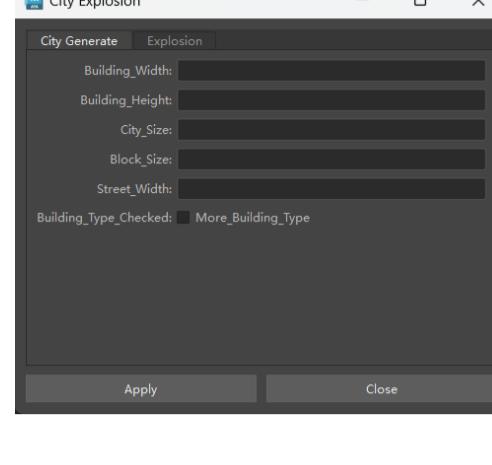
Scripting Report

Our python script for Maya can help users customize parameters to randomly generate cities, and define nuclear explosion effects and fragmentation effects.

Manual

To run our script:

1. Open Maya
2. Locate CityExploder.py / cityGeneratorLib.py / vShatterLib.py / RigidBodyLib.py / shockWaveLib.py, placing them in your Maya installation directory
3. Copy the 'CityExploder.py' into the Maya script editor
4. Select all the code and run
5. The plugin window pop up



How to use the UI

1. Launch Maya and open the plugin's GUI by selecting the appropriate menu option or running a script.
2. The GUI is divided into two main categories: City Generation and Explosion. Choose the desired category to access the corresponding set of parameters.
3. Adjust the parameters according to your requirements. Each parameter controls a specific aspect of the plugin's functionality. Refer to the documentation or tooltips for detailed information about each parameter.
4. Once you have set the desired parameters, click the "Apply" button to initiate the process. The plugin will start executing and generating the desired output. Please wait for the process to complete.
5. After the process is finished, you can manually fine-tune the results. This includes editing materials, adjusting lighting, or making any other modifications to achieve the desired visual effect.
6. If needed, you can repeat the process by adjusting the parameters and clicking "Apply" again to generate different variations or refine the output further.

Note: The plugin provides a user-friendly interface to simplify the process of generating cities and explosions in Maya. However, for more advanced customization or specific requirements, you can manually edit the generated output, such as applying custom materials or making additional modifications using Maya's native tools and features.

Implementation

Our program is based on four main procedures:

1. **City Generate** We have developed an algorithm that randomly generates city buildings and provides users with access to relevant parameters. Users can adjust these parameters to achieve the desired cityscape effects.
2. **Object Shattering** We have implemented a random object shattering effect based on the Voronoi algorithm and provided users with access to relevant parameters to adjust the desired level of object fragmentation.
3. **Rigid Body Motion** In this system, the rigid body motion is based on Maya's API and physical simulation system to achieve the real, high school building bursting effect. At the same time, in order to allow users to better customize the effect they want, we have opened a considerable number of adjustable parameters.
4. **Shock Wave** The code creates a wave scene animation using Autodesk Maya's scripting interface (cmds module). It generates multiple shock waves represented by spheres and applies materials to them. The shock waves are animated by setting keyframes for their translation and scale attributes. A particle system is created and set to collide with the shock wave spheres. Finally, a camera is created, and the scene is rendered as a playblast animation.

In the user interface, after setting various parameters, clicking the "Apply" button triggers the execution of the following functions:

- **apply:** This function retrieves the data from the GUI and executes the respective functions within the libraries to progressively achieve the generation of the city, city building fragmentation, applying rigid body motion to buildings, and generating shockwave effects.

In the cityGeneratorLib library, the following functions are executed:

- **cityGene:** Automatically generates the layout of city blocks and street arrangements based on the provided parameters.
- **squareBlockGen:** Within the corresponding square block, generates buildings with random dimensions and heights.

In the vShatterLib library, the following function is executed:

- **vShatter:** Utilizes the Voronoi algorithm to split the buildings, creating a fragmented effect.

In the RigidbodyLib library, the following functions are executed:

- **buildGravityField:** Establishes the gravity field.
- **makeRigidBody:** Assigns rigid body properties to objects, enabling rigid body motion.

In the shockWaveLib library, the following function is executed:

- **createWaveScene:** Creates an animated simulation of the shockwave effect.

Future outlook:

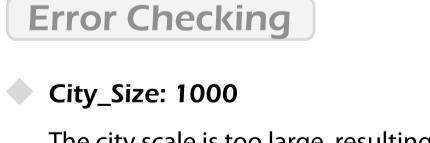
Our plug-in has achieved a simple city generation and nuclear explosion animation effect, some important parameter control to the user, so that it is controlled by the user to achieve a better visual effect. In the future, more building generation effects, more material and light rendering functions can be added.

Reflection summary:

In this maya plugin opening process, we mainly encountered difficulties in the following two aspects.

1. Although we did a good job of code specification and workload allocation in the early stage, the difficulties we encountered in the subsequent code combination exceeded our expectations, resulting in a slow progress in the medium term;
2. We use physical simulation to achieve rigid body movement. Once the number of objects in the scene is too large and the calculation is too large, the operation will be slow

Outcomes



This rendering effect requires adding additional materials to the object

Error Checking

◆ City_Size: 1000

The city scale is too large, resulting in excessively long computation time, taking over 200 minutes.

◆ City_Size: 10

The city scale is too small, smaller than the Block_Size, leading to the inability to generate buildings and the city correctly.

◆ Building_Type_Checked: True, Fragments/object: 8

After the fragmentation calculation is completed, due to the multitude of building types and complex fragments, errors occur during rigid body motion calculation, resulting in program crashes.