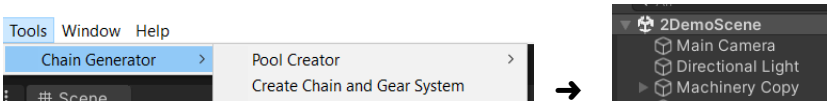
Custom Gear & Chain System Guide

https://docs.google.com/document/d/1Aq2NZMK6_pXqzfpuGhTuZg8Xu4HSQl8wMJdN7LGH14g/edit?usp=sharing

Creating Instance

To craft your unique chain and gear machinery, navigate to
Tools -> Chain Generator -> Create Chain and Gear System.

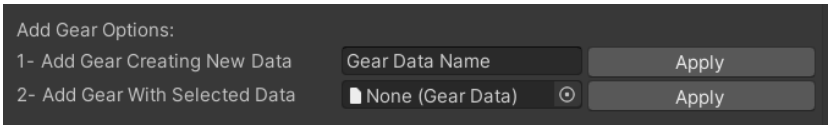
This action creates an empty machinery base on scene, providing accessible editor settings to facilitate customization for gear and chain creation.



1.GEARS

1. Adding Gears

You have the option to add a gear with new gear data or utilize existing gear data. To create a new gear with unique data, input a new gear data name or select from the existing data, and click the 'Apply' button.

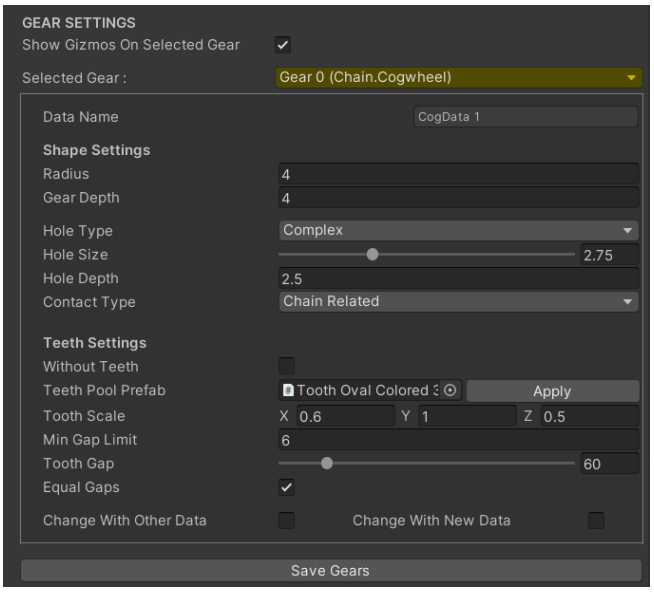


This action will generate a random gear within the scene. Each gear data is stored in the ChainGenerator/Data folder.

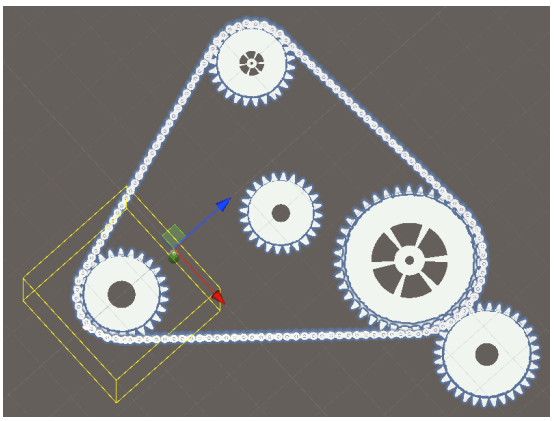
Warning: Avoid modifying the gear prefab section in the data.

2. Customizing gears

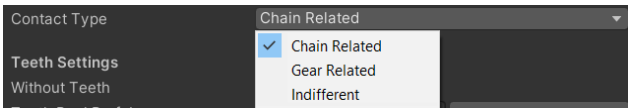
Customize the appearance and settings of each gear within the 'Selected gear' section. Switching between gear slots allows modification of individual gears.



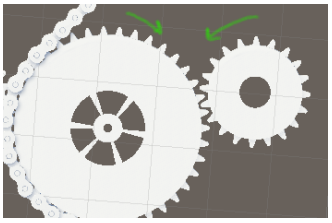
The currently selected gear is identifiable by a yellow gizmo surrounding it in the scene. To hide these gizmos, deselect the 'Show Gizmos on selected gear' option."



Radius defines the size of the gear.
Contact Type defines whether the gear is in contact with the chain, another gear, or nothing at all.



When the contact type is set to gear Related, the gears will rotate in opposite directions.



Equal Gaps option ensures uniform spacing between each tooth by converting the given tooth gap to equal distances.

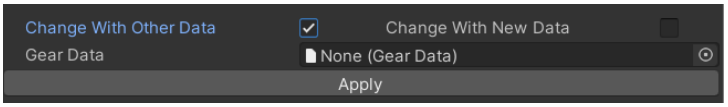
Warning: Maintain hole visibility by using 'GearMaterial' instances when changing gear colors. GearMaterial can be found in ChainGenerator/Graphics/Materials.

3. Removing gears:

To remove gears from the machinery, simply select the gear and click the 'Remove' button."

4. Changing gear Data for Selected gear:

You have the flexibility to alter a gear's data using either newly created gear data or existing data."

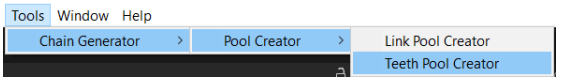


5. Teeth Pool:

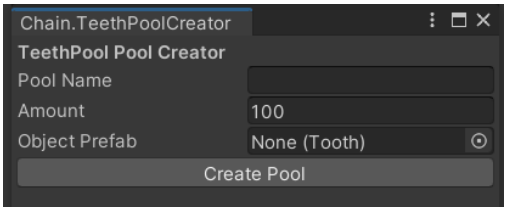
Teeth are pooled for each gear in specific quantities.

5.1 Creating a Teeth Pool:

To create a tooth pool, navigate to *Tools -> Chain Generator -> Pool Creator -> Teeth Pool Creator*.



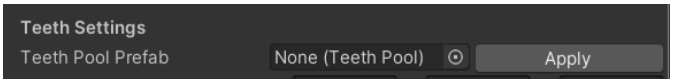
This action opens a window where you should input the pool name, quantity, and tooth prefab. The created pool will be saved in the ChainGenerator/Prefabs/Pools folder."



5.2 Applying Teeth Pool:

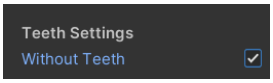
If there's no teeth pool present, you can add one. Additionally, to modify the teeth appearance associated with your gear, you can adjust its teeth pool by adding a new pool to the slot.

Within the selected gear settings, navigate to the teeth settings area and select the desired teeth pool to fill the ‘teeth pool prefab’ slot."



5.3 Without Teeth Option

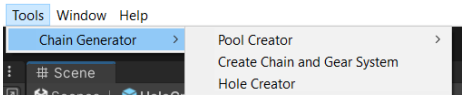
Select this option if you prefer no teeth around the gear.



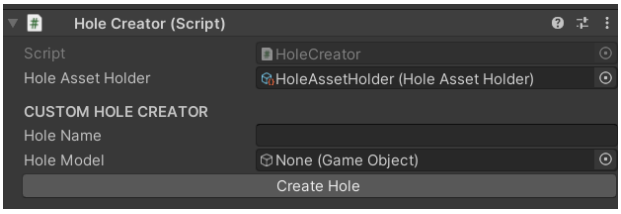
Note that by default, motion is calculated based on teeth; hence, without teeth, motion will not occur. But you can adjust this from motion settings. For further details on motion and how to adjust it, refer to the '3. Motion' section.

6. Hole Creator

To include custom holes within the gears, you can integrate your own models using the Hole Creator tool. Open the Hole Creator from *Tools -> Chain Generator -> Hole Creator*. Utilize the opened inspector to create the hole.



In the Hole Creator's inspector, specifically within the Custom Hole Creator Section, you can input your hole model and its name, then click 'Create Hole.' Subsequently, your hole will be visible in the HoleTypes Section of each gear data, allowing you to select and apply your customized hole from there.

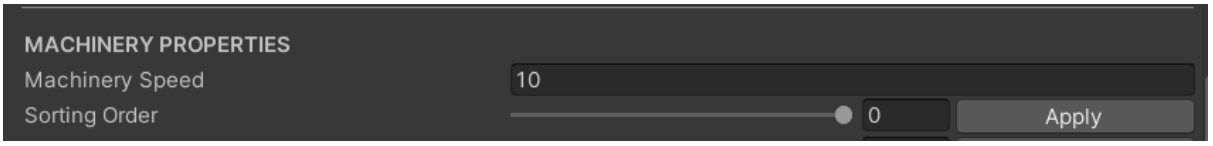


To update all machineries after creating a new hole, disable and enable them, or enter and exit play mode once.

Warning: When deleting a hole from the hole asset holder, remember to delete its label as well.

6. Hole Sorting Order

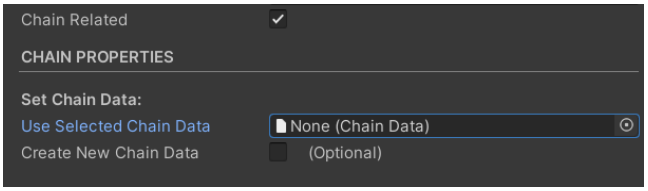
If two gears from different machineries overlap, to prevent the overlapping of their holes, set the sorting order of the machineries accordingly.



2.CHAIN

1.Chain Data

Based on your preference for generating a chain around the gears, select the 'Chain Related' option. When selected, the 'Chain Properties' menu will appear. To proceed, begin by creating new chain data or selecting from existing chain data within this menu.

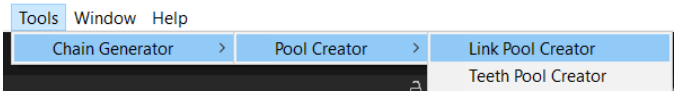


2.Chain Customization

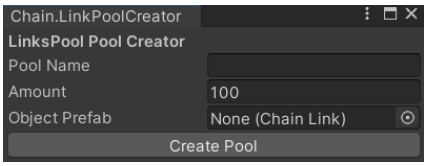
If the link pool slot is empty, you need to add a link pool to that section to proceed with the chain properties. The link pool comprises link objects that form the chain.

2.1 Creating Link Pool

To create a tooth pool, navigate to *Tools -> Chain Generator -> Pool Creator -> Link Pool Creator*.

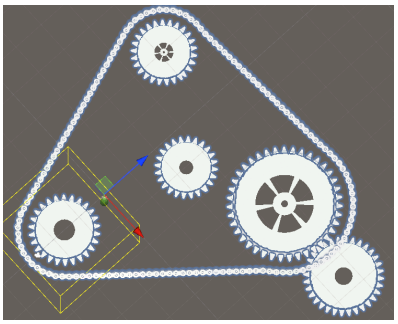


This action opens a window where you should input the pool name, quantity, and link prefab. The created pool will be saved in the ChainGenerator/Prefabs/Pools folder."



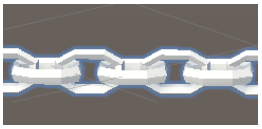
2.2 Chain Properties

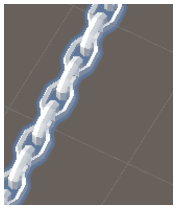
Distance from gears: the distance between the chain and the gears.
Link Size: This factor should be considered in conjunction with 'Link Interval.' The link interval needs to be adjusted based on the link size.



Link Interval: Indicates the distance between two links. This distance can either match the link size or be adjusted smaller or larger based on user preferences. Hence, this setting is left open for user customization.

Rotate Links: When selected, each link rotates a certain amount relative to the preceding link. Not recommended for bike chains but suitable for standard chains."





When 'Is Moving' is selected, the following options appear:

Speed Multiplier: By default, the chain speed is automatically determined based on the speed of chain-related gears within the system. However, you can modify this speed by

adjusting the speed multiplier. If you wish to maintain the default speed, set the speed multiplier to 1. For more details, refer to 3.Motion/Set Motion By gear.

Note: Properties with implied functions based on their names haven't been explained.

3.Generate Chain Button

When changes are made in the editor, the chain is generated automatically as required. Yet, if you move a gear within the scene, use the 'Generate Chain' button at the bottom to update the chain accordingly.

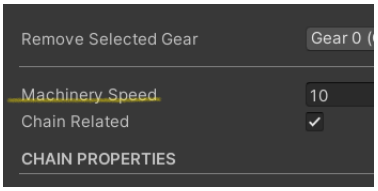
3.MOTION

Within the Machinery Properties section, enabling the 'Moving At Start' option will initiate movement of the system upon pressing the play button.

To initiate motion at a specific moment, ensure the 'Moving At Start' option is disabled within the designated section. Then, you can trigger motion by invoking the Machinery.Move() function whenever required.

1. Speed

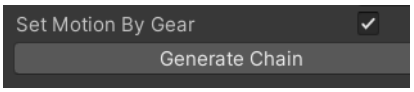
The overall speed of the system can be adjusted from the 'Machinery Speed' section, located at the end of the gear settings just before the chain properties.



The system automatically adapts this machinery speed to each gear relatively based on their teeth count. Consequently, the chain speed is determined by the gears' speed. However, users can modify the chain speed using the Speed Multiplier, as explained in the Chain Properties section.

2. Set Motion by gear

Activate this option to independently control the chain's motion regardless of the gears' speed. When enabled, the chain's speed relies solely on the Speed Multiplier. Lower values (less than 1) are recommended.

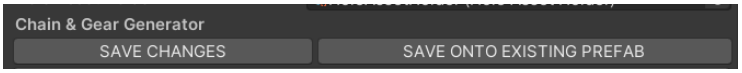


4.SAVE

Modifications are usually saved automatically by the system. However, for added assurance, manually clicking '**Save Changes**' after completing modifications is recommended.

You can save your machinery as a prefab by adding it to the 'Prefabs' folder in the usual way. Customizations to your system can be made either in prefab mode or within the scene.

However, when placing the prefab into the scene, the object unpacks due to the system potentially requiring the removal of objects and pools. Yet, after completing modifications, clicking on the '**Save Onto Existing Prefab**' button incorporates your changes into the prefab object with the same name.



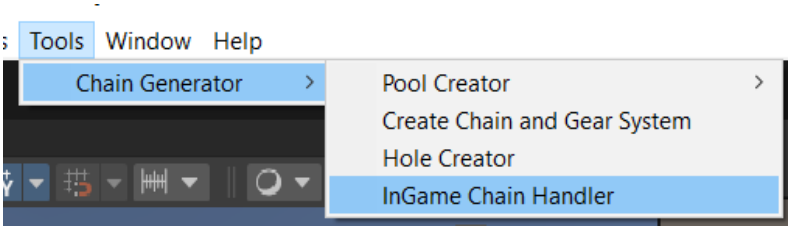
Please note, when using identical gear or chain data across different entities, any alterations made in one will affect others as they're scriptable objects. Consider using the same data for universal changes (e.g., for using uniform gears in a system), otherwise, creating new data might be preferable.

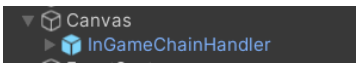
5.IN-GAME CHAIN GENERATION

In-game chain generation allows for the creation of chains around selected gears during runtime. Left-clicking on a gear adds it to the machinery system and recreates the chain accordingly. Right-clicking on a gear removes it, updating the chain accordingly.

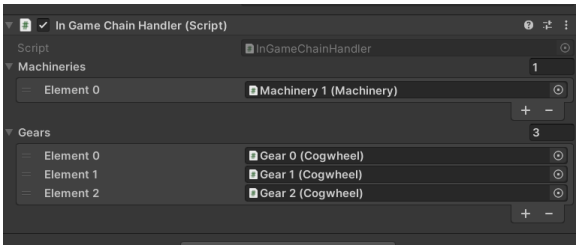
To enable this feature, follow these steps:

1- Navigate to *Tools -> Chain Generator -> InGame Chain Handler* to create an in-game chain handler under the Canvas.





2- Add the gears and machinery systems that you want to include in runtime to the inspector of the InGameChainHandler script.



If no elements are added here, it will automatically include every gear and machinery system in the scene.

Reminder: Ensure that the machineries are marked as 'Chain Related' and that 'Chain Data' is added accordingly.

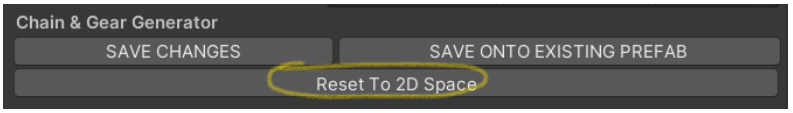
3- By clicking on the Stop/Move buttons, you can halt or move the selected machinery during runtime.

You can check an example in DemoSceneInGame.

6.EXTRAS

1. 2D Option

Enable the 'Reset To 2D Space' option if you intend to utilize this tool for 2D games.

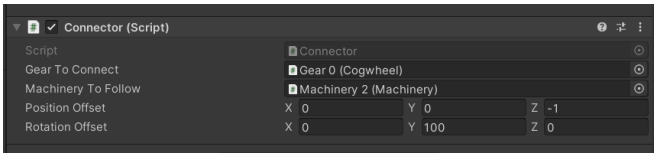


2- Adjusting pivot

You might need to assign the pivot point of the machinery to one of its gears. To do this, go to Machinery Properties in the editor, select "Set Pivot as Selected Gear," choose the gear index, and click apply.

3. Connecting Machinery

To link one piece of machinery to another, start by adjusting the pivot using 'Set Pivot as Selected Gear.' Next, attach the Connector component to the machinery you wish to connect and fill in the necessary slots. This action will synchronize the movement and rotation of the selected machinery with the connected one. Additionally, you have the option to include offsets based on your specific requirements.



7.SOLUTIONS TO POSSIBLE DIFFICULTIES

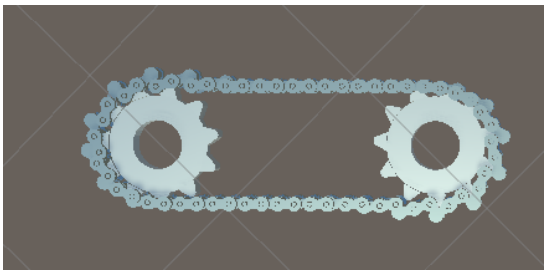
1. If the chain won’t generate, consider the following:

- Check the chain data section. If it's empty, fill it with the necessary data.

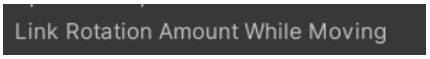
- If your gears are small in size, adjust the link interval accordingly. If the interval is larger than the gears, the chain won't be created.

- If the distance between gears is long, the link amount might not be enough. Consider creating a new link pool with more links in it.

2. Deviation in link rotations while moving:



Depending on the speed of the machinery or the size of the links, the rotation speed might not be adequate for the links. To adjust the rotation, modify the 'Link Rotation Amount While Moving' parameter under the 'Chain Properties' section.



2. Hole overlapping problem

- Search ‘Hole Sorting Order’ in the documentation