# How to rig vehicle in blender 2.8 for Unreal Engine 4

Creating a simplified virtual Scoomatic from Scretch in Blender for Carla

auto imported

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Last edit 1 year, 11 months ago

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## Table of contents

## Introduction

First time when I tried to rig a simple vehicle using Blender for UE4, it took several hours to get it working. And after several months or even years, I needed to rig another vehicle in Blender for UE4. I thought it will not take much time, at least not so much as before. But I was wrong, it took several hours again. So I made a tutorial on how to rig simple vehicle using Blender which will work in UE4.

In this tutorial I will show how to rig simple vehicle in blender 2.8 and how to get it working in UE4.

**I made a free addon for Blender which will speed up vehicle rigging process, you can get it here.**

## Prerequisites

- Blender 2.8 or newer installed. (As I am creating this tutorial, I am using Blender 2.8 beta version, but it should not differ much in a stable release or newer versions.)
- Unreal Engine 4.21.2 installed. Any newer should also work, maybe some older versions also will work.
- Basic knowledge of how to use Blender and UE4.

## Creation of a vehicle in Blender

### Project setup

At the start, we need to have an empty Blender project. To get that, we have to open a new project, and then select everything and delete it.

- I prefer to do that by once pressing `A` key, then pressing `X` and then accepting deletion by hitting Enter or by mouse click.

- Or just do that your way.

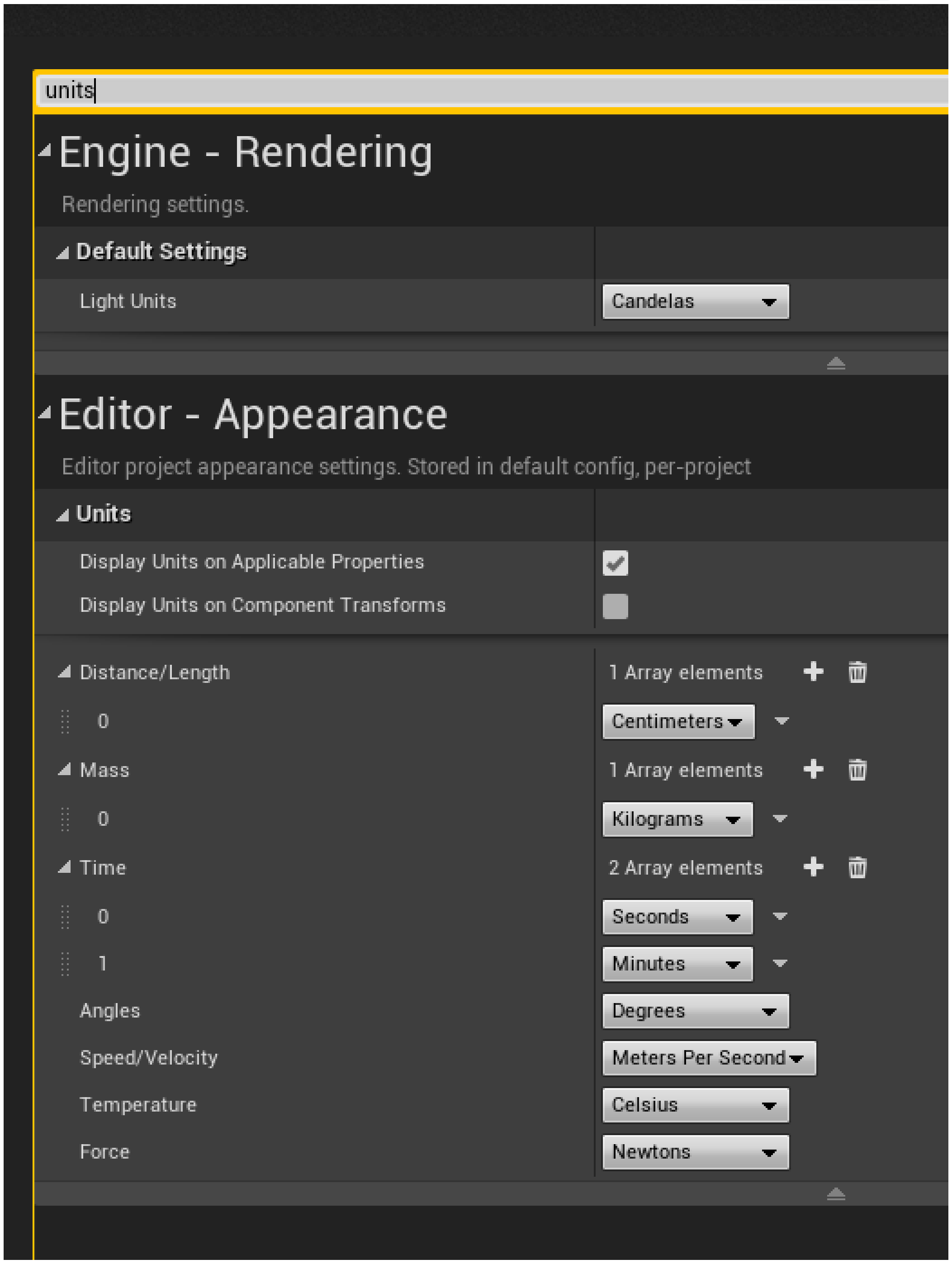
- [ ] After we have a clean empty project, we **must** change the scene **Unit Scale** to **0.01**.

**Info**

this helps during the import in unreal engine, because everything in UE4 is in cm.

- [x] ~~Does this include carla? ✅ 2022-05-31~~
- [x] ~~Check units in carla ✅ 2022-05-31~~

This image shows the distance unit in carla is indeed `Centimeters`.



units

Engine - Rendering

Rendering settings.

Default Settings

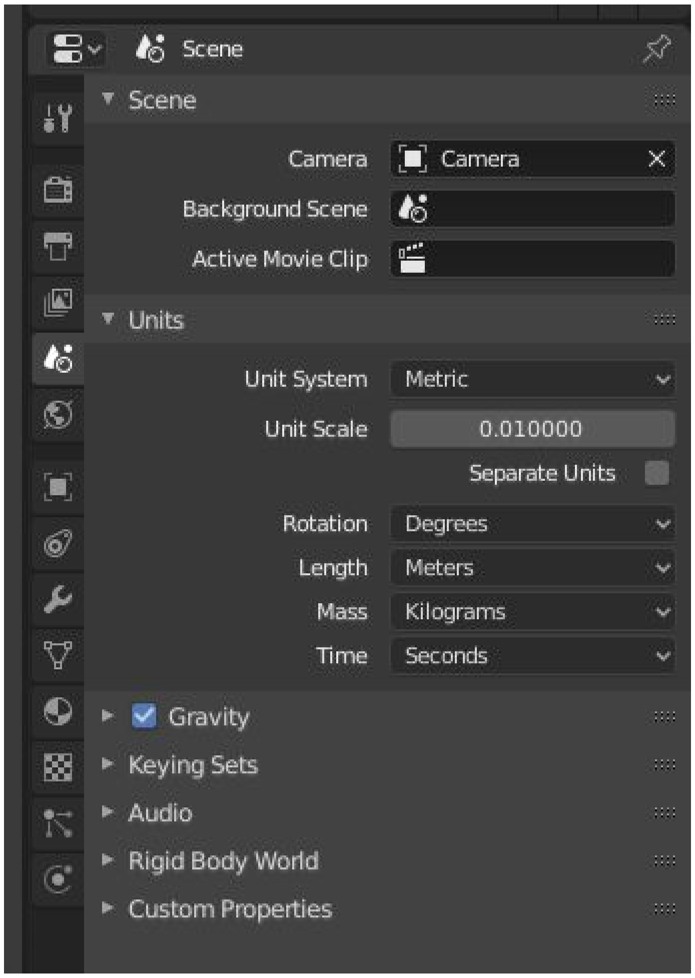
| | |
|---|---|
| Light Units | Candelas |

Editor - Appearance

Editor project appearance settings. Stored in default config, per-project

Units

| | |
|---|---|
| Display Units on Applicable Properties | ✓ |
| Display Units on Component Transforms | ☐ |
| Distance/Length | 1 Array elements |
| 0 | Centimeters |
| Mass | 1 Array elements |
| 0 | Kilograms |
| Time | 2 Array elements |
| 0 | Seconds |
| 1 | Minutes |
| Angles | Degrees |
| Speed/Velocity | Meters Per Second |
| Temperature | Celsius |
| Force | Newtons |


Scene

Scene

Camera: Camera

Background Scene:

Active Movie Clip:

Units

Unit System: Metric

Unit Scale: 0.010000

Separate Units

Rotation: Degrees

Length: Meters

Mass: Kilograms

Time: Seconds

Gravity

Keying Sets

Audio

Rigid Body World

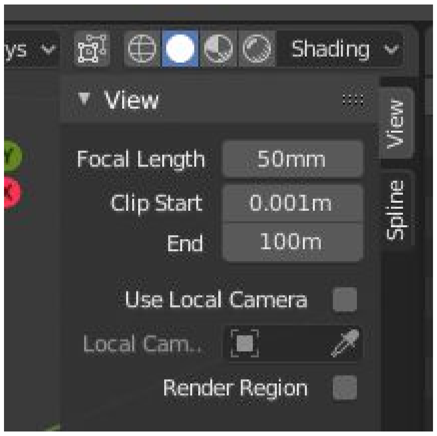
Custom Properties

We can find **Unit Scale** in the bottom right side of the Blender window. There we should select **Scene** tab, expand **Units** section and we will see **Unit Scale** value, which by default is 1. Also, make sure that the **Unit System** is set to **Metric** because UE4 uses metric system.

We changed this value, because UE4 one unit is equal to 1 cm, but in Blender default unit value is 1 meter, that's why we scaled it down to 1 cm. If you have exported models from Blender to UE4 before, you might think you didn't do this and all worked as expected to you, then probably you didn't used armatures in your models.

After **Unit Scale** change, there will occur a problem in a 3D viewport, that we cannot see objects from further distances. This happens because with changing **Unit Scale** also 3D view end clipping distance changes.

**Clipping distance** determines how far and near we can see objects from our viewport camera in our scene. That's why we need to increase it.



▼ View

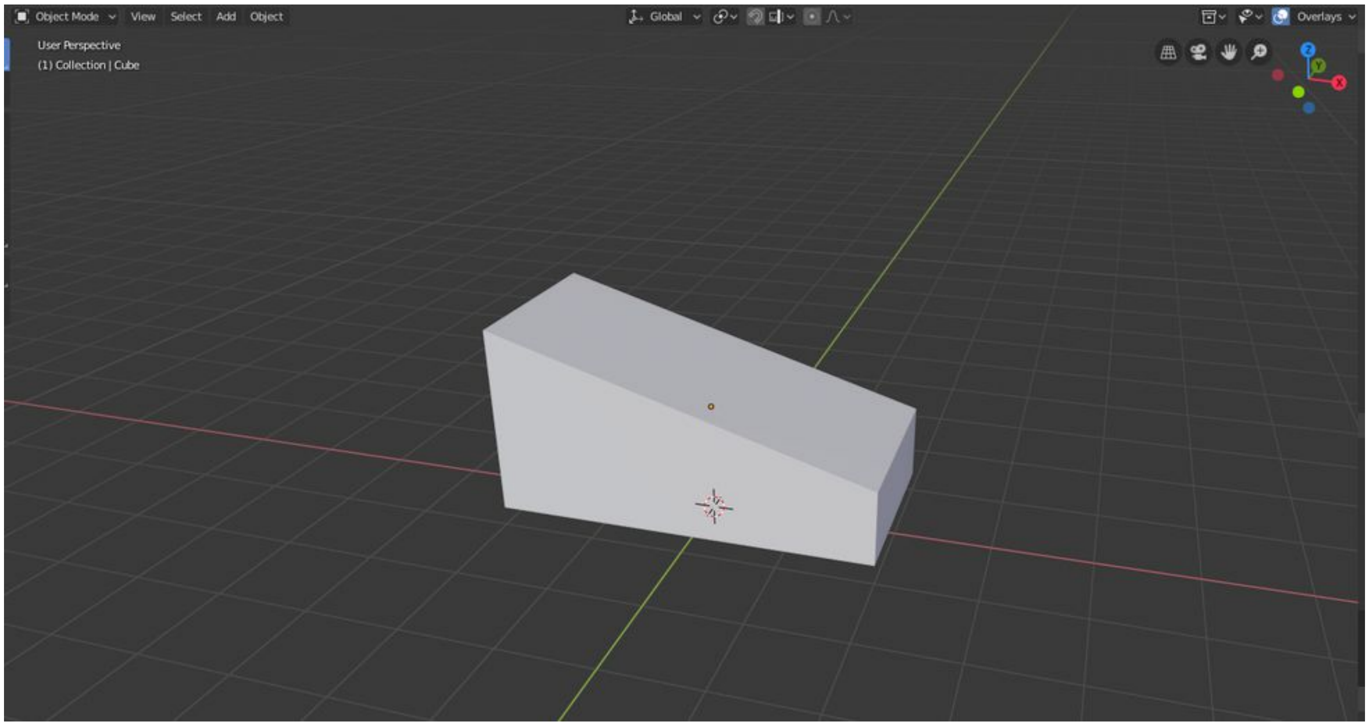
| | |
|---|---|
| Focal Length | 50mm |
| Clip Start | 0.001m |
| End | 100m |
| Use Local Camera | ☐ |
| Local Cam.. | |
| Render Region | ☐ |

To increase 3D view **Clip End** distance, we need to press N key, which will open the properties menu on the top right corner of the 3D viewport.

There under the **View** section, we will see the **End** value, which will be set to 10m. I usually set it to **100m**, because I am too lazy to add more zeros. Most of the time 100m is enough for me to move a camera around. If this distance is not enough for you, you can always increase it, by default it's set to 1000m.

## Mesh creation

Now we can model a vehicle. At first, we need to model a simple vehicle body without wheels.



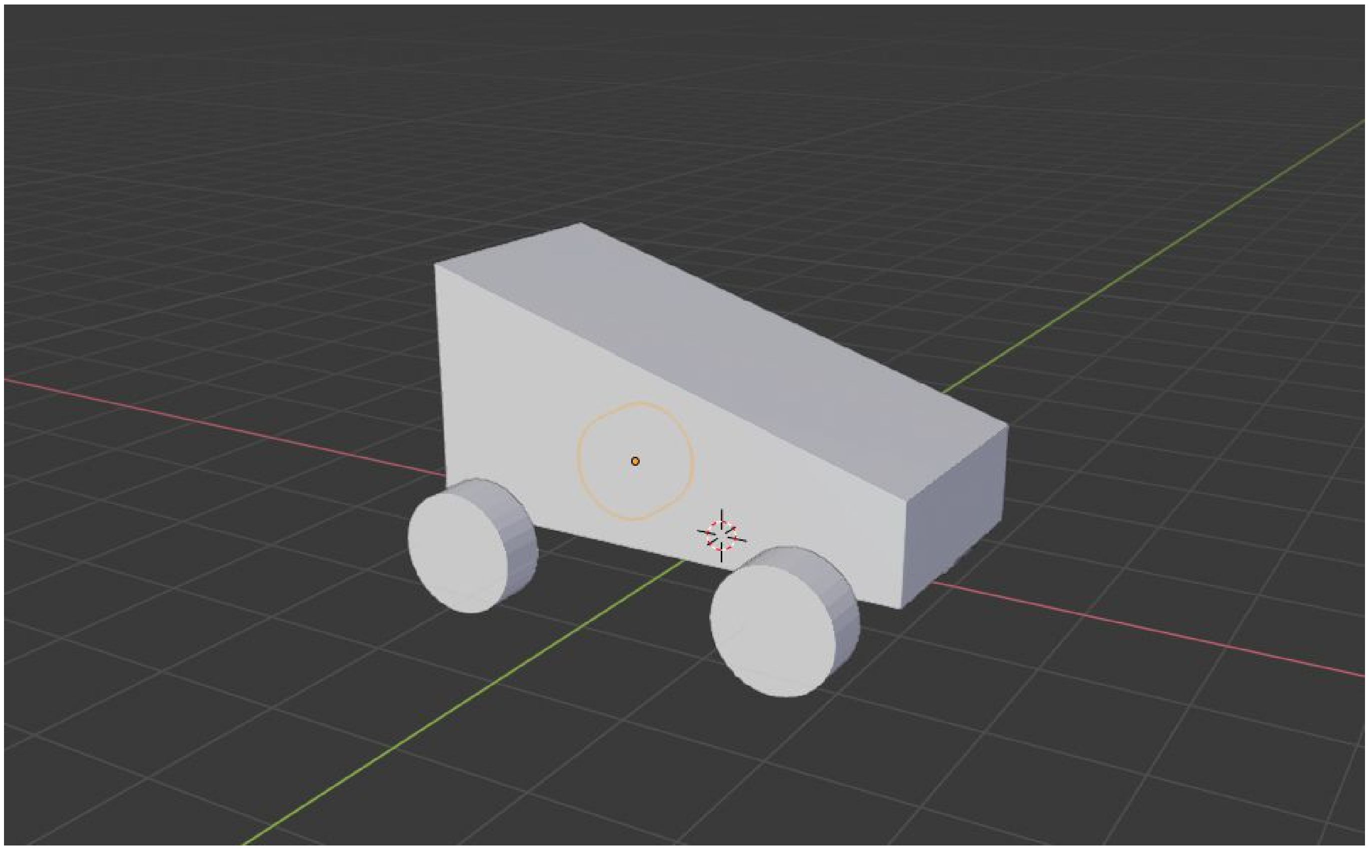
We can see that I made a simple vehicle base model. When you will model a vehicle, make sure, that your **vehicle's front** is faced to the **positive X-axis**. To see which axis is which look at 3D viewport's left upper corner. As we can see my vehicle's front is narrower than the back and it's facing to the positive X-axis.

If you want to make exactly the same model as I made you can follow these steps:

1. Create cube - press Shift + A and then in **Mesh** sub-menu select **Cube**
2. Move cube higher - press G then Z and type **1.2**, press Enter
3. Scale cube on X-axis - press S then X and type **2**, press Enter
4. Enter Edit mode and choose Edge select - press Tab and then 2
5. Lower upper edge at positive X-axis side - select edge with a left mouse click, press G then Z and type **-1.2**, press Enter
6. Exit edit mode - press Tab

### add wheels

Now we can add wheels to our vehicle.



We can see that my wheels are just simple cylinders.

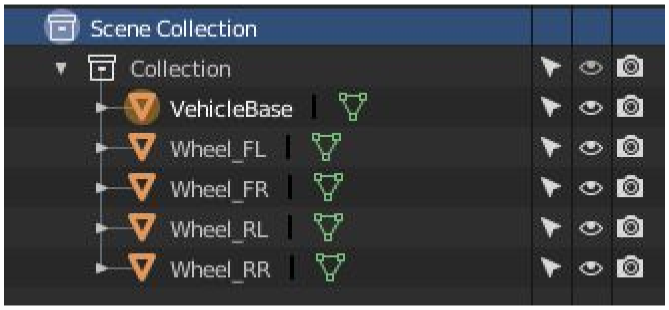
If you want to get wheels exactly like mine, you can follow these steps:

1. Create cylinder - press Shift + A and then in **Mesh** sub-menu select **Cylinder**
2. Scale cylinder's width - press S then Shift+Z and type **0.5**, press Enter
3. Scale cylinder's height - press S then Z and type **0.2**, press Enter

4. Rotate a wheel to the standing position - press R then X and type **90**, press Enter
5. Move wheel to front left position - press G then X and type **1.2**, press Enter then G then Y and type **1.2**, Enter
6. Make right front wheel - press Shift+D then Y and type **-2.4**, press Enter
7. Make both rear wheels - select both front wheels by holding Shift and clicking on them with left mouse click then press Shift+D then X and type **-2.8**, press Enter

### renaming

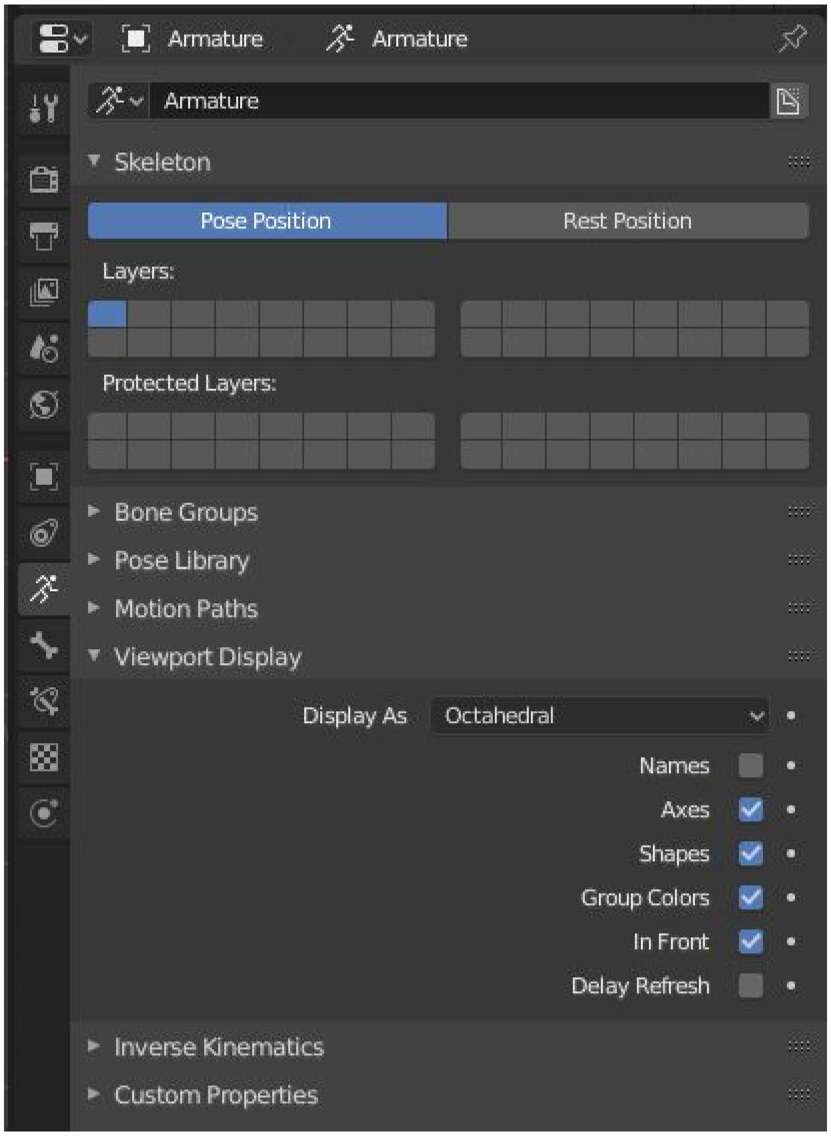
Now it would be good practice if we named each part of the vehicle , but if you are lazy, you can just leave them as they are.



We can see how I named my parts in an image above.

## Vehicle rigging

Now we can rig the vehicle. At first we need to add armature to our scene. To do that press Shift + A and then select **Armature**. Now we need to change properties for our armature, so it would be easier to work with.


Armature
Armature

Armature

Skeleton

Pose Position | Rest Position

Layers:

Protected Layers:

Bone Groups

Pose Library

Motion Paths

Viewport Display

Display As: Octahedral

Names ☐

Axes ✓

Shapes ✓

Group Colors ✓

In Front ✓

Delay Refresh ☐

Inverse Kinematics

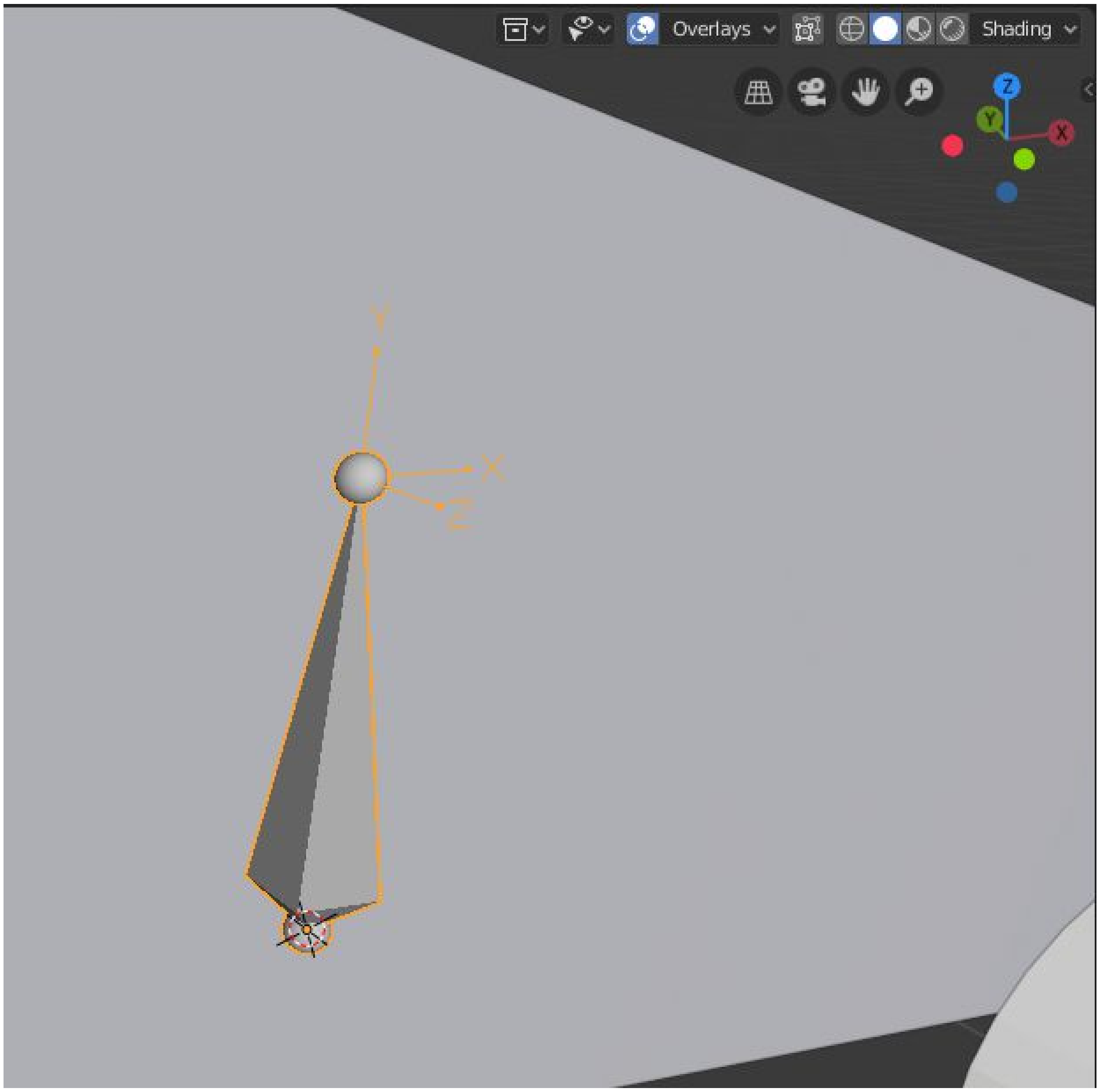
Custom Properties

Properties which we need to change we can find in the bottom right side of the Blender window. There we should select **Object Data** tab, expand **Viewport Display** section. There we should see check boxes with names **Axes** and **In Front**, by default they are unchecked, make them **Checked**.

- By checking **Axes** armature bones will show their axes, which will help us to place bones in the right orientation.
- By checking **In Front** armature bones will be drawn in front of other objects, this will help us with bone placement in objects. In previous blender versions this property was named X-Ray.

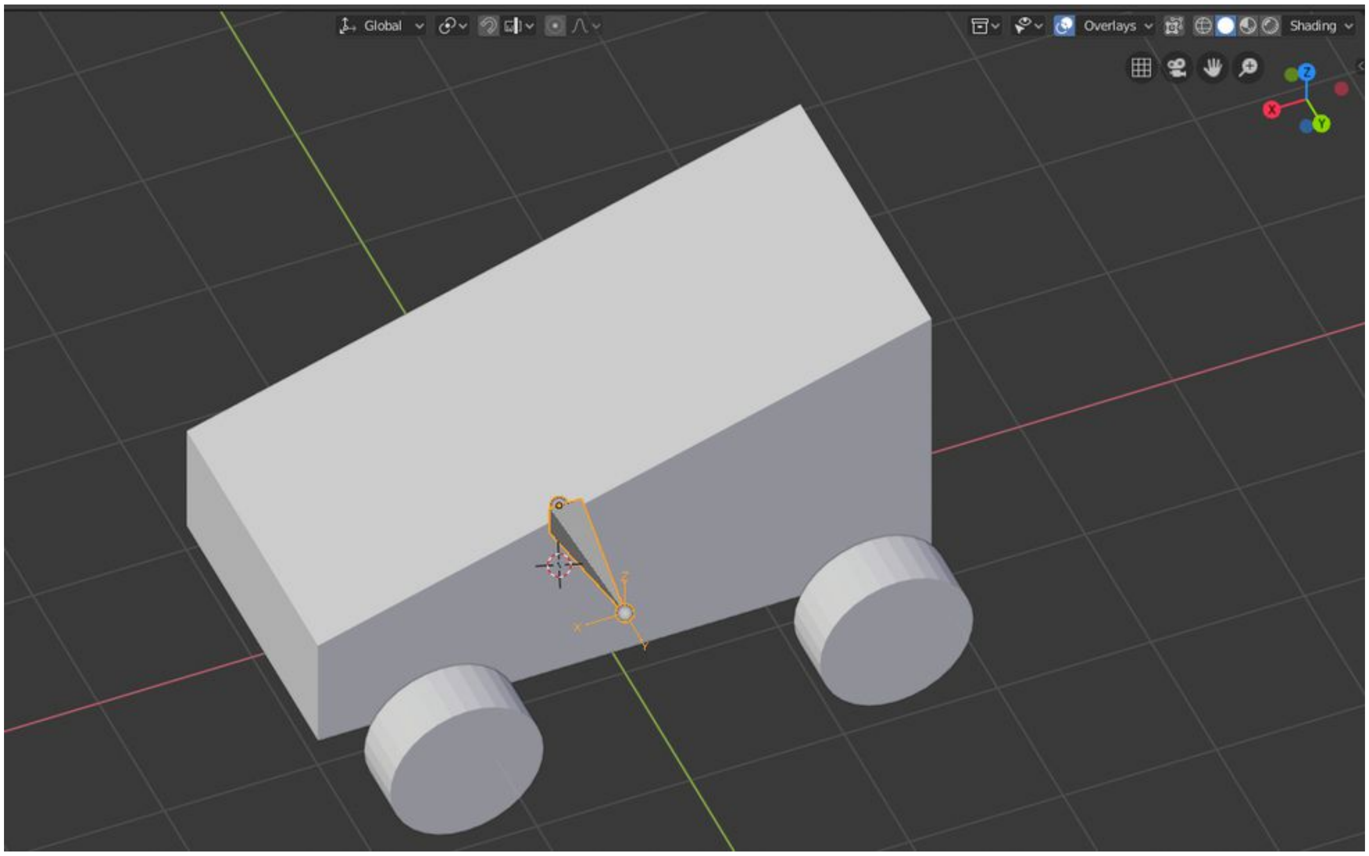
Right now you may be confused because I explained that **In Front** setting will draw bones in front of all other objects, but you see a none bone in the viewport. We can't see it because it's too small, that's because we changed the Blender unit size to 1 cm so bone was created one unit big.

To see the bone, we need to scale it up. To scale it up, press S type **100** and then press Enter.



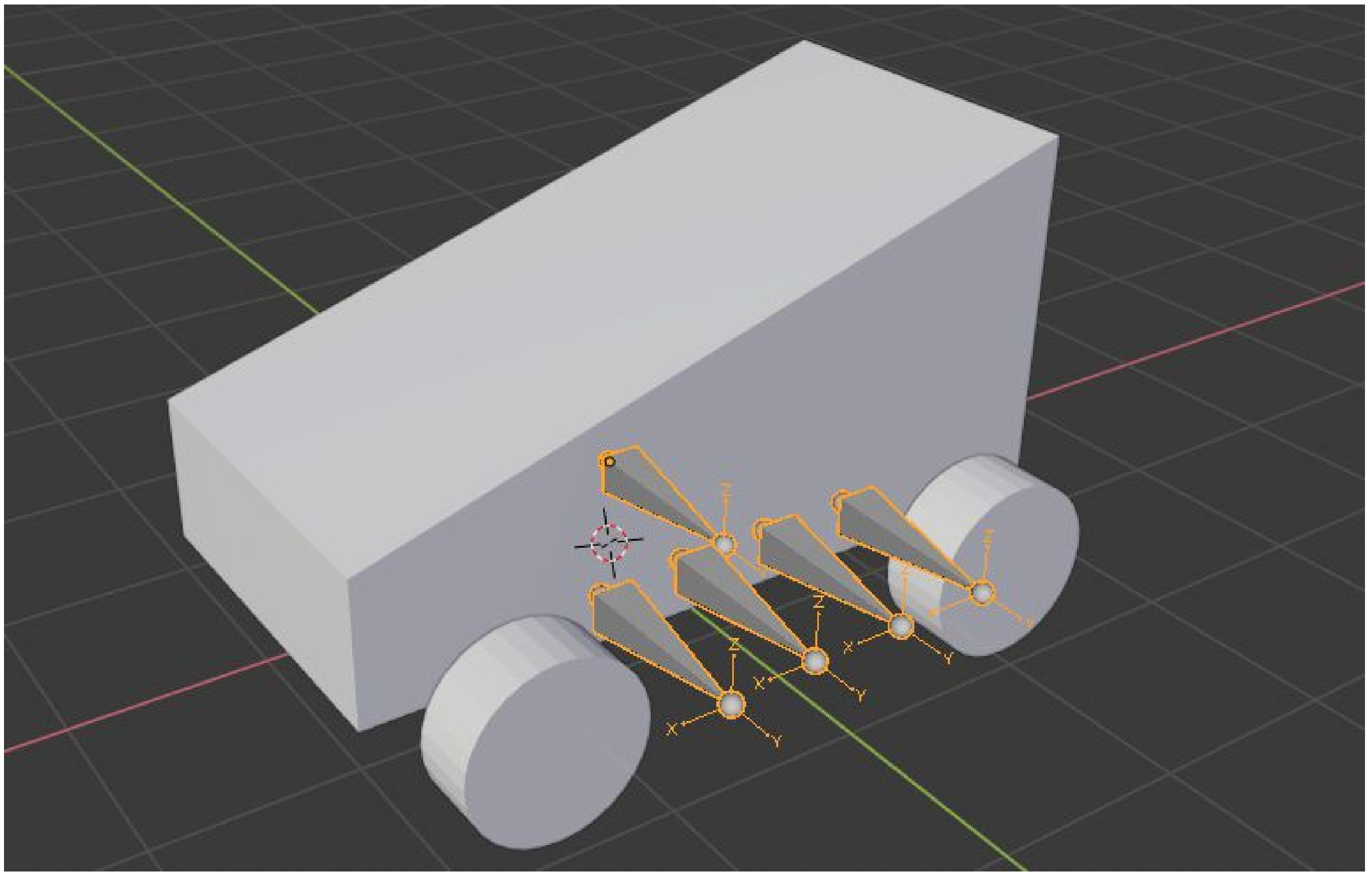
Now we can see bone through the vehicle base and see its axis. If we look closer, we can see that the bone axis is not aligned with the global axis. To get our rigged vehicle correctly working in UE4, we need to align all bone axis to the global axis. To do that we will just rotate our bone so axis would align.

To rotate bone to correct its orientation press R then X type **-90** and press Enter. Also, because the bone is below the vehicle body, we will lift it up so it would be inside the vehicle body. To lift up bone, press G then Z and type **0.5** and press Enter.



Now we have the main bone which is correctly oriented. Now we need to extrude 4 more bones from this bone with correct axis orientation, one for each wheel. To do that we will follow these steps:

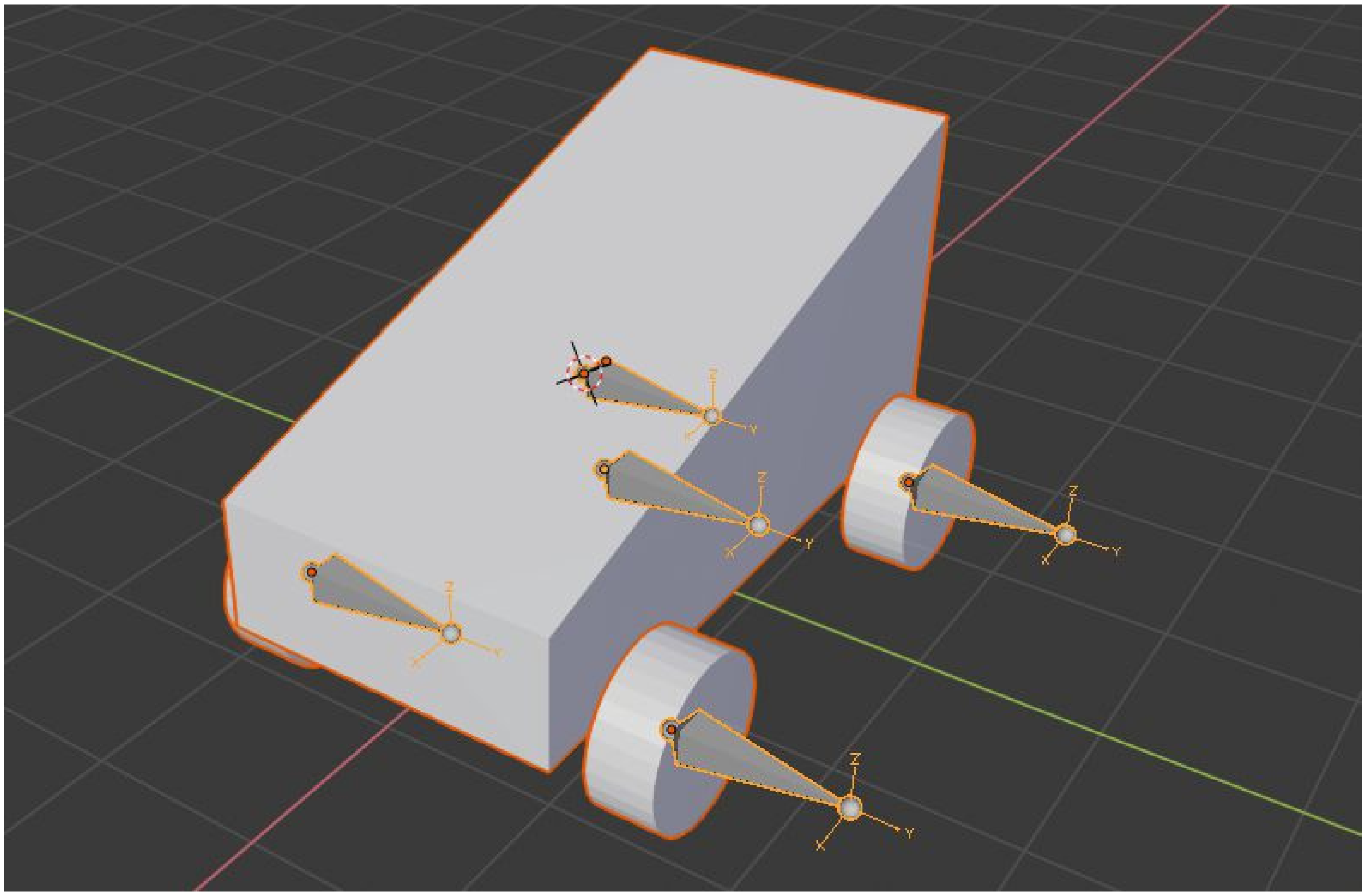
1. Enter edit mode - press Tab
2. Make sure that the whole bone or its outer part is selected, then press E then press Y and type **1** and press Enter
3. Using a left mouse click select newly created bone
4. Press Alt+P and select **Disconnect Bone**
5. Move the bone to the side so there would be a place for other bones - press G then X and type **-0.75**, press Enter
6. Create another bone for wheels - press Shift+D then press X and type **0.5**, press Enter
7. Repeat previous step 2 more time to get in total 5 bones, one in the vehicle base and 4 for the wheels.
8. Exit edit mode - press Tab



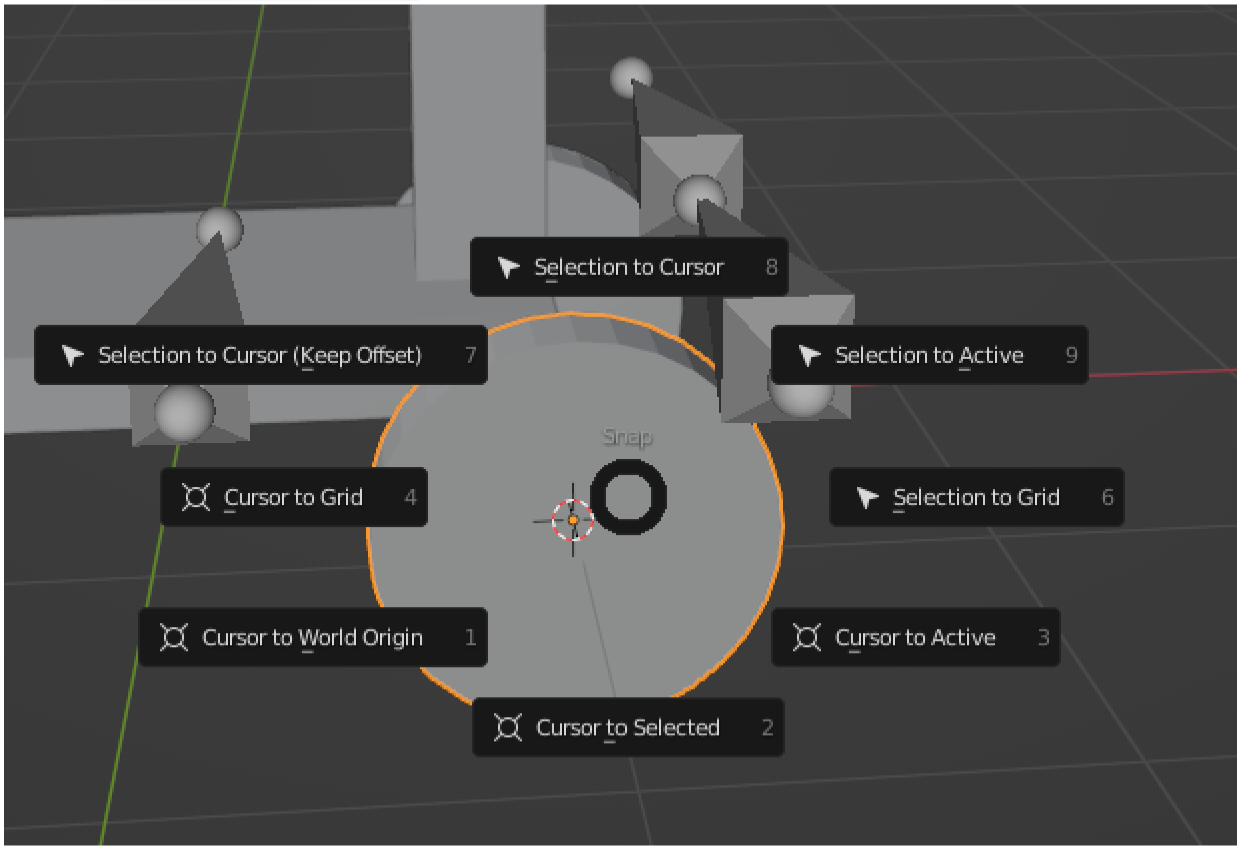
### position the bones

Since we have all bones for the wheels, we can now position each of them in their wheel positions. To do that we will follow these steps:

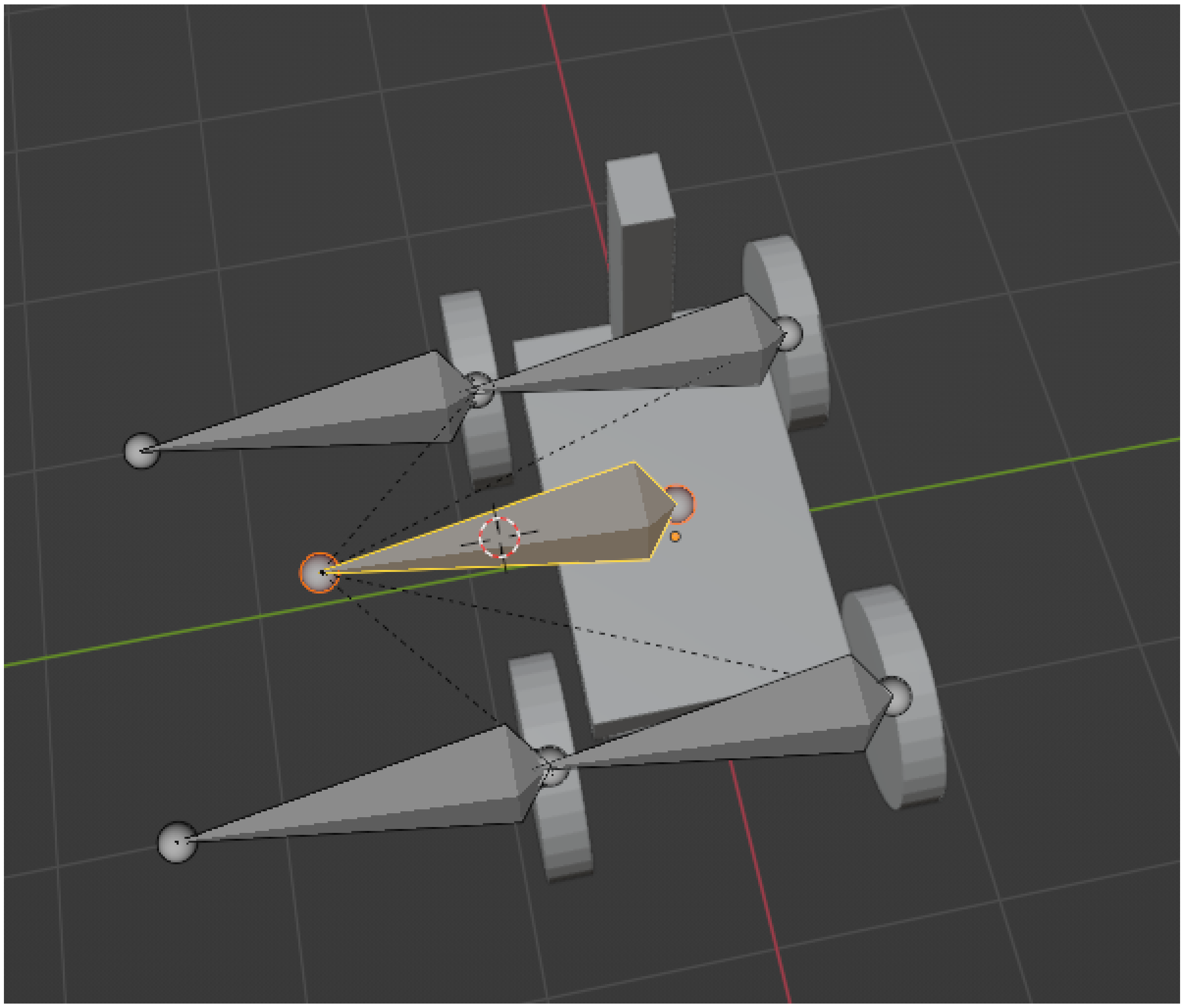
1. With the ~~right~~ left Smouse click select one wheel and press Shift+S, then press 2 or click **Cursor to Selected**
2. Select armature and then go in edit mode by pressing Tab, then select one of the wheel bones
3. Press Shift+S and then press 8 or click **Selection to Cursor**
4. Exit edit mode by pressing Tab and then repeat all these steps until each wheel has its own bone



Show `Cursor to Selected 2`



When you are done with bone placement, you should get a similar result like in the image above.

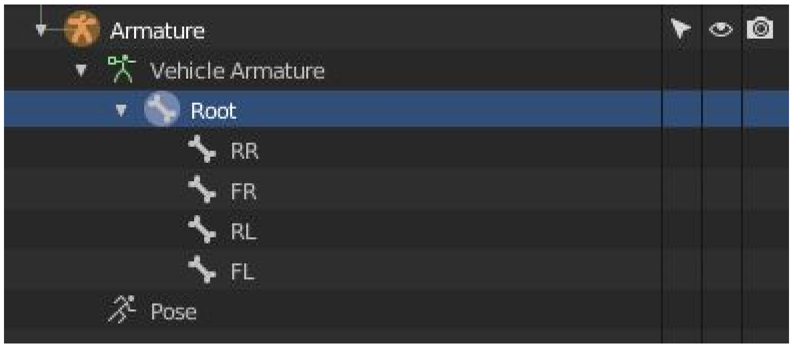


Before we can parent mesh to armature and weight it, but before that we need apply scaling and rotation to meshes and armature.

To apply scaling and rotation to all objects we select all objects by pressing A and then we press Ctrl+A and select **Rotation & Scale**.

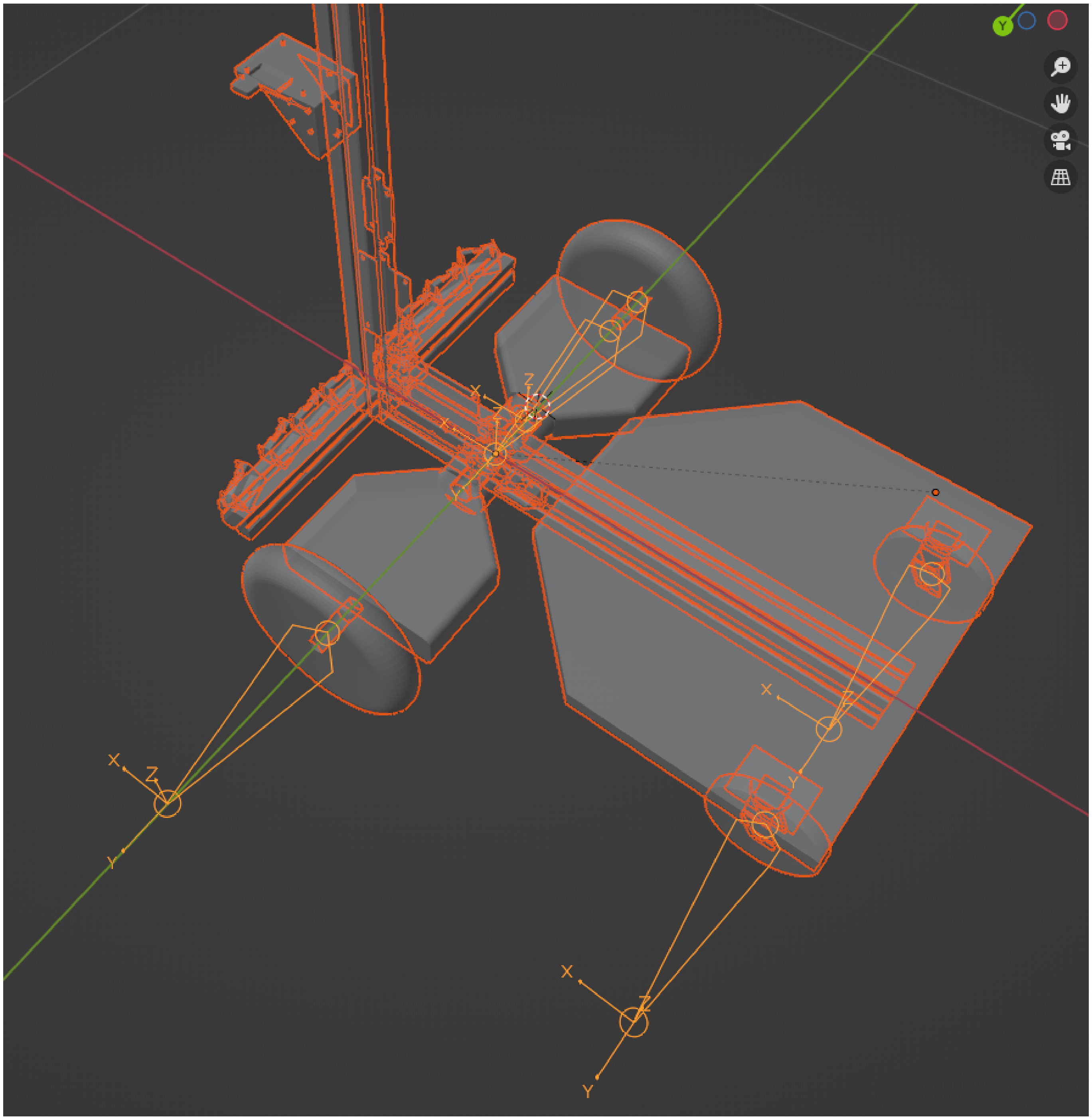
Also it's good practice to name each armature bone. Naming will help us with the mesh weighting and setting up it in UE4.

You can name bones by selecting armature with a left click, and then entering edit mode by pressing Tab. Then you can select each individual bone by left clicking them and then you can change their name in the bottom right side of the Blender window in **Bone** tab top part.



I renamed each bone by its wheel's position. Also, I renamed the first bone to Root.

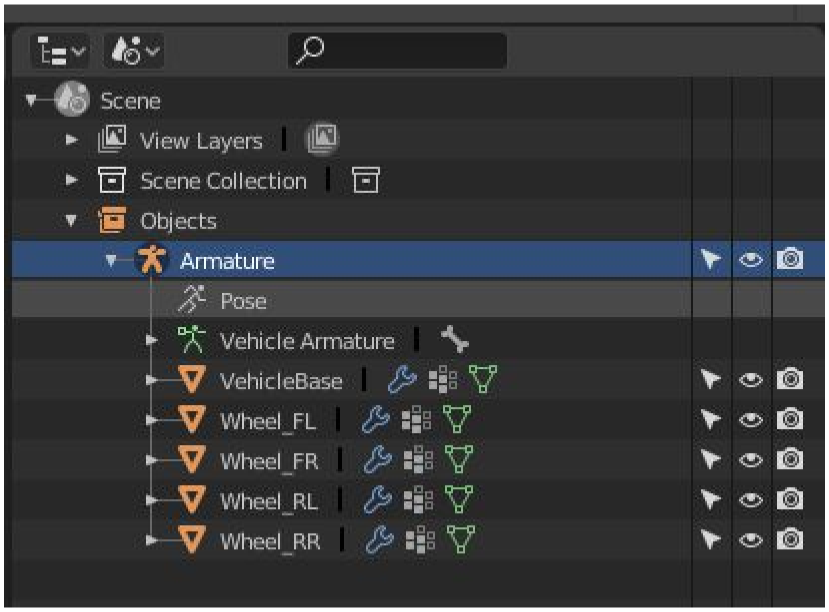
Now we can parent mesh to armature and weight it. To do that, we need to be in `object mode` and have selected all meshes and armature. Make sure, that **armature** is **active** when all objects are selected. Active object has lighter highlight around it . You can see how correct selection looks 2 images above. You can select and change active object by Shift left clicking object.



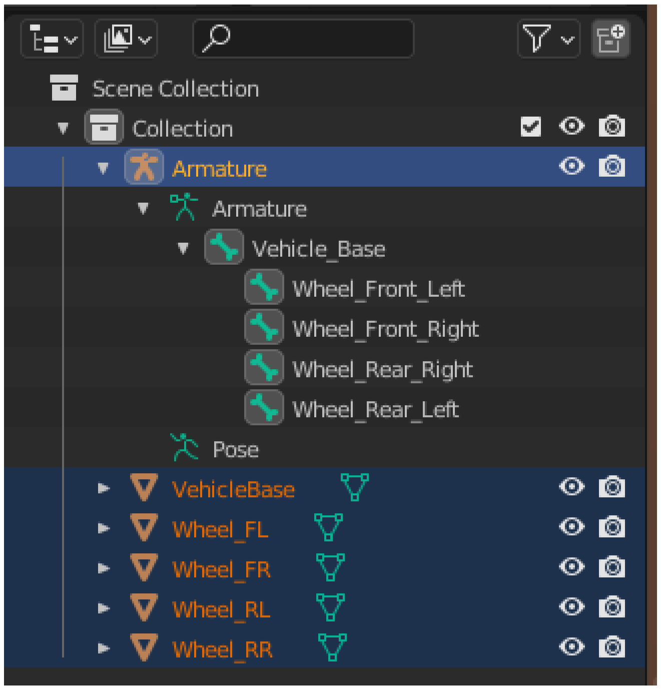
See that the Armature bones are in yellow, while the rest is in orange.

After selection is made, we can parent meshes to armature by pressing Ctrl+P and then selecting **With Empty Groups**.

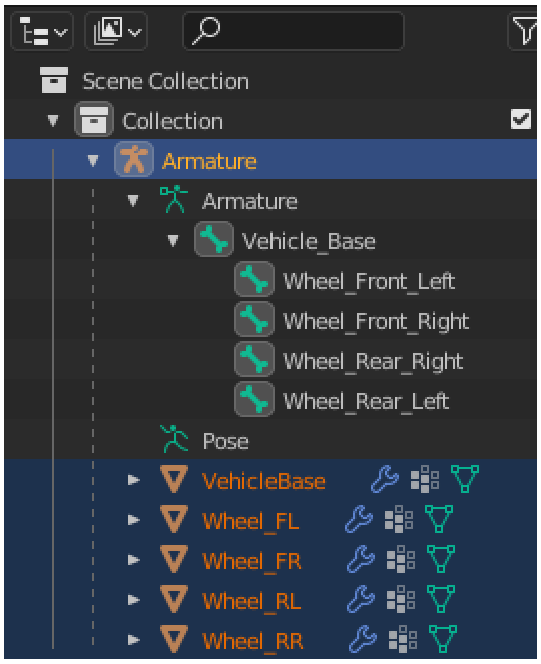
If we look at Blender window right top side, we will see outliner there, and if we change its **Display Mode** from **View Layer** to **Scenes**, we should see in a tree hierarchy that armature now is parent to all meshes.



Before creating groups:



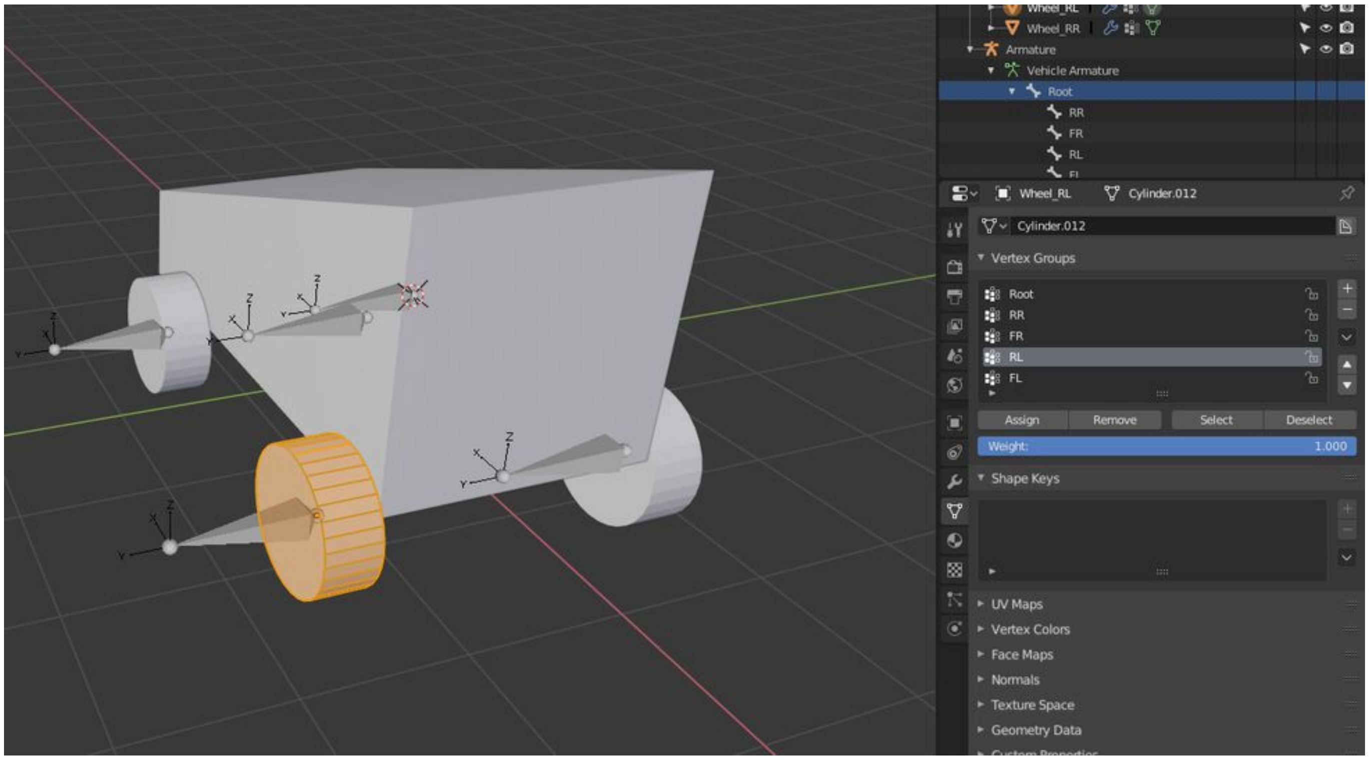
After creating groups:



## Weight meshes

If we would go in pose mode now and try to move any of the bones, we would see, that they aren't moving any mesh with them. That's why we need to weight meshes . To that, we will do the following steps:

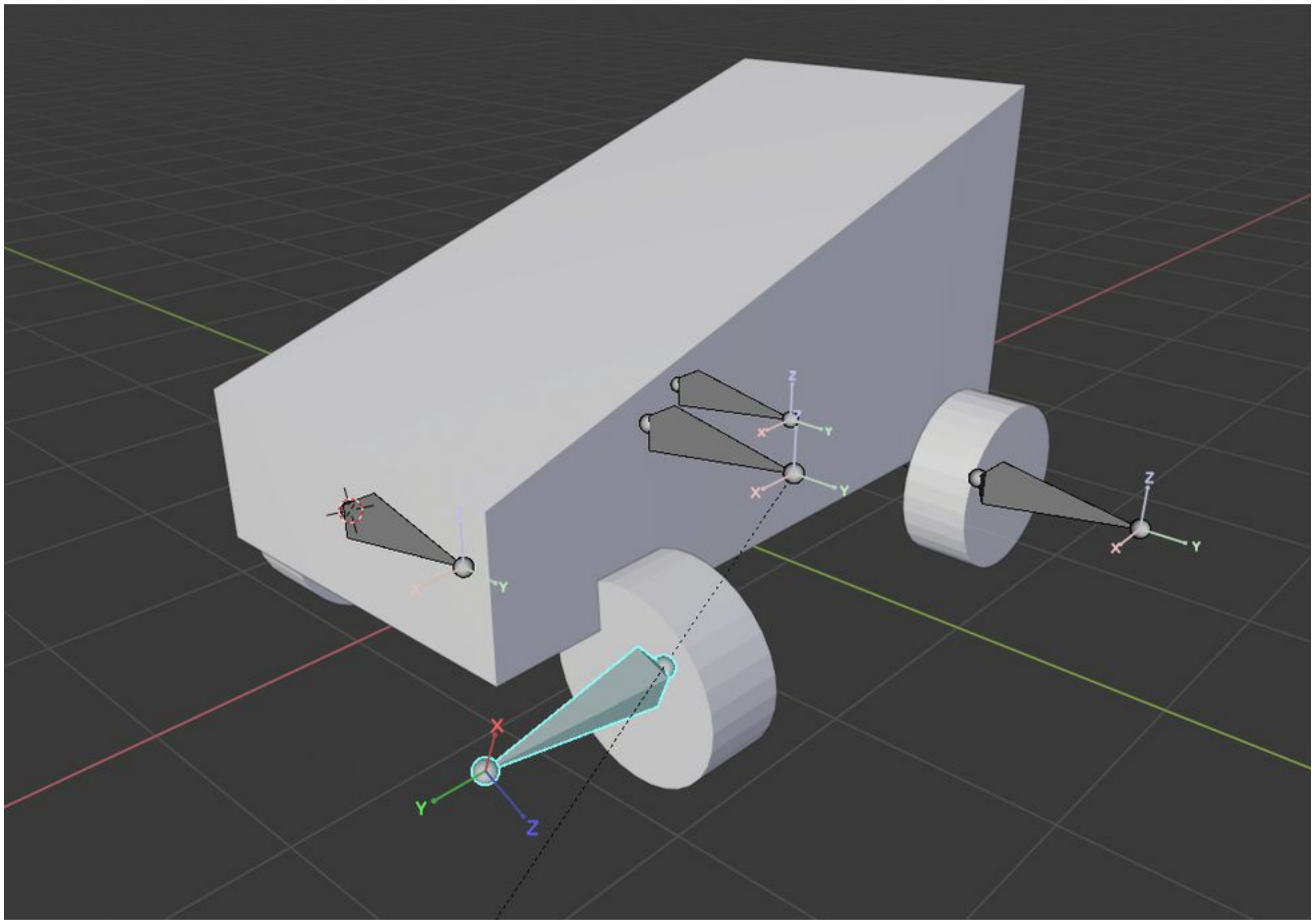
1. In the object mode with the left mouse click we will select one of the meshes
2. Enter in edit mode by pressing **Tab** and make sure that all mesh is selected, we can select all mesh by pressing A
3. In the bottom right side of the Blender window we open the **Object Data** tab and expand the **Vertex Groups** section
4. We select the group which corresponds to our selected mesh and click **Assign**
5. Exit edit mode by pressing Tab and repeat these steps for all meshes (For vehicle body set Root group)



## Test

Now our vehicle should be ready for exporting , but before we do that, let's check if we assigned all vertex groups correctly. We will do that by looking if in pose mode each bone and its mesh counterpart reacts as they should.

1. In object mode select armature
2. Enter pose mode by pressing Ctrl+Tab
3. Select one bone with the left mouse click
4. Move bone around by pressing G or rotate it around by pressing R, stop movement with right mouse click
    - If with bone is moving its corresponding mesh, then the mesh is assigned to the correct vertex group (Root bone should move all mesh and bones)
    - If with bone is not moving corresponding mesh or also moving other mesh, then recheck mesh vertex groups
5. Repeat these steps for all bones



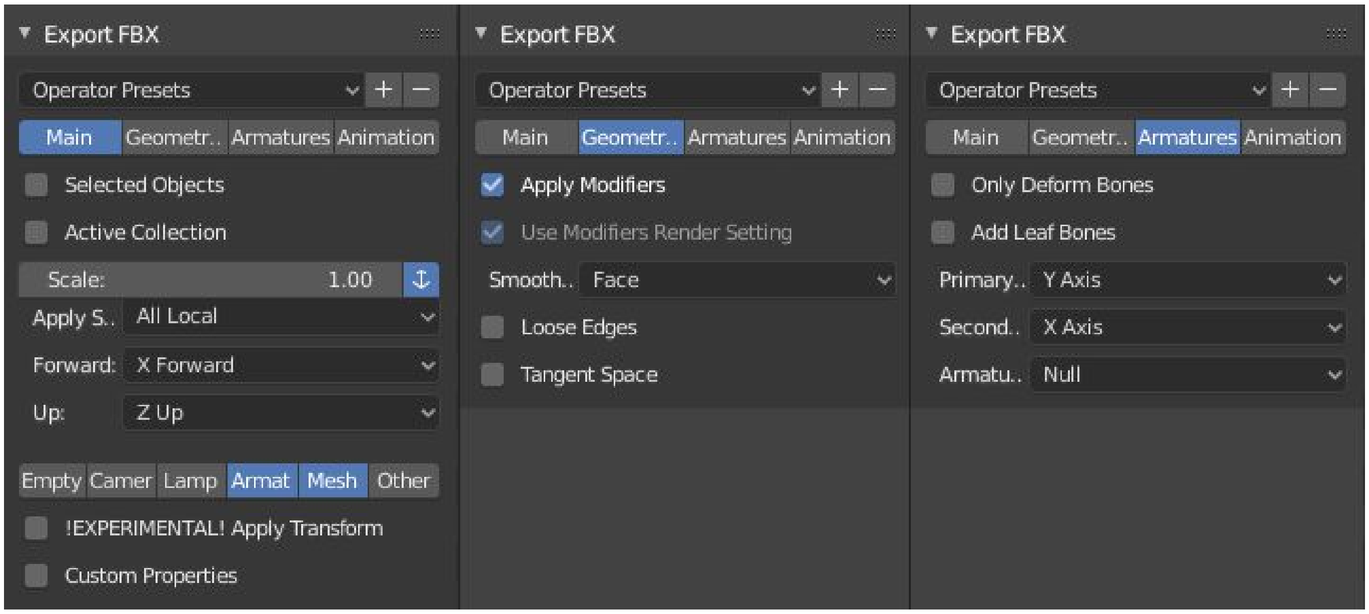
### Exporting vehicle

Finally, we can export our vehicle and import that in UE4. To export vehicle we will do following steps:

⚠ **Warning**

This has been edited in the interface. It is all an expandable scroll bar on the right. `Main` became `Include`

1. Click on **File→ Export→ FBX (.fbx)**
2. With Shift click make sure that in a **Main** setting tab only **Armature** and **Mesh** are selected as exportable objects
3. In the same **Main** tab change **Forward:** to **X Forward** and **Up:** to **Z Up**
4. In a **Geometries** tab set **Smoothing** to **Face**
5. In an **Armatures** tab **uncheck Add Leaf Bones**
6. Choose place and name for your file and press **Export FBX**

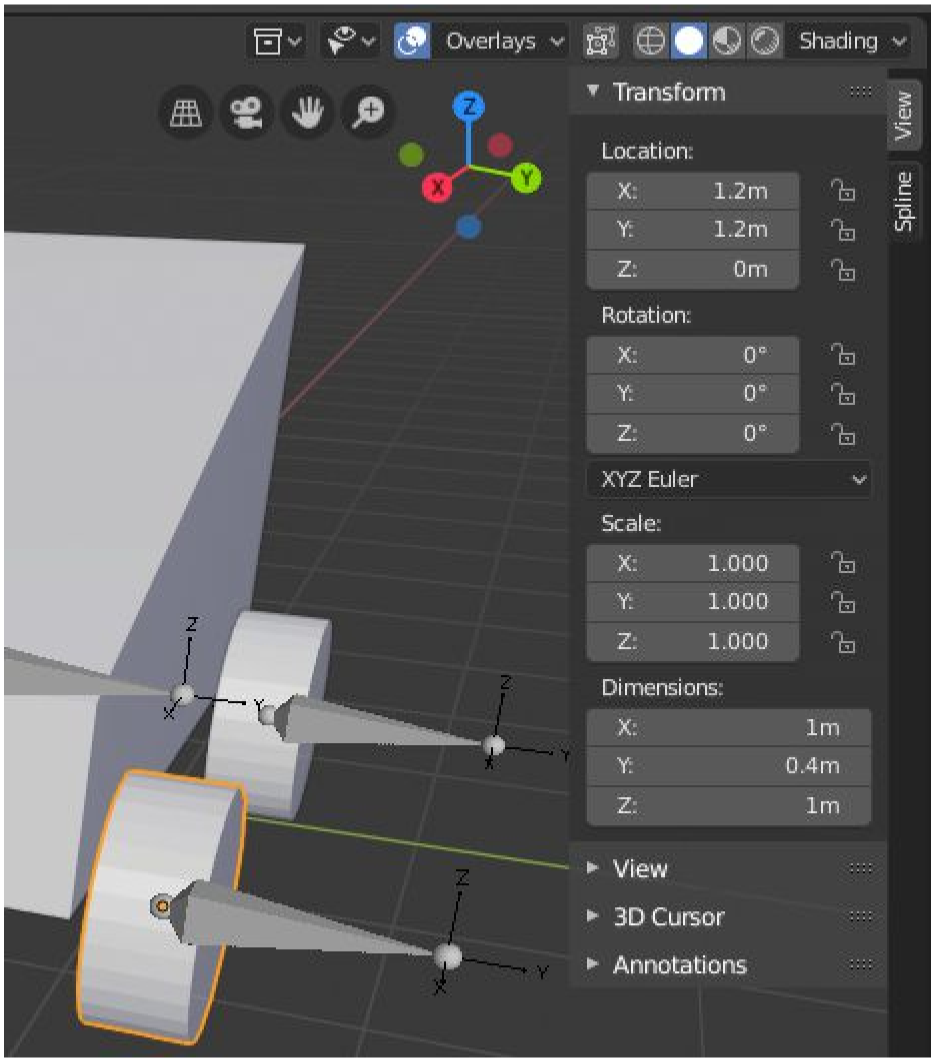


```
Export FBX
Operator Presets
[Main] Geometr.. Armatures Animation
☐ Selected Objects
☐ Active Collection
Scale: 1.00
Apply S.. All Local
Forward: X Forward
Up: Z Up
Empty Camer Lamp [Armat] [Mesh] Other
☐ !EXPERIMENTAL! Apply Transform
☐ Custom Properties

Export FBX
Operator Presets
Main [Geometr..] Armatures Animation
☑ Apply Modifiers
☑ Use Modifiers Render Setting
Smooth.. Face
☐ Loose Edges
☐ Tangent Space

Export FBX
Operator Presets
Main Geometr.. [Armatures] Animation
☐ Only Deform Bones
☐ Add Leaf Bones
Primary.. Y Axis
Second.. X Axis
Armatu.. Null
```

We are done with file exporting. But don't close Blender yet. We need to know our vehicle wheel sizes, so we could set them up correctly in UE4.

To do that we need in object mode select one wheel and then at the right side of the viewport we should see its **Dimensions** in properties menu under **Transform** section, if you don't see properties menu, you can toggle it by pressing N.

> go to Object mode and click on Item



Transform

Location:
X: 1.2m
Y: 1.2m
Z: 0m

Rotation:
X: 0°
Y: 0°
Z: 0°

XYZ Euler

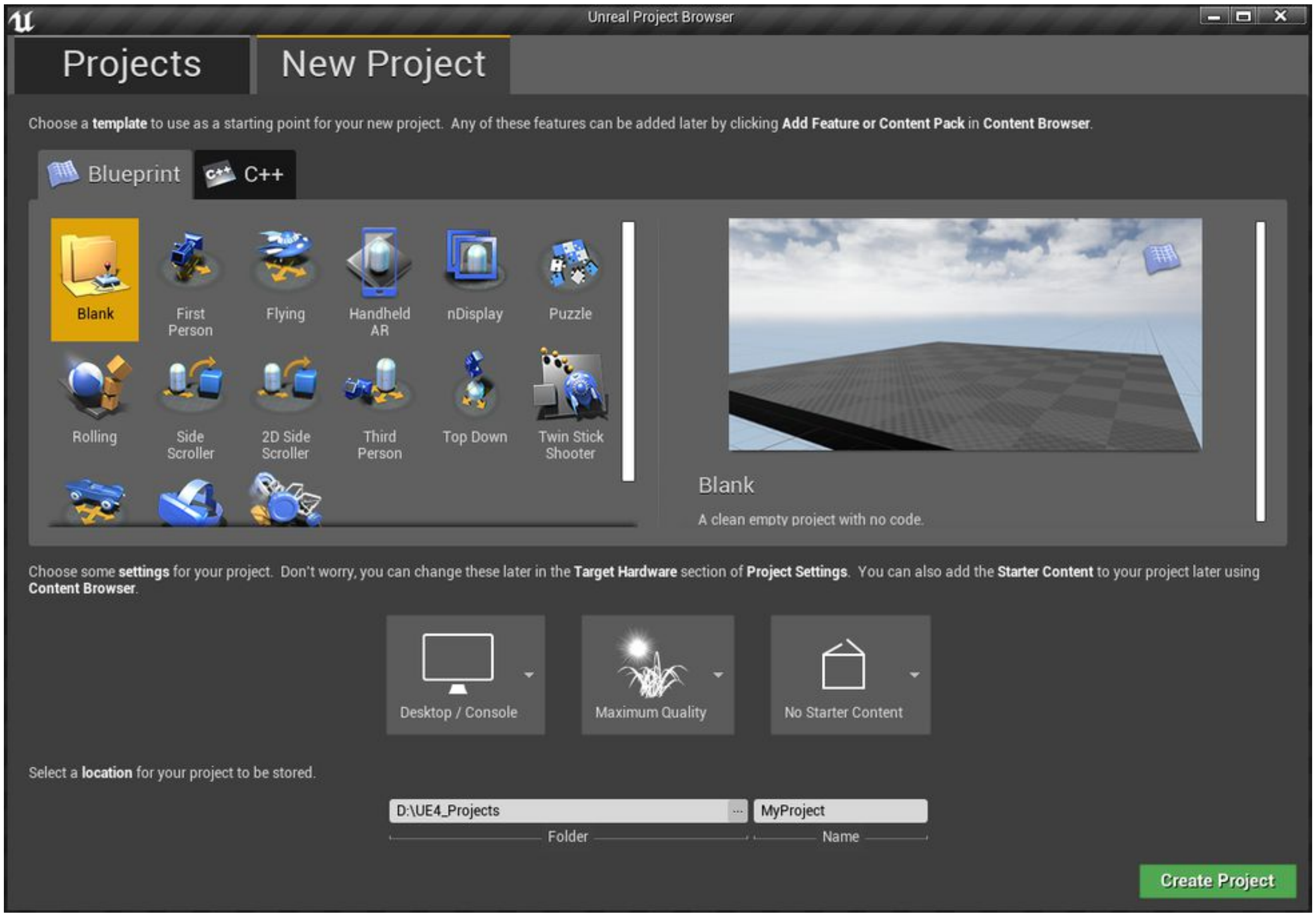
Scale:
X: 1.000
Y: 1.000
Z: 1.000

Dimensions:
X: 1m
Y: 0.4m
Z: 1m

If you made vehicle exactly the same as I did, you should see that X and Z dimensions are 1 m and Y dimensions is 0.4 m. For UE4 we need to know wheel radius and half of it's width, in this situation **wheel radius** will be **0.5 m** and **half width** will be **0.2 m**.

## Setting up the vehicle in UE4

We will set up our vehicle in an empty UE4 project. So we will start by creating a **Blank Blueprint** project.



Choose a **template** to use as a starting point for your new project. Any of these features can be added later by clicking **Add Feature or Content Pack** in **Content Browser**.

Blank

A clean empty project with no code.

Choose some **settings** for your project. Don't worry, you can change these later in the **Target Hardware** section of **Project Settings**. You can also add the **Starter Content** to your project later using **Content Browser**.

Select a **location** for your project to be stored.

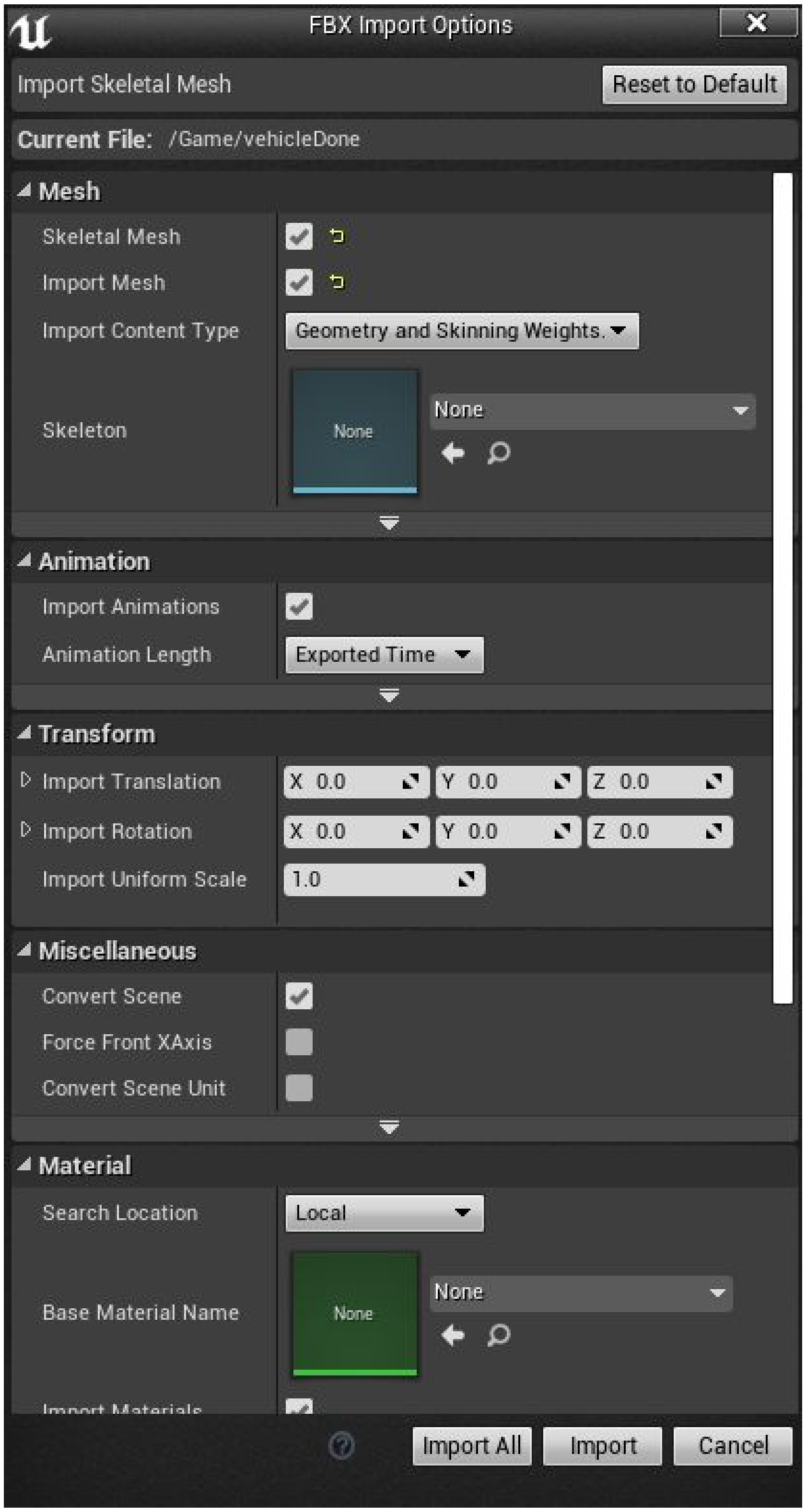
D:\UE4_Projects

MyProject

## Vehicle import

After our project is loaded up, we can now import our vehicle. To import vehicle we will do the following things:

1. Push on **Import** button
2. Select our previously exported FBX file
3. Make sure that **Skeletal Mesh** and **Import Mesh** is checked
4. Press the import button at the import window bottom


FBX Import Options

Import Skeletal Mesh — Reset to Default

Current File: /Game/vehicleDone

**Mesh**

- Skeletal Mesh: ✓
- Import Mesh: ✓
- Import Content Type: Geometry and Skinning Weights.
- Skeleton: None

**Animation**

- Import Animations: ✓
- Animation Length: Exported Time

**Transform**

- Import Translation: X 0.0, Y 0.0, Z 0.0
- Import Rotation: X 0.0, Y 0.0, Z 0.0
- Import Uniform Scale: 1.0

**Miscellaneous**

- Convert Scene: ✓
- Force Front XAxis: ☐
- Convert Scene Unit: ☐

**Material**

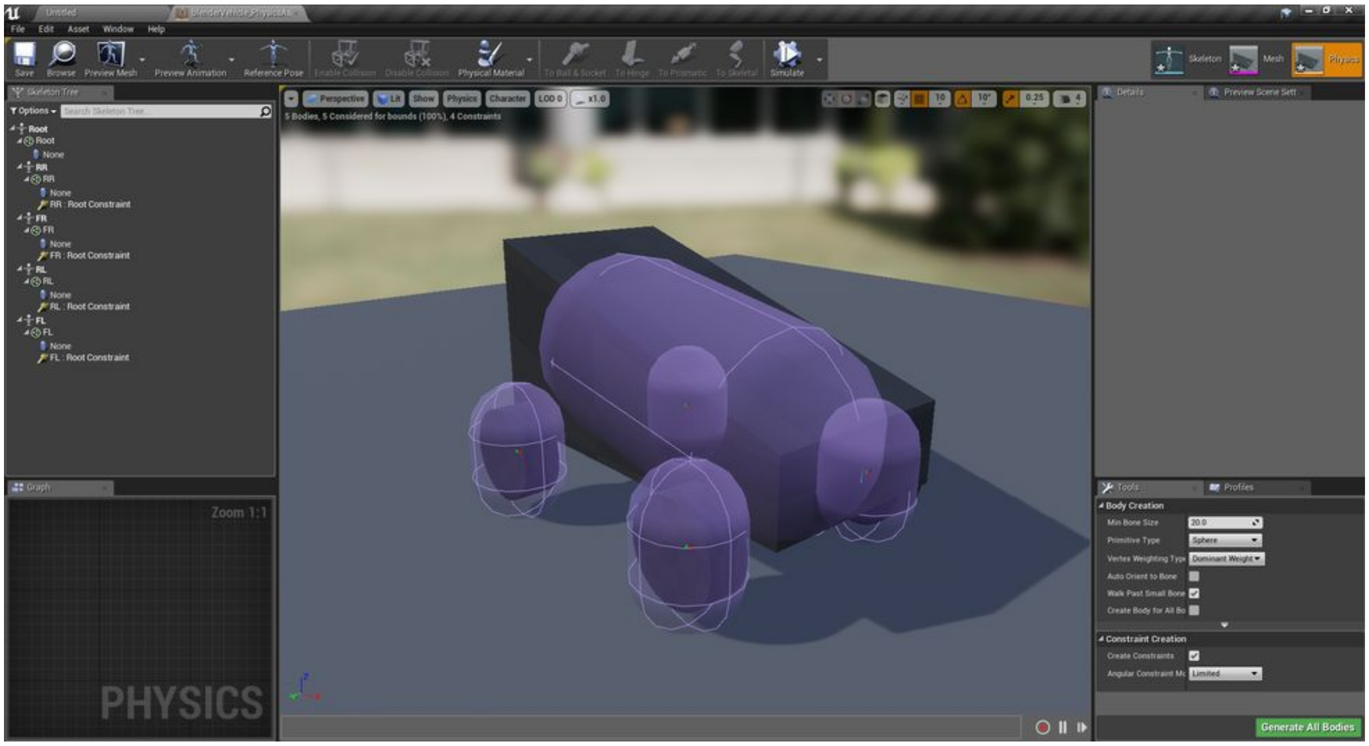
- Search Location: Local
- Base Material Name: None
- Import Materials: ✓

Now we will see, that in our content panel we have 3 new assets for our vehicle:

1. Skeletal mesh
2. Physics Asset
3. Skeleton

## Physics asset edit

We will start by editing vehicle's **Physics Asset**. When we will open it up, we will see, that we have auto generated collisions on our vehicle.



Body Creation
- Min Bone Size: 20.0
- Primitive Type: Sphere
- Vertex Weighting Type: Dominant Weight
- Auto Orient to Bone: ☐
- Walk Past Small Bone: ✓
- Create Body for All Bo: ☐

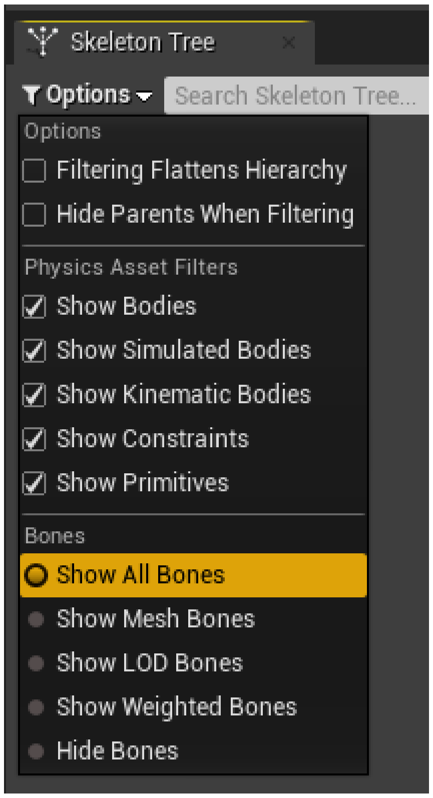
Constraint Creation
- Create Constraints: ✓
- Angular Constraint Mc: Limited

We can see that our all vehicle physic bodies are made of capsules. Capsule collision may be acceptable for vehicle body physics collision, but capsules for wheels not so much. Especially when capsules are in a standing position. We will regenerate all physics assets. So we need to delete all existing physics bodies.

1. Press Ctrl+A to select all physics bodies
2. Press Delete to delete all selected physics bodies

Now we need to regenerate new physics bodies for our vehicle.

1. Select **Root** bone in **Skeleton Tree** tab

1. 
Skeleton Tree

Options

- [ ] Filtering Flattens Hierarchy
- [ ] Hide Parents When Filtering

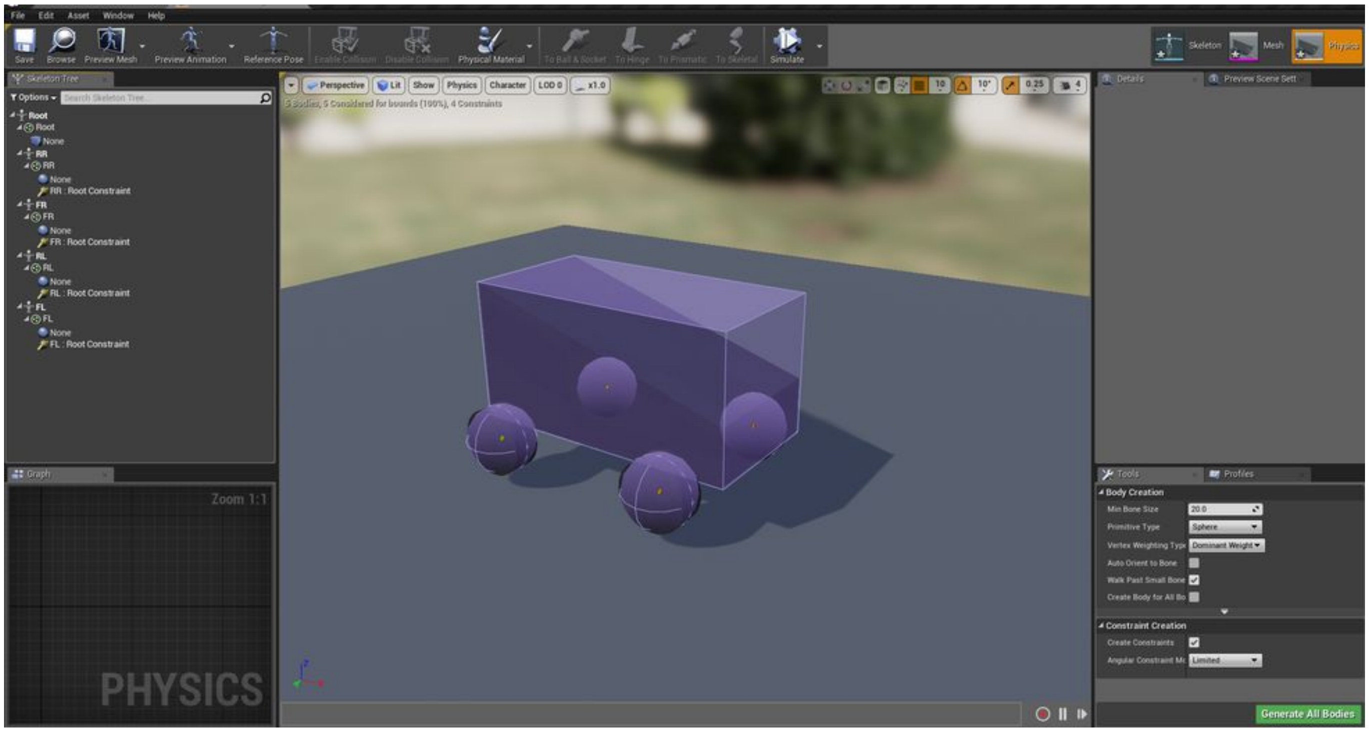
Physics Asset Filters

- [x] Show Bodies
- [x] Show Simulated Bodies
- [x] Show Kinematic Bodies
- [x] Show Constraints
- [x] Show Primitives

Bones

- ● Show All Bones
- Show Mesh Bones
- Show LOD Bones
- Show Weighted Bones
- Hide Bones

2. In a **Tools** tab for **Primitive Type** select **Box** and make sure that **Auto Orient to Bone** is disabled
3. Click on **Add Bodies** button, we should now see a new box physics collision generated
4. Select all **Wheel** bones in **Skeleton Tree** tab
5. In the **Tools** tab for **Primitive Type** select **Sphere**
6. Click on **Add Bodies** button, we should now see new sphere physics collisions generated for our wheels



5 Bodies, 5 Considered for bounds (100%), 4 Constraints

Root
- Root
  - None
- RR
  - RR
    - None
    - RR : Root Constraint
- FR
  - FR
    - None
    - FR : Root Constraint
- RL
  - RL
    - None
    - RL : Root Constraint
- FL
  - FL
    - None
    - FL : Root Constraint

Body Creation

| | |
|---|---|
| Min Bone Size | 20.0 |
| Primitive Type | Sphere |
| Vertex Weighting Type | Dominant Weight |
| Auto Orient to Bone | ☐ |
| Walk Past Small Bone | ✓ |
| Create Body for All Bo | ☐ |

Constraint Creation

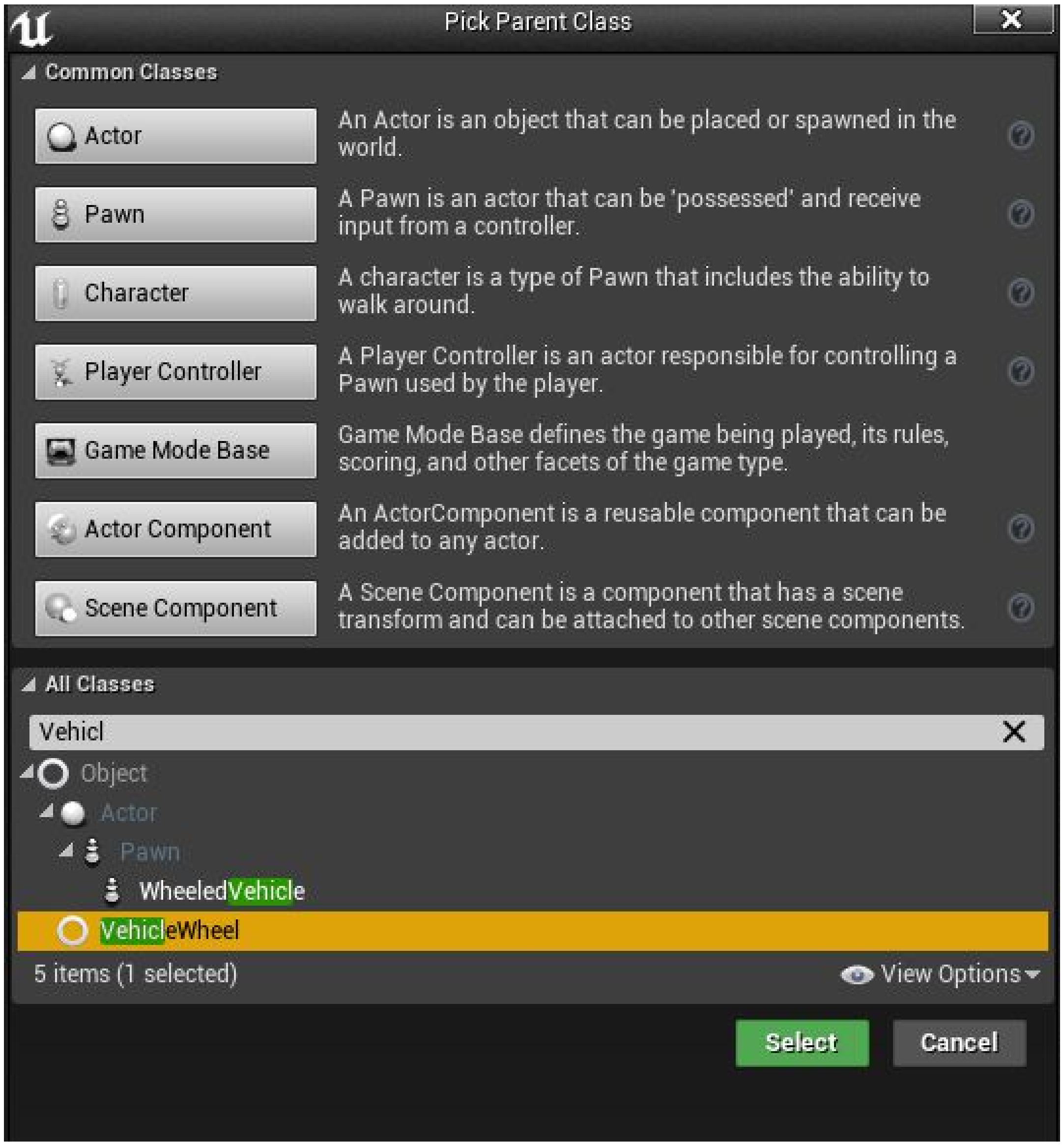
| | |
|---|---|
| Create Constraints | ✓ |
| Angular Constraint Mc | Limited |

We need to have at least physics body for the root bone, otherwise our vehicle will not move. Our vehicle will be ridable even without wheel physics bodies, but it's recommended to have those, so our vehicle would have better collisions with other physics bodies. Also, you can move physics bodies just like in the objects in level editor, so you can adjust them by a hand.

### Wheel blueprint creation

Now we will create blueprint for our wheels. Usually we would create 2 blueprints for wheels, one for front wheels and second for rear wheels, but for simplicity we will make just one blueprint for all wheels.

1. Click **Add new** button or **right mouse click** in content browser
2. Select **Blueprint Class**
3. Expand **All Classes** tab at the bottom of the class select window
4. Search for **VehicleWheel** class and select it
5. We will name it **BP_VehicleWheel** you can name as you want, just remember its name


Pick Parent Class

Common Classes

| | |
|---|---|
| Actor | An Actor is an object that can be placed or spawned in the world. |
| Pawn | A Pawn is an actor that can be 'possessed' and receive input from a controller. |
| Character | A character is a type of Pawn that includes the ability to walk around. |
| Player Controller | A Player Controller is an actor responsible for controlling a Pawn used by the player. |
| Game Mode Base | Game Mode Base defines the game being played, its rules, scoring, and other facets of the game type. |
| Actor Component | An ActorComponent is a reusable component that can be added to any actor. |
| Scene Component | A Scene Component is a component that has a scene transform and can be attached to other scene components. |

All Classes

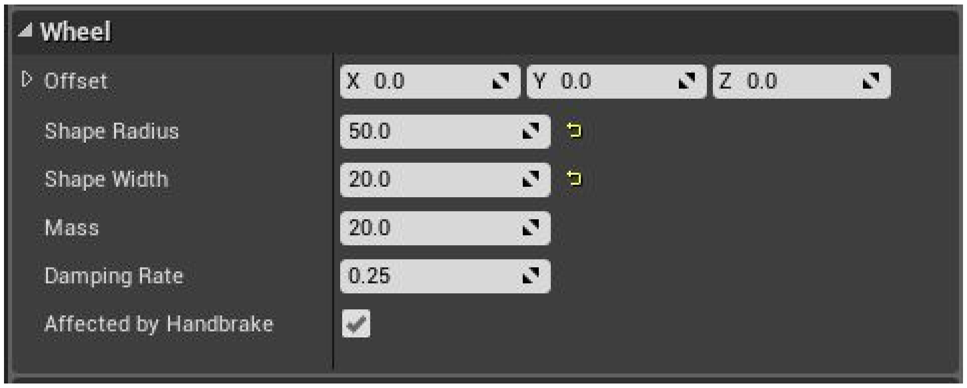
Vehicl

```
Object
  Actor
    Pawn
      WheeledVehicle
VehicleWheel
```

5 items (1 selected)

We need to adjust wheel sizes in **BP_VehicleWheel** blueprint, so it would match our vehicle wheel sizes.

1. Open **BP_VehicleWheel** blueprint
2. Look in **Details** tab under **Wheel** section
3. There change **Shape Radius** to **50** or your own value
4. Also, change **Shape Width** to **20** or your own value


Wheel

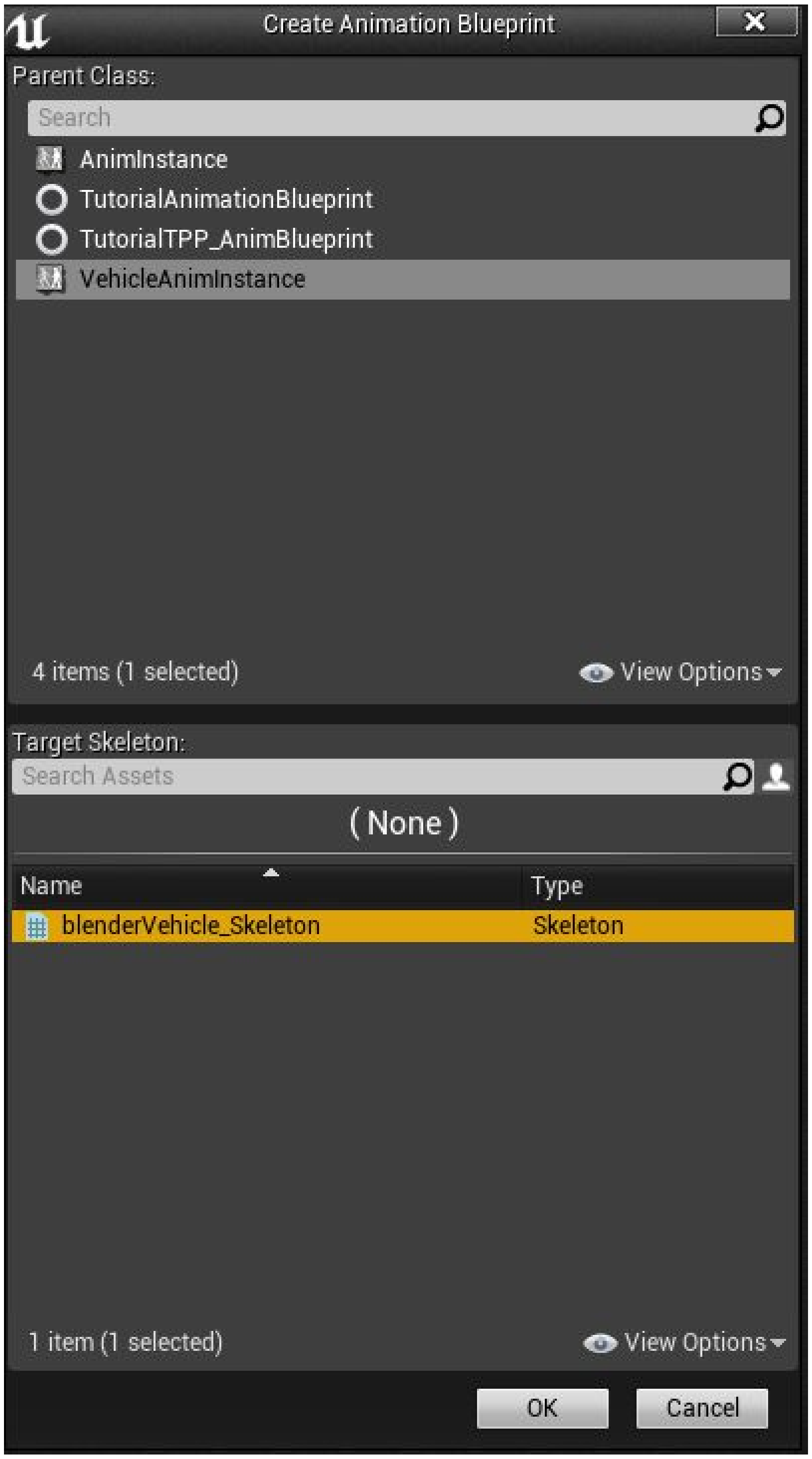
| | |
|---|---|
| Offset | X 0.0 Y 0.0 Z 0.0 |
| Shape Radius | 50.0 |
| Shape Width | 20.0 |
| Mass | 20.0 |
| Damping Rate | 0.25 |
| Affected by Handbrake | ✓ |

If you don't know what are your wheel sizes, you can go back to blender and check them there. We already had a look at how to check them. Just remember that **Shape Width** actually is a half-width of the wheel.

## Animation blueprint creation

Before we make vehicle blueprint, we will make animation blueprint for it.

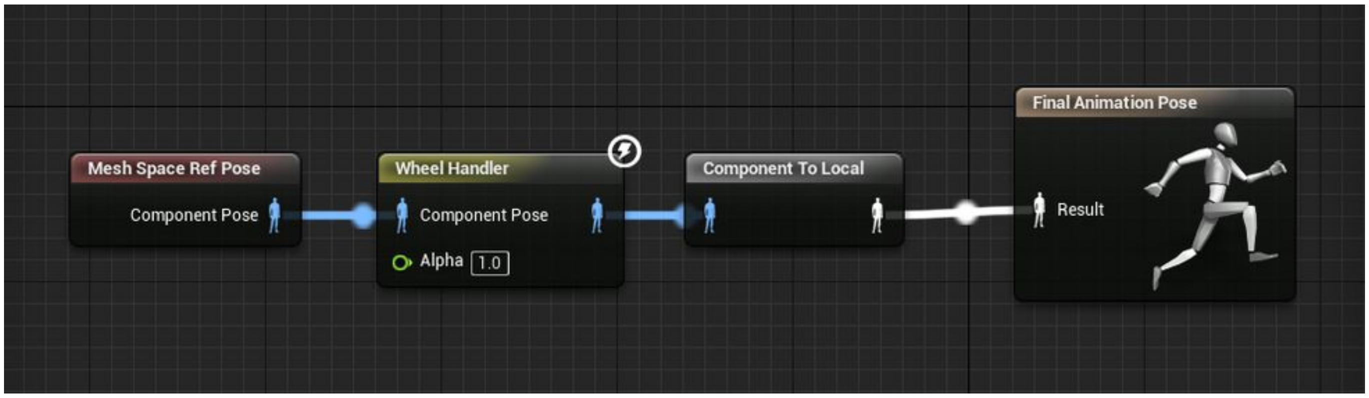
1. Click **Add new** button or **right mouse click** in the content browser
2. Under **Create Advanced Asset** move to **Animation** and in a sub-menu select **Animation Blueprint**
3. In **Create Animation Blueprint** window as **Parent Class** select **VehicleAnimInstance**
4. In the same window as **Target Skeleton** select your vehicle's skeleton.
5. Press **OK**
6. We will name it **ABP_VehicleAnimation**



To have our animation blueprint useful, we need to add some things in its **Anim Graph**.

1. Open **ABP_VehicleAnimation**
2. In the left bottom side we can see **Graphs** section, there we double click on **Anim Graph** to open it
3. In open **Anim Graph** we will see **Final Animation Pose** node
4. **Right click** on an empty space in the graph and find **Wheel Handler for WheeledVehicle** and select it

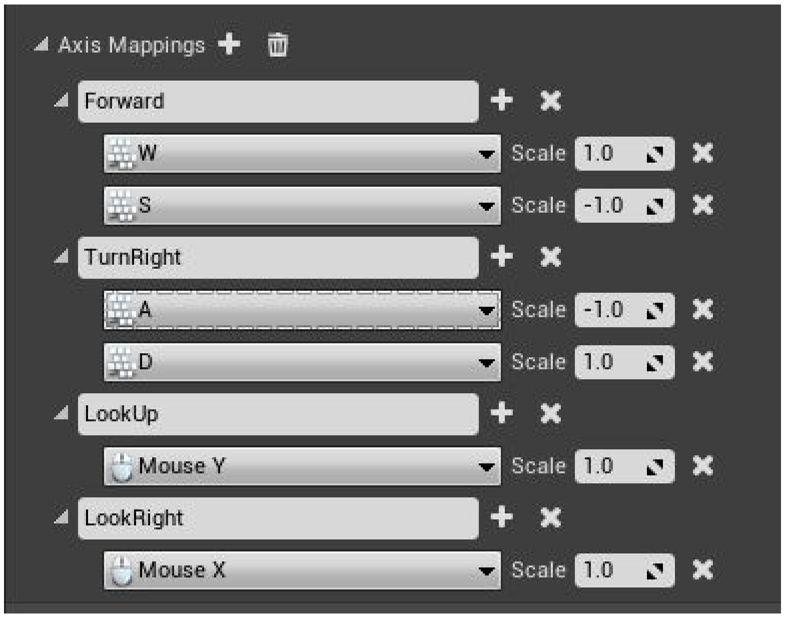
5. Connect **Wheel Handler** node's right side output with **Final Animation Pose Result** input, a new node will appear between their connection named **Component To Local**
6. **Right click** on the empty space in the graph and find **Mesh Space Ref Pose** and select it
7. Connect **Mesh Space Ref Pose** with **Wheel Handler Component Pose** input
8. Save it and you are now done with this blueprint



## Input setting setup

Before we create our vehicle blueprint, it would be nice to bind inputs to our project, so we could make straight away playable vehicle, so we would not need in the middle of blueprints creation go out of it and bind inputs to the project.

1. Open **Project Settings**, you can find them under **Edit** menu or **Settings** menu over the game viewport
2. In the left side of **Project Settings** window open **Input** tab
3. Expands **Axis Mapping** and add mapping for:
    - **Forward**
    - **TurnRight**
    - **LookUp**
    - **LookRight**
4. Assign inputs to each mapping like in **image below**, also remember to assign right **scales** to them (change **1** to **-1** where needed)


Axis Mappings

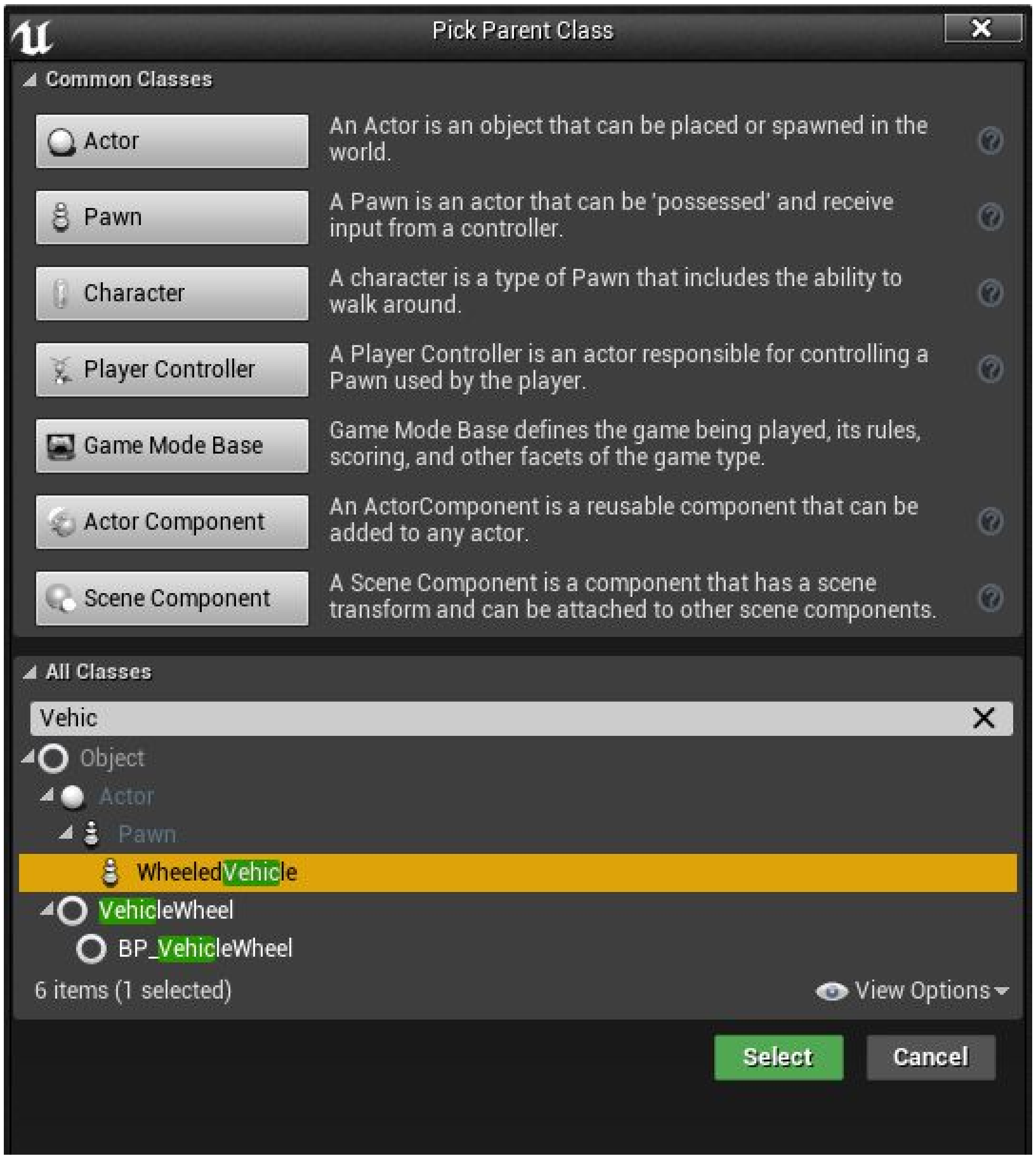
- Forward
  - W Scale 1.0
  - S Scale -1.0
- TurnRight
  - A Scale -1.0
  - D Scale 1.0
- LookUp
  - Mouse Y Scale 1.0
- LookRight
  - Mouse X Scale 1.0

You can choose your own names for axis mappings and your own inputs, just remember their names and what inputs you assigned to each axis.

## Vehicle blueprint creation

We have blueprints for wheels and vehicle's animation, now we can make vehicle blueprint.

1. Click **Add new** button or **right mouse click** in the content browser
2. Select **Blueprint Class**
3. Expand **All Classes** tab at the bottom of the class select window
4. Search for **WheeledVehicle** class and select it
5. We will name it **BP_Vehicle** you can name as you want, just remember its name



An Actor is an object that can be placed or spawned in the world.

A Pawn is an actor that can be 'possessed' and receive input from a controller.

A character is a type of Pawn that includes the ability to walk around.

A Player Controller is an actor responsible for controlling a Pawn used by the player.

Game Mode Base defines the game being played, its rules, scoring, and other facets of the game type.

An ActorComponent is a reusable component that can be added to any actor.

A Scene Component is a component that has a scene transform and can be attached to other scene components.

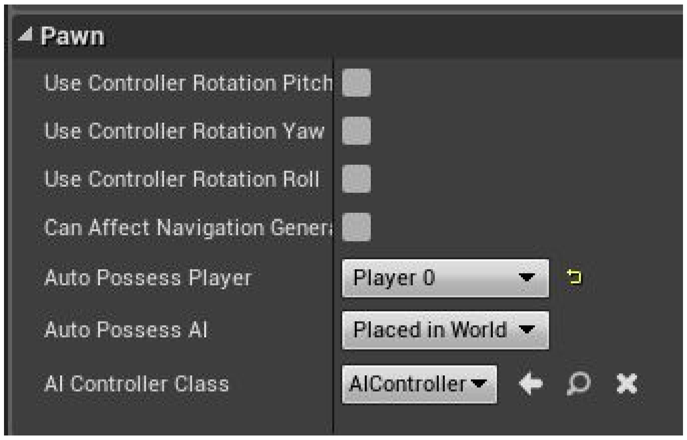
Vehic

Object
Actor
Pawn
WheeledVehicle
VehicleWheel
BP_VehicleWheel

6 items (1 selected)

We want to make sure, that we would automatically posses it, so we could test vehicle right away. So at first we will make our sure, that it's auto possessed by a player.

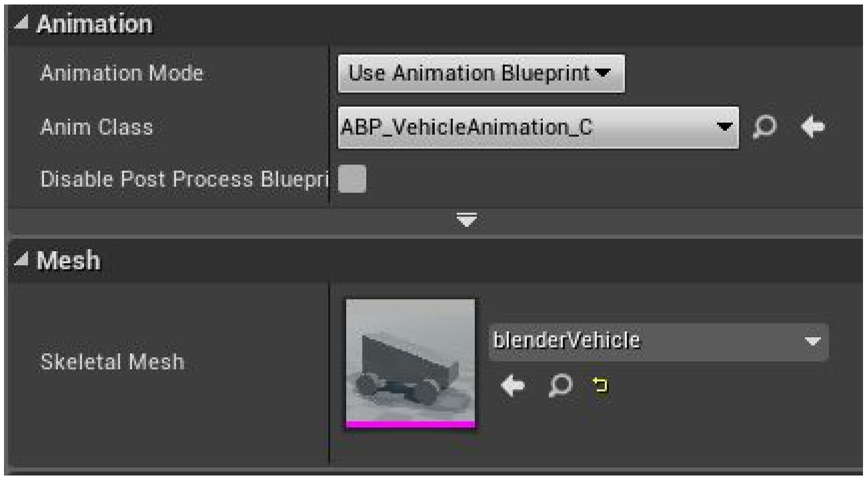
1. Open **BP_Vehicle**
2. Open **Class Defaults**, you can find it in the top middle part of the window.
3. In the right side of the window in **Details** tab under **Pawn** selection change **Auto Posses Player** to **Player 0**


Pawn

Use Controller Rotation Pitch
Use Controller Rotation Yaw
Use Controller Rotation Roll
Can Affect Navigation Genera
Auto Possess Player: Player 0
Auto Possess AI: Placed in World
AI Controller Class: AIController

Now we will set up our mesh and it's animations.

1. At the left top side of the window we can see **Components** tab, we select **Mesh (inherited)** in it
2. Now at the right side in the **Details** tab under **Animation** section change **Anim Class** to **ABP_VehicleAnimation** or however you named your animation blueprint
3. In the same **Details** tab under **Mesh** section change **Skeletal Mesh** to our vehicle's mesh


Animation

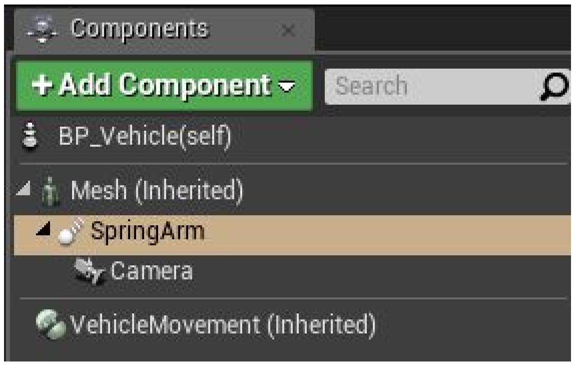
Animation Mode: Use Animation Blueprint
Anim Class: ABP_VehicleAnimation_C
Disable Post Process Bluepri

Mesh

Skeletal Mesh: blenderVehicle

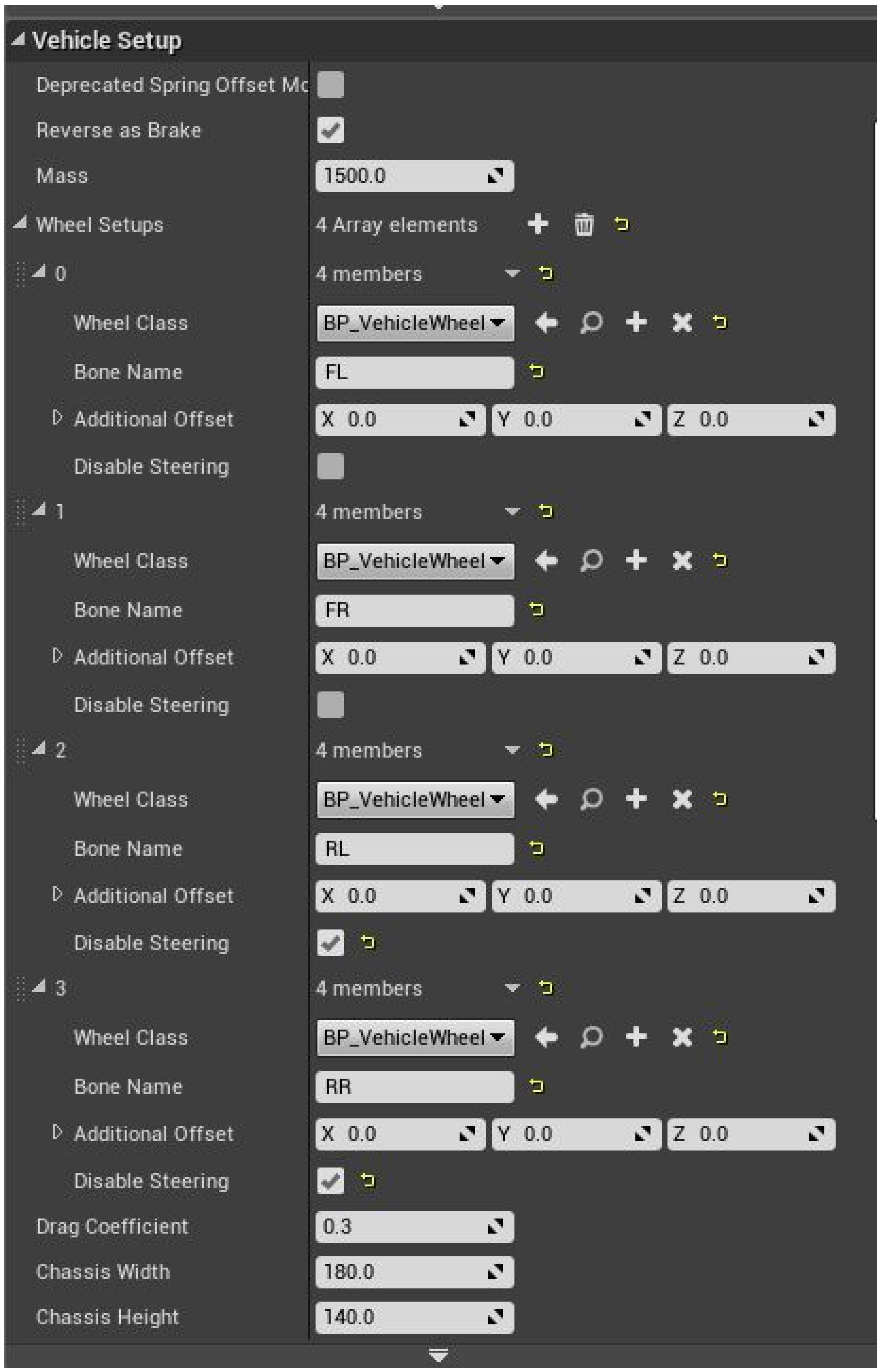
We also need camera attached to our vehicle.

1. While in the **Components** tab **Mesh** is selected press on **Add Component** button
2. Search for **Spring arm** in menu and select it
3. Select **Spring arm** in **Components** tab and again press **Add Component** button
4. Search for **Camera** in menu and select it
5. Select **Spring arm** again and in the **Details** tab under **Camera** section adjust **Target Arm Length** to your preferred camera distance.
6. I set the distance to **1000**



Now we will setup our wheels for the vehicle.

1. In **Components** tab select **VehicleMovement (Inherited)**
2. In **Details** tab now move to **Vehicle Setup** section
3. Expand **Wheel Setups** there you will see 4 wheel settings
4. For each **Wheel Class** set **BP_VehicleWheel**
5. Set first two wheel **Bone Name** to front wheel bone names, in my case they are **FL** and **FR**
6. Set last two wheel **Bone Name** to rear wheel bone names, in my case they are **RL** and **RR**
7. Set last two wheel **Disable Steering** to checked

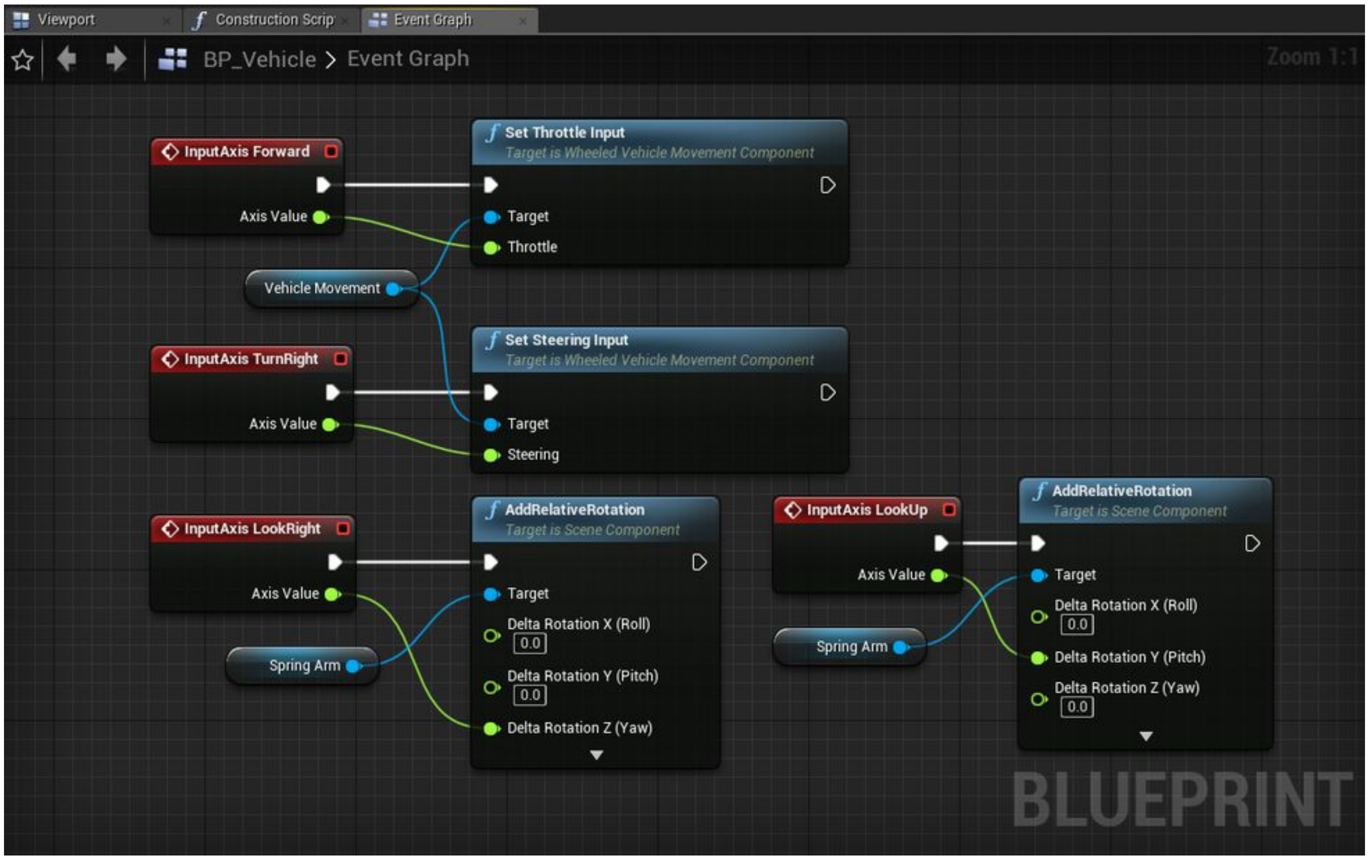


Vehicle Setup

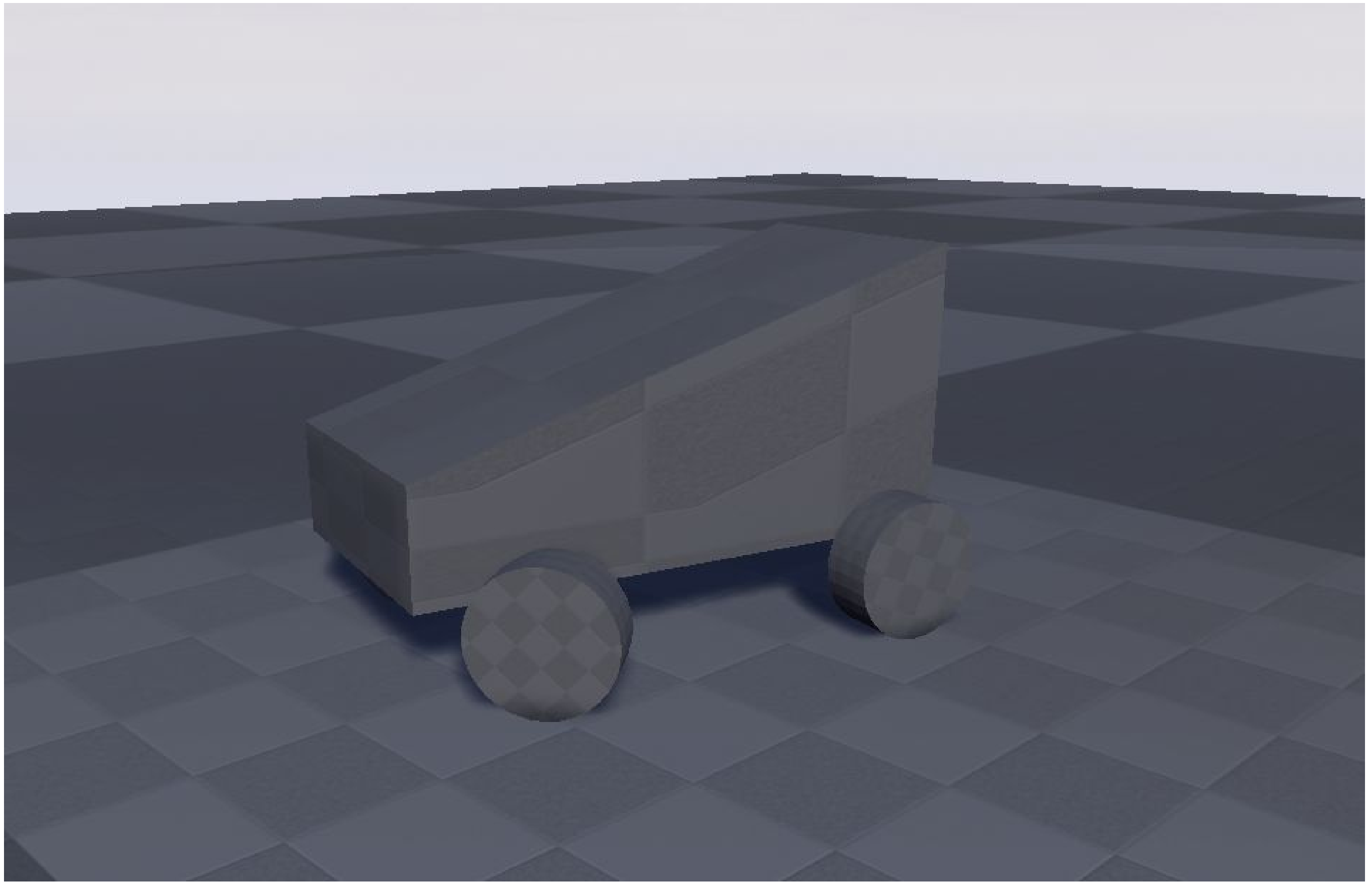
| | |
|---|---|
| Deprecated Spring Offset Mc | ☐ |
| Reverse as Brake | ✓ |
| Mass | 1500.0 |
| Wheel Setups | 4 Array elements |
| 0 | 4 members |
| Wheel Class | BP_VehicleWheel |
| Bone Name | FL |
| Additional Offset | X 0.0 Y 0.0 Z 0.0 |
| Disable Steering | ☐ |
| 1 | 4 members |
| Wheel Class | BP_VehicleWheel |
| Bone Name | FR |
| Additional Offset | X 0.0 Y 0.0 Z 0.0 |
| Disable Steering | ☐ |
| 2 | 4 members |
| Wheel Class | BP_VehicleWheel |
| Bone Name | RL |
| Additional Offset | X 0.0 Y 0.0 Z 0.0 |
| Disable Steering | ✓ |
| 3 | 4 members |
| Wheel Class | BP_VehicleWheel |
| Bone Name | RR |
| Additional Offset | X 0.0 Y 0.0 Z 0.0 |
| Disable Steering | ✓ |
| Drag Coefficient | 0.3 |
| Chassis Width | 180.0 |
| Chassis Height | 140.0 |

After this we actually could put our vehicle in the level and test if it's holding right on the ground, but we could not ride it or move camera around it. That's why we will set up controls before we put vehicle in level.

1. Open **Event Graph** tab
2. In it make following blueprints which you see in image below
3. When you will use **AddRelativeRotation** node, you will not have 3 inputs by default, to get them **Right click** on **Delta Rotation** variable and press **Split Struct Pin**, and now you will have 3 inputs
4. After blueprint is done, don't forget to press **Compile**



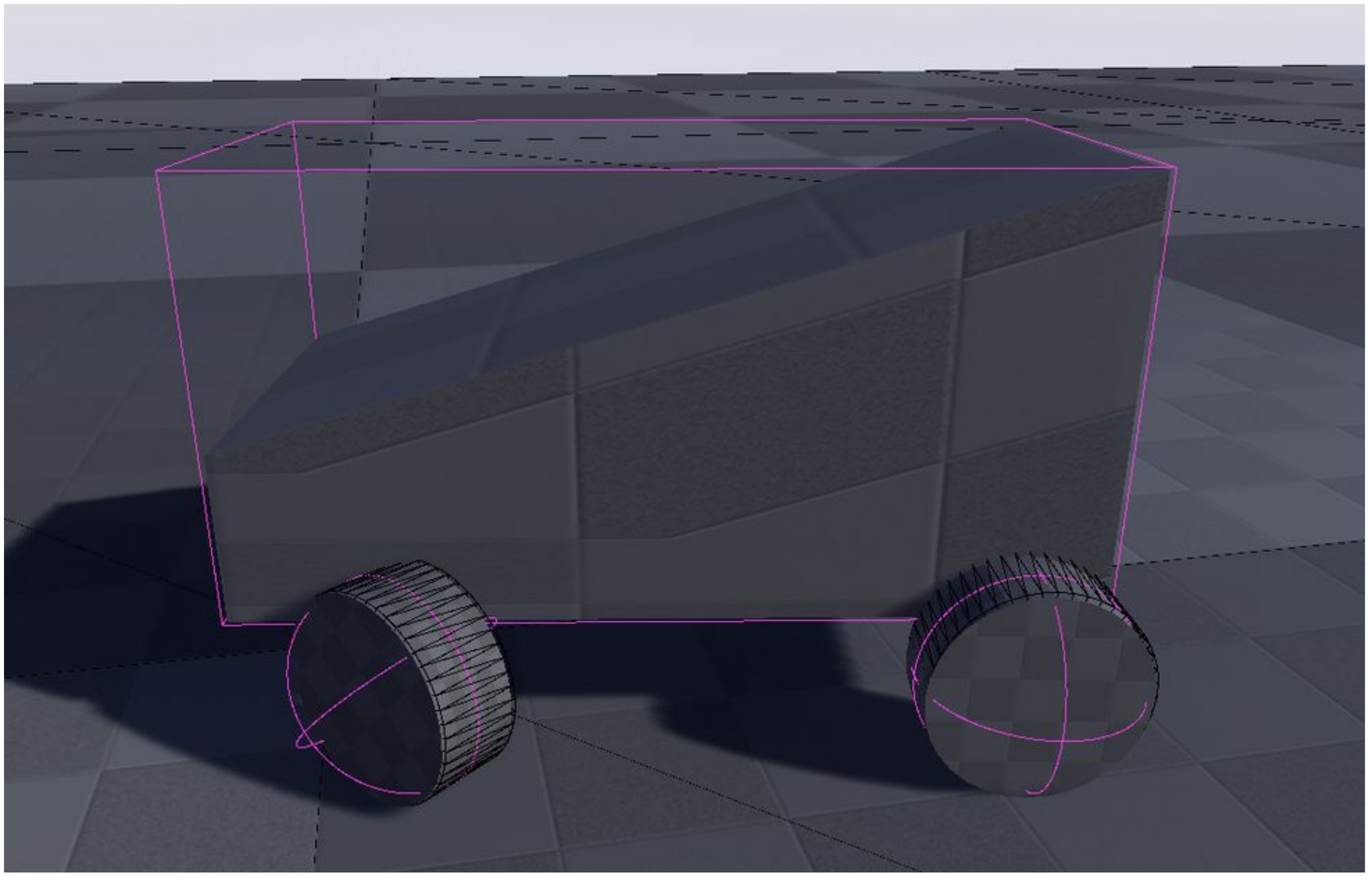
Now our vehicle should be done and we can drag it in our level and it should be ready to drive. Just hit **Play** and we should be able to ride around with it and move camera around the vehicle with a mouse.



### For debug

There is still possibility that we may have did something wrong. So there is good thing to know how to debug and look what's wrong with our vehicle.

- After you pressed **Play** Press ` (tilde '~' key) to open console and then type in it **pxvis collision** and hit enter. Now you can see physics collisions.
- If you will press F8 while you in game, you will unposses your controlled pawn, and you can freely move around your vehicle and check if everything with collisions or wheels is fine.



And that should be it.

### Video

I also made a video where I use fewer keyboard shortcuts for vehicle creation. Also, the video has no sound or voiceover, so you can continue to listen to your music.

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