Forklift Controller
User Manual v1.0

WSM GAME STUDIO

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2020

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1. Intro

Thank you for purchasing “Forklift Controller”!

This package contains all that you need to include a simple and functional forklift to your game.

More forklift models may be included in the future and/or sold separately as extensions (Here).

It’s really simple to use and customize.

2. How to Use This Asset

In this section you will learn how this asset works and how to use it based on the sample prefabs.

2.1. What can it do? (Quick Start Guide)

This asset contains ready to use forklift prefabs which you can drive and use to lift and move cargo around your game. It also contains modular pallet racks prefabs to build your scene and ready to use wooden pallets prefabs.

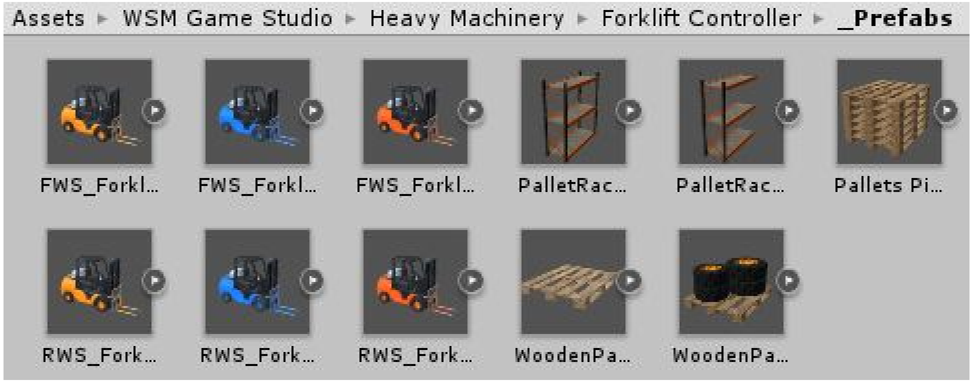


Figure: Sample Prefabs

The **FWS** and **RWS** prefixes on the forklift prefabs stands for **Front Wheels Steering** and **Rear Wheels Steering**.

Note: Usually most real life forklifts use rear wheels steering for greater maneuverability while handling cargo on tight spaces. However, front wheels steering forklifts are also supported by the asset.

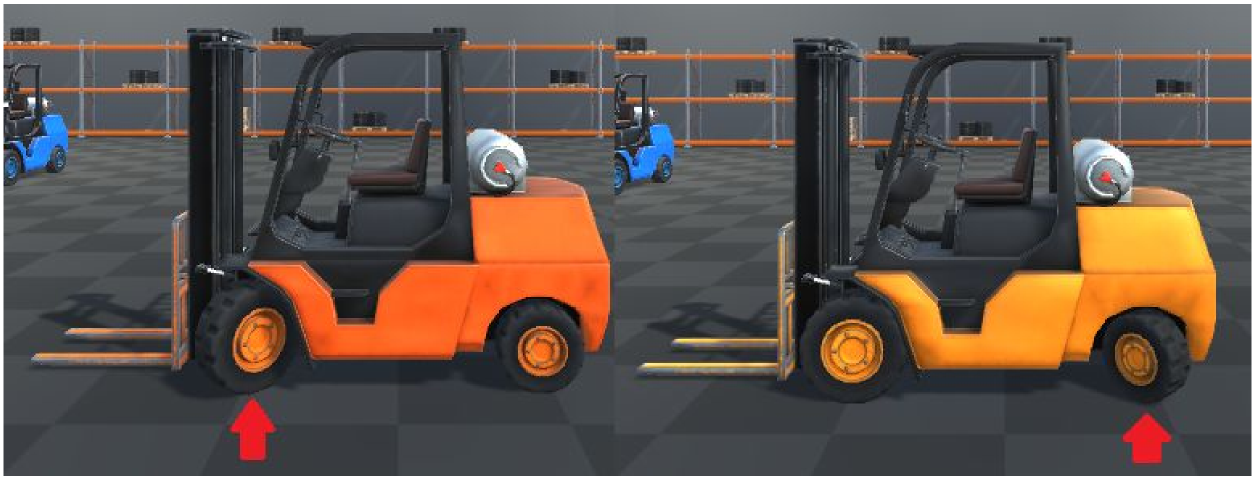
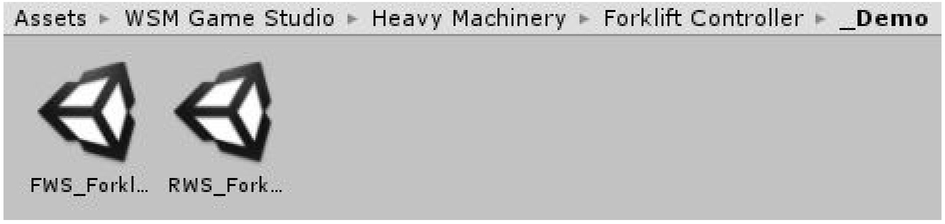


Figure: Forward Wheels Steering x Rear Wheels Steering

To see these prefabs in action, please take a look at the demo scenes included on the package.



Assets ▸ WSM Game Studio ▸ Heavy Machinery ▸ Forklift Controller ▸ **_Demo**

FWS_Forkl... RWS_Fork...

Figure: Demo Scenes

Hint: By pressing the Tab key on the demo scenes you can show or hide the current forklift input keys. This can be useful for testing the forklift for the first time.

This asset supports 3 distinct forklift forks movements.

- Vertical Fork Movement
- Horizontal Fork Movement
- Mast Tilting

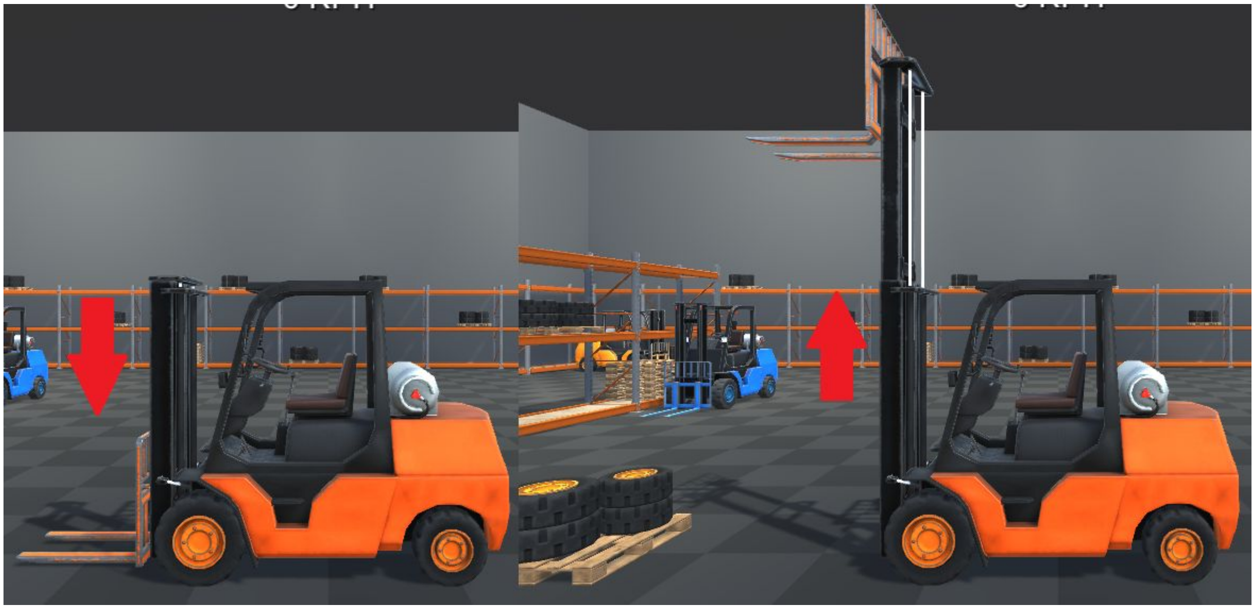


Figure: Vertical Fork Movement

Vertical movement is used to lift and lower cargo, by default it can reach approximately up to 3.45 meters high.

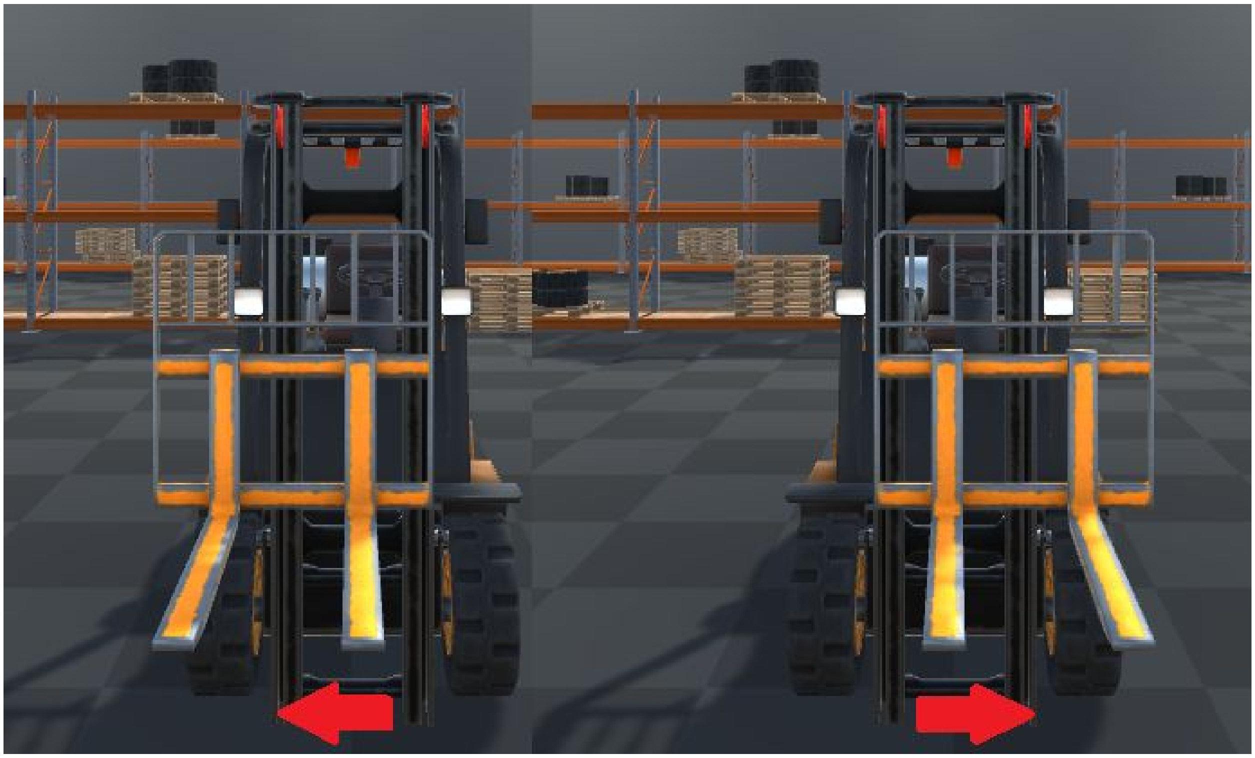


Figure: Horizontal Fork Movement

Horizontal movement can be used to precisely organize cargo near to each other without steering the forklift. Forks are centered by default and have a horizontal reach of 42 cm (21 cm left, 21cm right).

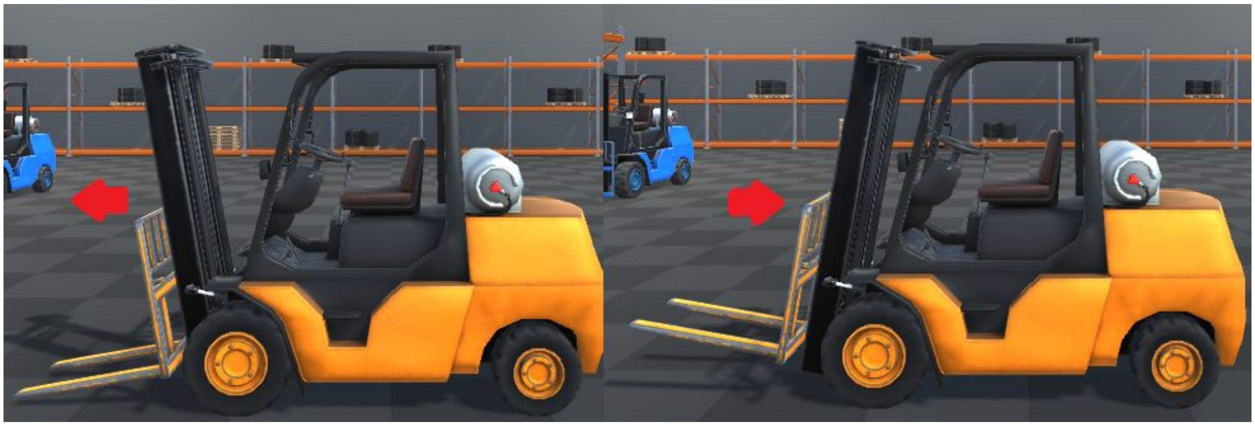


Figure: Mast Tilting

Mast tilting can be very useful to reduce the risk of letting loose cargo fall from the pallet. For example, if you are carrying a stack of wooden pallets, tilting the mast backwards will increase the stack stability and avoid unwanted accidents

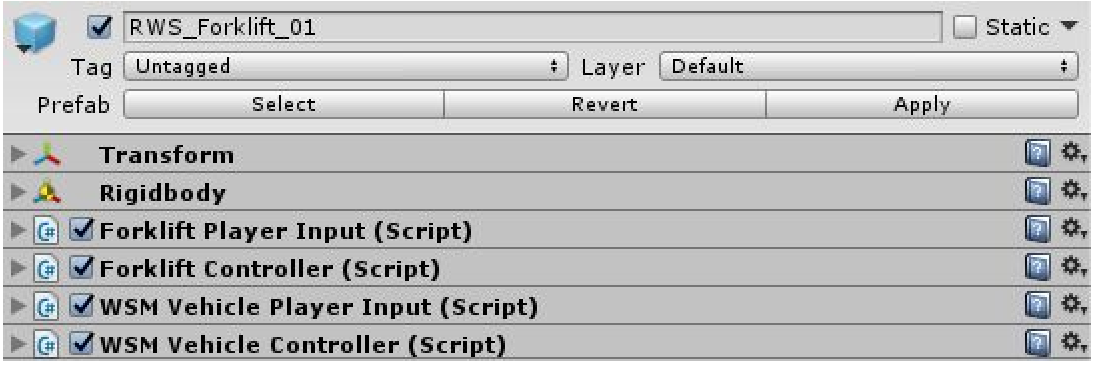
Figure: Mast Tilting Sample

2.2. How it Works

This asset was designed with modularity and easy customization in mind. Therefore, the Component Game Design Pattern was implemented to keep player input, forklift behaviour and vehicle behaviour as decoupled as possible.

Each forklift is composed of four main modules:

- Forklift Player Input
- Forklift Controller
- Vehicle Player Input
- Vehicle Controller



☑ RWS_Forklift_01 □ Static

Tag Untagged Layer Default

- Transform
- Rigidbody
- ☑ Forklift Player Input (Script)
- ☑ Forklift Controller (Script)
- ☑ WSM Vehicle Player Input (Script)
- ☑ WSM Vehicle Controller (Script)

Figure: Forklift Components

The forklift and vehicle input modules are responsible to gather and feed player input into the corresponding controller modules. For more information about these modules and how to customize input, please take a look at the Forklift Input and Vehicle Input sections.

The Forklift Controller component is responsible for handling all forklift specific behaviour. Which means, handling the fork movements and SFX. For more information, please take a look at the Forklift Controller section.

The Vehicle Controller component is responsible for handling all vehicle specific behaviour (Ex: acceleration, steering, vehicle physics, etc.). For more information, please take a look at the Vehicle Controller section.

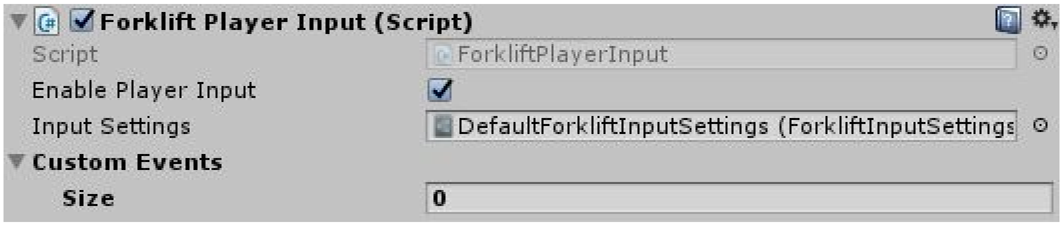
This modular approach was adopted to allow customization by the replacement of any module for third party or custom modules. For example, a client that already owns a custom or third party vehicle controller, may wish to replace the default vehicle related modules and still be able to control the forklift mechanical parts by using the Forklift Controller component.

3. Forklift Modules

This section covers the forklift related modules and settings.

3.1. Forklift Input

This component is responsible for handling player input for all forklift specific behaviours. It holds a reference to the Default Forklift Input Settings file, which contains the keyboard key configurations for controlling the mechanical parts of your forklift.



▼ ☑ Forklift Player Input (Script)

Script: ForkliftPlayerInput

Enable Player Input: ☑

Input Settings: DefaultForkliftInputSettings (ForkliftInputSettings

▼ Custom Events

Size: 0

Figure: Forklift Player Input

> **Note:** Enable Player Input can be used to toggle input on/off.

The Default Forklift Input Settings file is located under the “WSM Game Studio ► Heavy Machinery ► Forklift Controller ► Input” folder.

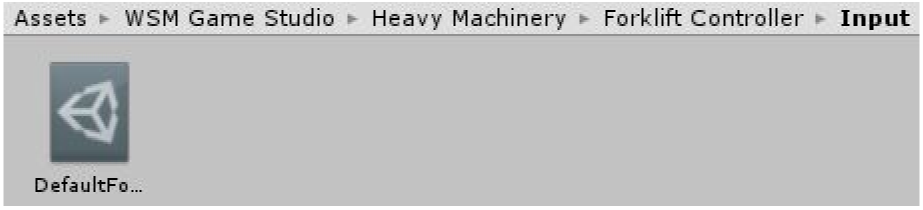
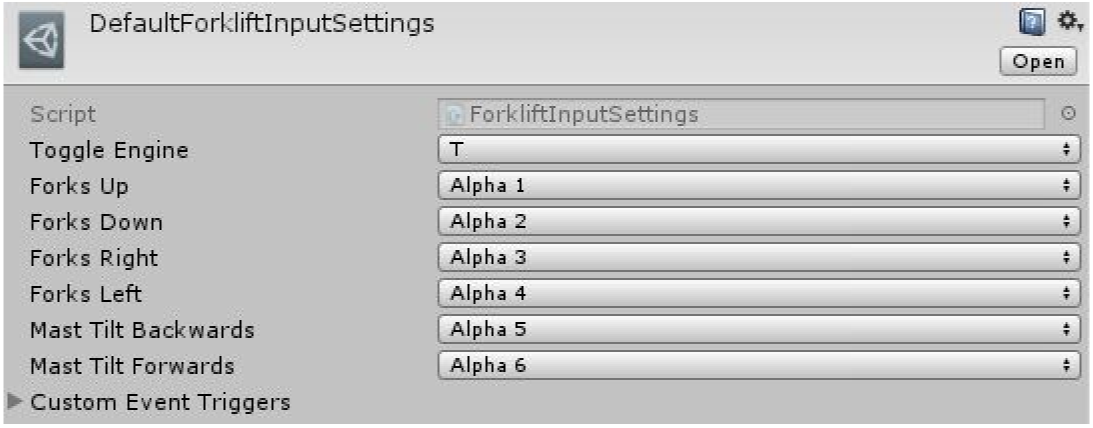

Assets ▸ WSM Game Studio ▸ Heavy Machinery ▸ Forklift Controller ▸ Input
DefaultFo...

Figure: Forklift Input Settings Location

By selecting this file, you can see and customize the input keys used to control your forklift.



DefaultForkliftInputSettings

Open

Script	ForkliftInputSettings
Toggle Engine	T
Forks Up	Alpha 1
Forks Down	Alpha 2
Forks Right	Alpha 3
Forks Left	Alpha 4
Mast Tilt Backwards	Alpha 5
Mast Tilt Forwards	Alpha 6

▶ Custom Event Triggers

Figure: Forklift Input Settings

You can also create a new custom input settings by right-click on your project and using the Unity Creation menu: "Create ► WSM Game Studio ► Heavy Machinery ► Forklift Input Settings".

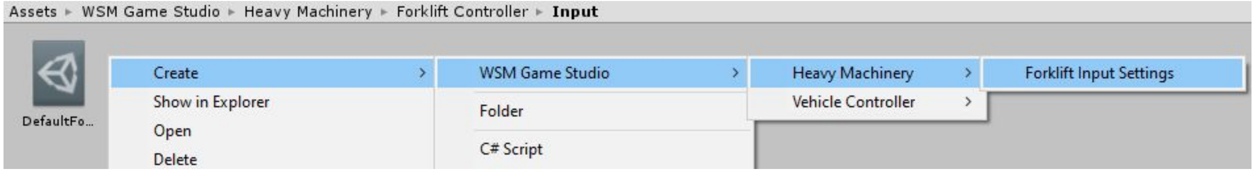
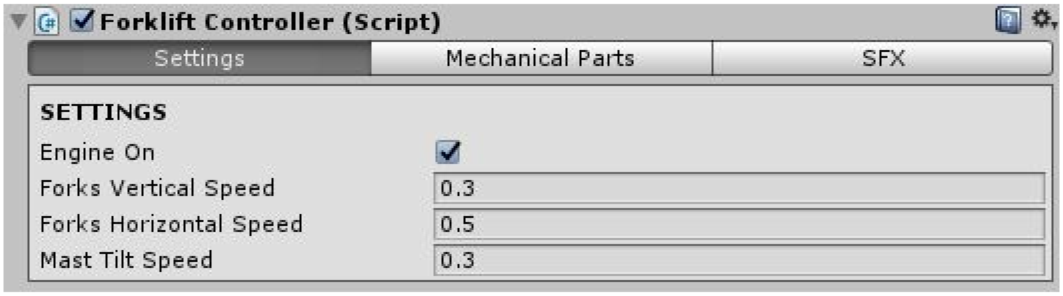


Figure: Creating a new Forklift Input Settings

You can create as many input settings as you wish, this can be very useful for testing different input settings for your game.

3.2. Forklift Controller

This component is responsible for controlling the forks mechanical movements.



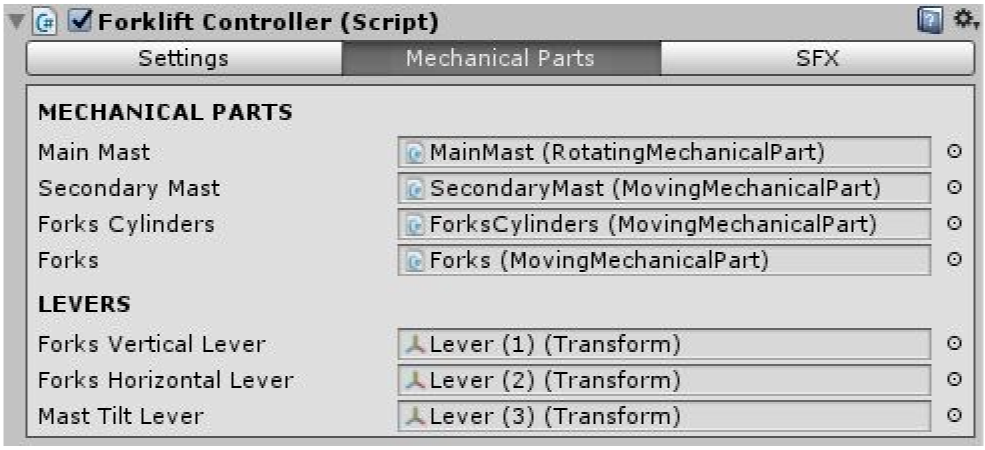
SETTINGS

Engine On	☑
Forks Vertical Speed	0.3
Forks Horizontal Speed	0.5
Mast Tilt Speed	0.3

Figure: Forklift Controller

At the Settings tab, you can set up the forks movement speed and enable or disable the mechanical parts engine.

Note: The forklift mechanical parts engine and vehicle engine are separated.

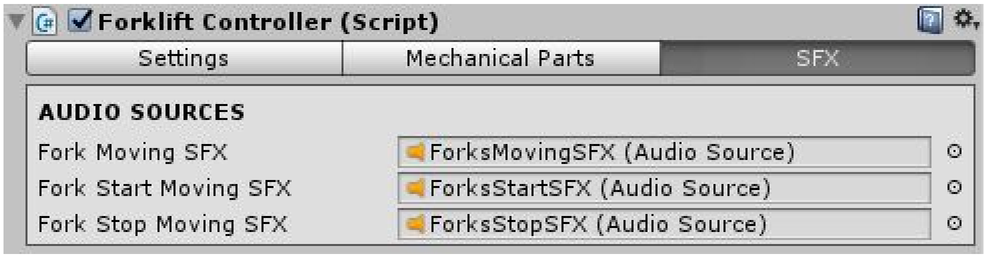


MECHANICAL PARTS	
Main Mast	MainMast (RotatingMechanicalPart)
Secondary Mast	SecondaryMast (MovingMechanicalPart)
Forks Cylinders	ForksCylinders (MovingMechanicalPart)
Forks	Forks (MovingMechanicalPart)
LEVERS	
Forks Vertical Lever	Lever (1) (Transform)
Forks Horizontal Lever	Lever (2) (Transform)
Mast Tilt Lever	Lever (3) (Transform)

Figure: Forklift Mechanical Parts

The Mechanical Parts tab holds the references to all forklift mechanical parts.

Note: Besides the forks mechanical parts, it also supports levers, to simulate the operator manually moving the levers at the cabin.



AUDIO SOURCES	
Fork Moving SFX	ForksMovingSFX (Audio Source)
Fork Start Moving SFX	ForksStartSFX (Audio Source)
Fork Stop Moving SFX	ForksStopSFX (Audio Source)

Figure: Forklift SFX

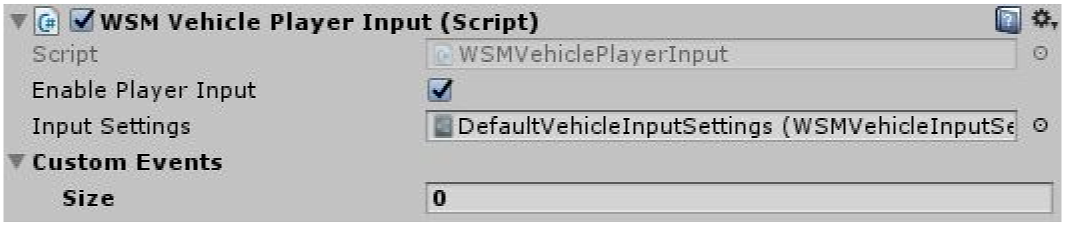
The SFX tab holds references to all the forks movements related Audio Sources.

4. Vehicle Modules

This section covers the vehicle related modules and settings.

4.1. Vehicle Input

This component is responsible for handling player input for all vehicle specific behaviours. It holds a reference to the Default Vehicle Input Settings file, which contains the keyboard key configurations for driving your forklift.

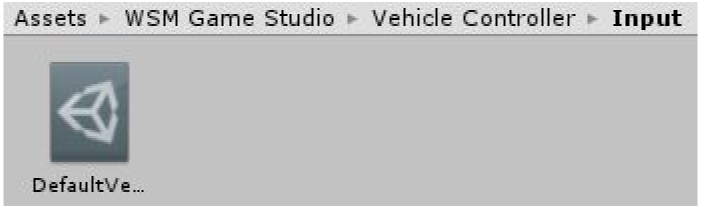


☑ WSM Vehicle Player Input (Script)

Script	WSMVehiclePlayerInput
Enable Player Input	☑
Input Settings	DefaultVehicleInputSettings (WSMVehicleInputSe
Custom Events	
Size	0

Figure: Vehicle Player Input

The Default Vehicle Input Settings file is located under the "WSM Game Studio ► Vehicle Controller ► Input" folder.

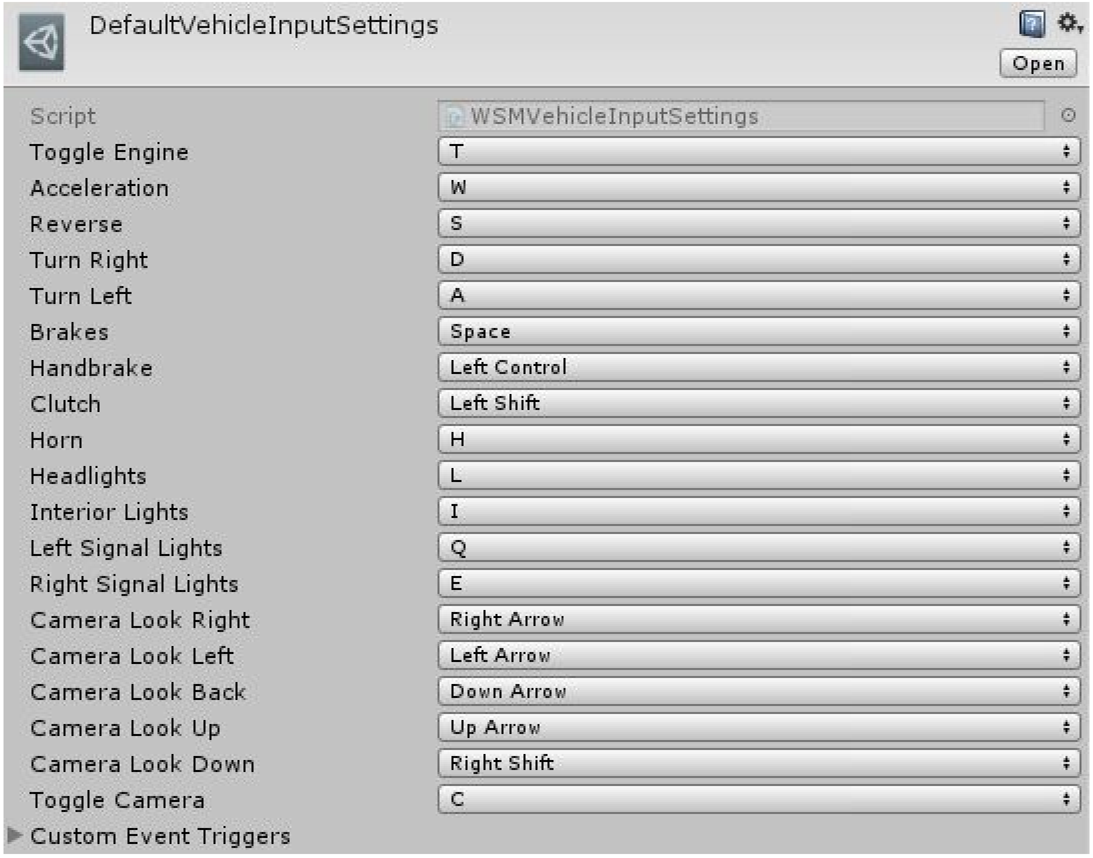


Assets ► WSM Game Studio ► Vehicle Controller ► **Input**

DefaultVe...

Figure: Vehicle Player Input Location

By selecting this file, you can see and customize the input keys used to control your vehicle.



DefaultVehicleInputSettings

Script	WSMVehicleInputSettings
Toggle Engine	T
Acceleration	W
Reverse	S
Turn Right	D
Turn Left	A
Brakes	Space
Handbrake	Left Control
Clutch	Left Shift
Horn	H
Headlights	L
Interior Lights	I
Left Signal Lights	Q
Right Signal Lights	E
Camera Look Right	Right Arrow
Camera Look Left	Left Arrow
Camera Look Back	Down Arrow
Camera Look Up	Up Arrow
Camera Look Down	Right Shift
Toggle Camera	C

▶ Custom Event Triggers

Figure: Vehicle Input Settings

You can also create a new custom input settings by right-click on your project and using the Unity Creation menu: “Create ► WSM Game Studio ► Vehicle Controller ► Vehicle Input Settings”.

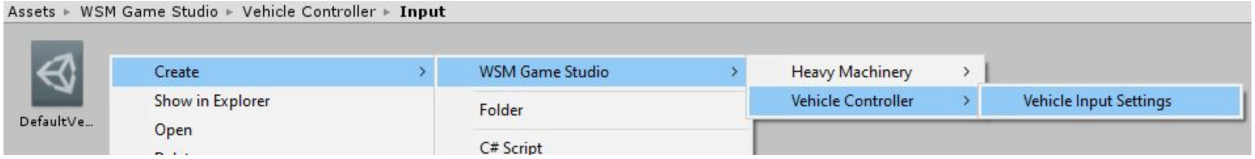
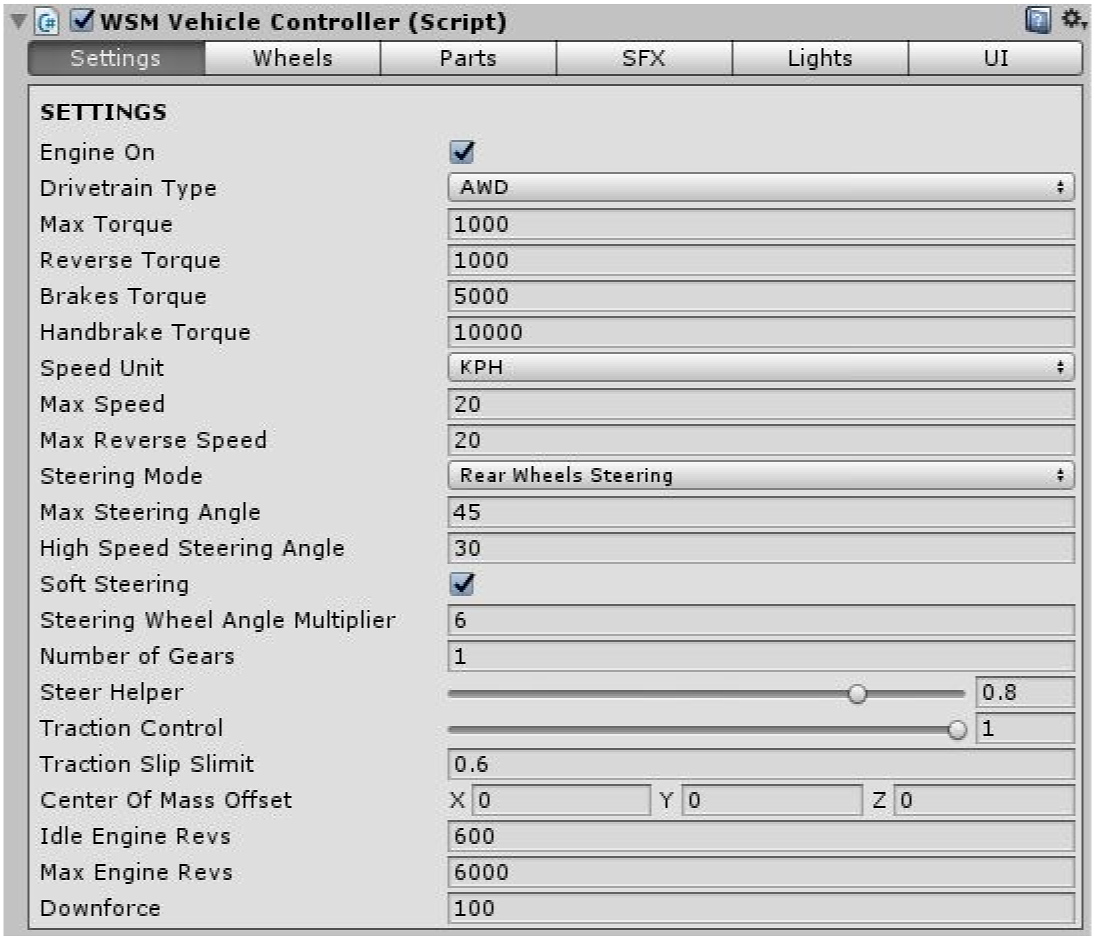


Figure: Creating a new Vehicle Input Settings

4.2. Vehicle Controller

This component is responsible for controlling vehicle related behaviours and vehicles physics.



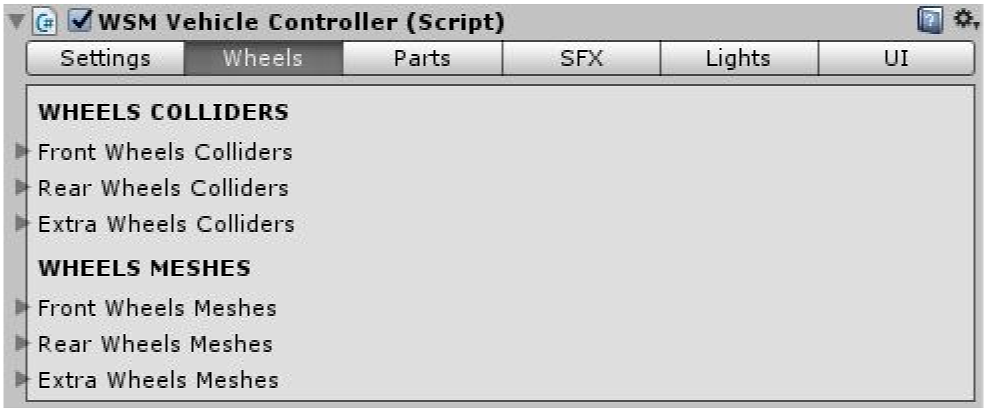
SETTINGS

Engine On	☑
Drivetrain Type	AWD
Max Torque	1000
Reverse Torque	1000
Brakes Torque	5000
Handbrake Torque	10000
Speed Unit	KPH
Max Speed	20
Max Reverse Speed	20
Steering Mode	Rear Wheels Steering
Max Steering Angle	45
High Speed Steering Angle	30
Soft Steering	☑
Steering Wheel Angle Multiplier	6
Number of Gears	1
Steer Helper	0.8
Traction Control	1
Traction Slip Slimit	0.6
Center Of Mass Offset	X 0 Y 0 Z 0
Idle Engine Revs	600
Max Engine Revs	6000
Downforce	100

Figure: Vehicle Settings

Most vehicle settings located here are very straightforward and use the same nomenclature as the corresponding real world counterpart. The most specific settings will be covered in this section.

Note: If you have any questions about any specific setting that was not covered in this section, feel free to email me about it (See Contact Info & Support section)



WHEELS COLLIDERS

Front Wheels Colliders

Rear Wheels Colliders

Extra Wheels Colliders

WHEELS MESHES

Front Wheels Meshes

Rear Wheels Meshes

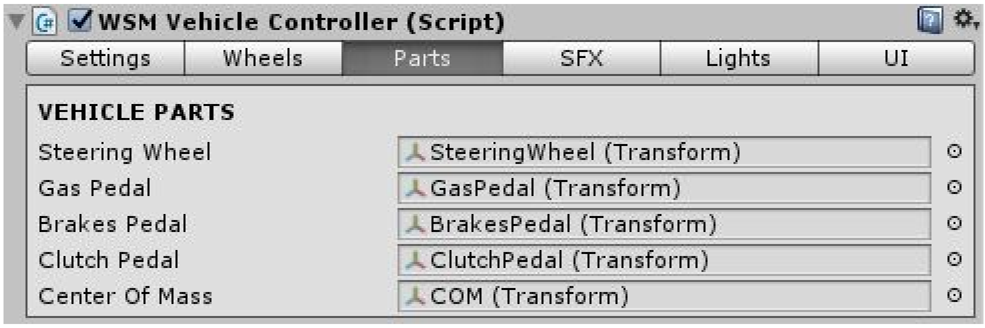
Extra Wheels Meshes

Figure: Vehicle Wheels

The Wheels tab holds references to all Wheel Colliders and Wheels Meshes. Front and rear wheel references are separated from each other. It was designed this way, so it would be possible to set up which wheels receive traction and which wheels are used for steering.

Note: Wheels traction is defined by the ***Drivetrain Type*** property and steering is defined by the ***Steering Mode*** property (Settings tab)

If your vehicle has more than four wheels, you can also use the Extra Wheels collections to assign the additional wheels references.



VEHICLE PARTS

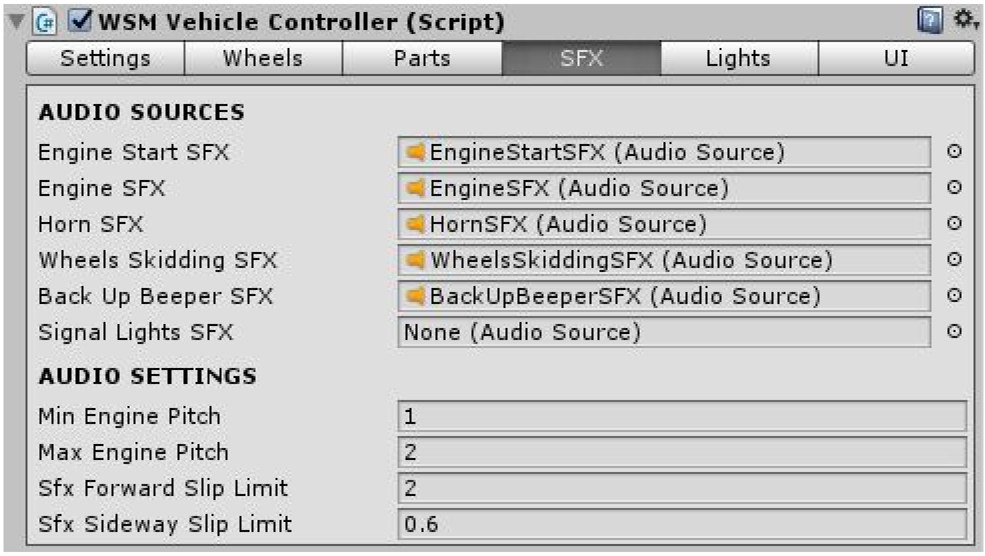
Steering Wheel	SteeringWheel (Transform)
Gas Pedal	GasPedal (Transform)
Brakes Pedal	BrakesPedal (Transform)
Clutch Pedal	ClutchPedal (Transform)
Center Of Mass	COM (Transform)

Figure: Vehicle Parts

The Parts tab holds references to all vehicles moving parts. If your vehicle has a open cabin or if your game supports cabin interior view, this is where you can set a reference to your steering wheel and pedals.

The rotation ratio between the wheels and the steering wheel is defined by the ***Steering Wheel Angle Multiplier*** property (Settings tab).

The Center of Mass reference is used to visualize the vehicle center of mass position. Which can be adjusted by the ***Center of Mass Offset*** property (Settings tab).



AUDIO SOURCES

Engine Start SFX	EngineStartSFX (Audio Source)
Engine SFX	EngineSFX (Audio Source)
Horn SFX	HornSFX (Audio Source)
Wheels Skidding SFX	WheelsSkiddingSFX (Audio Source)
Back Up Beeper SFX	BackUpBeeperSFX (Audio Source)
Signal Lights SFX	None (Audio Source)

AUDIO SETTINGS

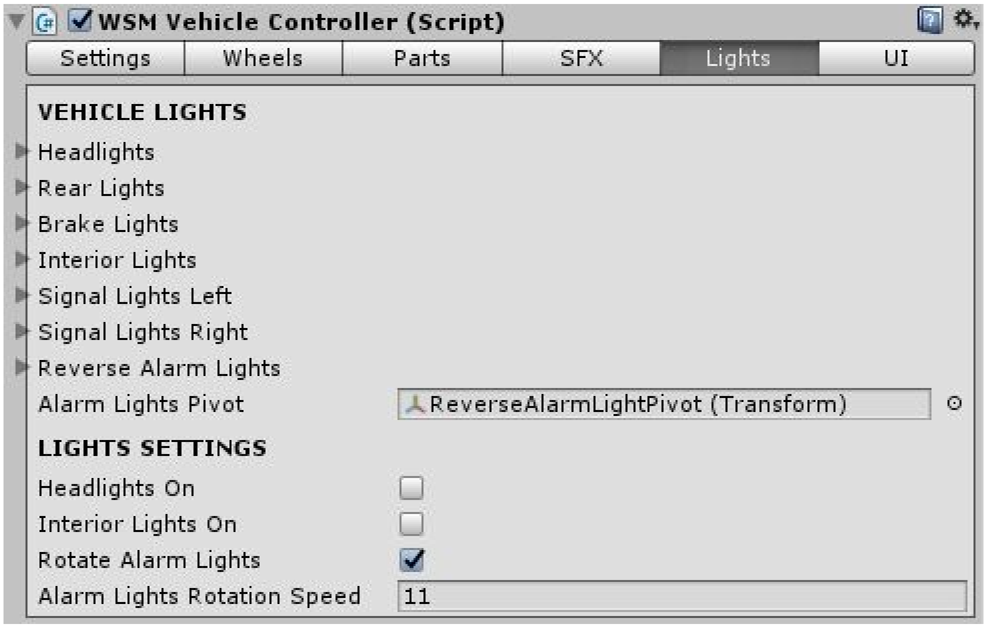
Min Engine Pitch	1
Max Engine Pitch	2
Sfx Forward Slip Limit	2
Sfx Sideway Slip Limit	0.6

Figure: Vehicle SFX

The SFX tab holds references to the vehicles Audio Sources. Audio settings are also located here.

The min and max engine pitch properties are used to simulate engine revving and gear switching sounds.

The slip limit properties are used to adjust when the wheel skidding SFX should be played.



VEHICLE LIGHTS

Headlights	
Rear Lights	
Brake Lights	
Interior Lights	
Signal Lights Left	
Signal Lights Right	
Reverse Alarm Lights	
Alarm Lights Pivot	ReverseAlarmLightPivot (Transform)

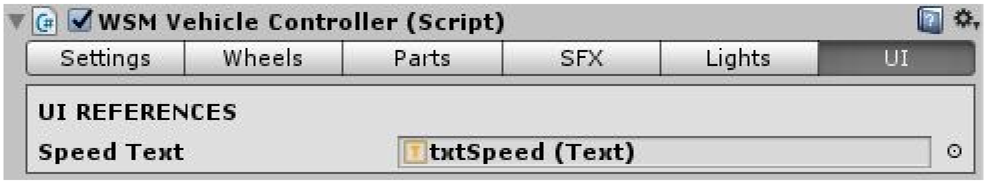
LIGHTS SETTINGS

Headlights On	☐
Interior Lights On	☐
Rotate Alarm Lights	☑
Alarm Lights Rotation Speed	11

Figure: Vehicle Lights

The Lights tab holds references to the vehicles lights. Lights settings are also located here.

Note: Alarm lights rotation refers to the ***Reverse Alarm Lights***. Some trucks and other heavy vehicles usually have rotating lights to warn pedestrians, besides the backup beeper sound.



UI REFERENCES

Speed Text: txtSpeed (Text)

Figure: Vehicle UI

The UI tab holds a reference to the vehicle related UI. For now, it contains only an option for outputting the current vehicle speed.

Note: You can choose KPH and MPH by changing the ***Speed Unit*** property (Settings tab).

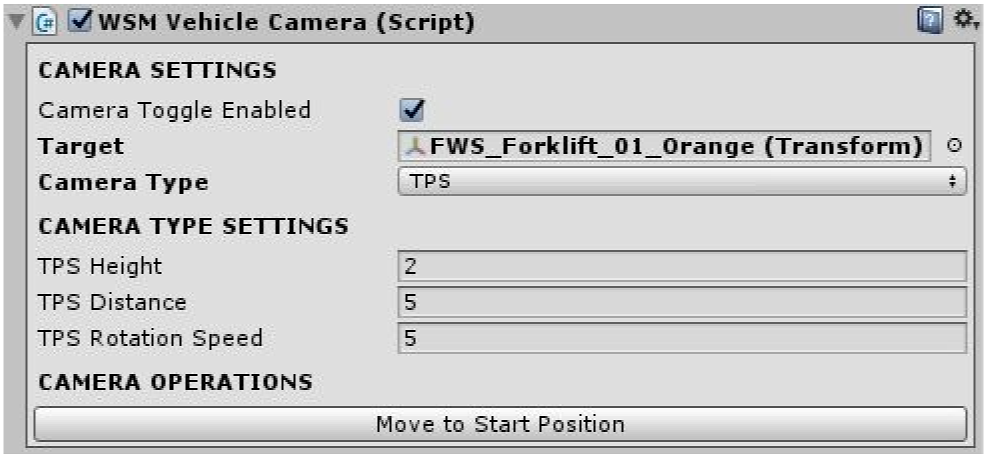
4.3. Vehicle Camera

A simple vehicle camera is also included in this package. The following camera types are currently supported:

- TPS (Third Person)
- FPS (First Person)
- Top Down

Also, runtime camera toggle can be enabled or disabled here. (See Vehicle Input section for more details on camera input keys)

Note: The Vehicle Camera component only shows the settings of the currently selected camera type.



CAMERA SETTINGS

Camera Toggle Enabled ☑

Target: FWS_Forklift_01_Orange (Transform)

Camera Type: TPS

CAMERA TYPE SETTINGS

TPS Height: 2

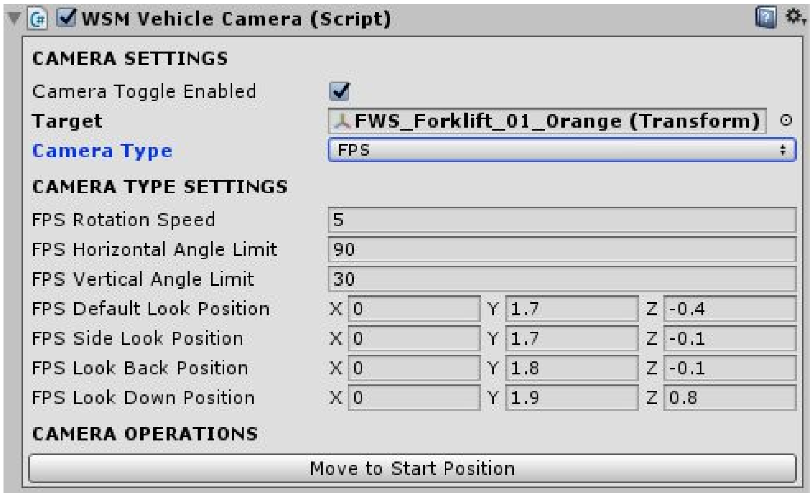
TPS Distance: 5

TPS Rotation Speed: 5

CAMERA OPERATIONS

Figure: TPS Camera Settings

You can adjust the height, distance and speed of the TPS camera. While the TPS camera is selected, you can also look left, right or backwards.


☑ WSM Vehicle Camera (Script)

CAMERA SETTINGS

Camera Toggle Enabled ☑

Target: FWS_Forklift_01_Orange (Transform)

Camera Type: FPS

CAMERA TYPE SETTINGS

FPS Rotation Speed: 5

FPS Horizontal Angle Limit: 90

FPS Vertical Angle Limit: 30

FPS Default Look Position: X 0 Y 1.7 Z -0.4

FPS Side Look Position: X 0 Y 1.7 Z -0.1

FPS Look Back Position: X 0 Y 1.8 Z -0.1

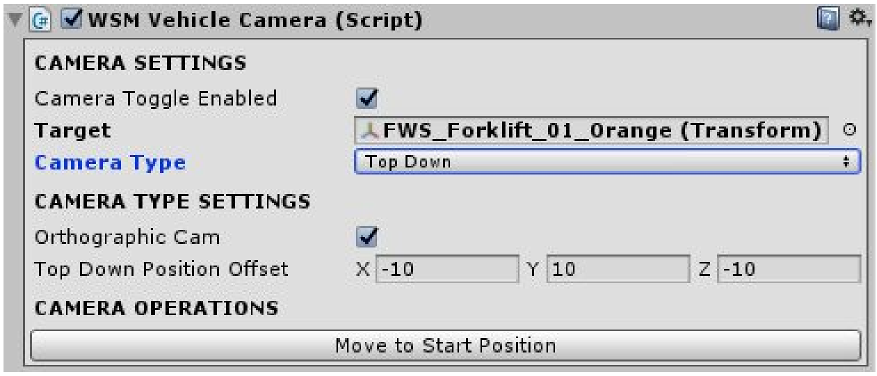
FPS Look Down Position: X 0 Y 1.9 Z 0.8

CAMERA OPERATIONS

Figure: FPS Camera Settings

While the FPS camera is selected, you can look left, right, backwards, up and down. You can also change the camera position for each look direction. This allows you to simulate some interesting behaviours, like putting the head out of the window when looking backwards.

Note: The position shift technique was used to focus on the forklift forks while looking down on the FPS camera.


☑ WSM Vehicle Camera (Script)

CAMERA SETTINGS

Camera Toggle Enabled ☑

Target: FWS_Forklift_01_Orange (Transform)

Camera Type: Top Down

CAMERA TYPE SETTINGS

Orthographic Cam ☑

Top Down Position Offset: X -10 Y 10 Z -10

CAMERA OPERATIONS

Figure: Top Down Camera Settings

While the Top Down camera is selected, you can adjust the camera position offset and choose between orthographic or perspective camera projection.

Tip: Use the ***Move to Start Position*** operation to preview the camera position after adjusting the settings.

5. Additional Info

5.1. Customization

This package includes a simple forklift model for sample purposes. More forklift models may be included in the future and/or sold separately as extensions (Here).

If you have your own models, it is possible to create custom forklifts by using the sample prefabs as a starting point and replacing the models using the Unity Editor default prefab editing workflow.

Just make sure your custom forklift main body, forks, primary mast, secondary mast and wheels models are separated from each other as shown in the sample image below.

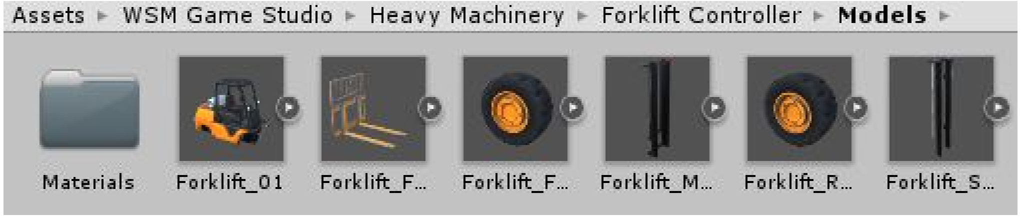


Figure: Default Forklift Models

5.2. Forklift Carrying Weight Capacity

As in real life, forklifts included on this asset have limited carrying weight capacity. Trying to raise cargo above this limit will shift the forklift center of mass, making it harder to safely transport the cargo or, in case of really heavy cargo, to keep the forklift wheels on the ground.

Rule of thumb is, a forklift cannot carry cargo heavier than itself. For example, if you intend to lift a forklift, you need a bigger and heavier forklift to do the job.

For this asset, the recommended rigidbody mass value for cargo must not exceed half the forklift mass.

Since sample prefabs are set to 1000 rigidbody mass, the recommended rigidbody mass value for cargo is between 22 to 500.

5.3. Rear Steering Vehicle Guidelines

The Vehicle Controller included in this package does support rear wheel steering vehicles.

Rear wheel steering vehicles, like forklifts for example, tend to easily oversteer on higher speeds which can result in undesired vehicle fishtailing.

To avoid fishtailing, increase the Steer Helper property value until your vehicle reaches the desired trade-off between realism and control.

Since vehicles are nonlinear systems, the optimal Steer Helper value will change accordingly to your vehicle aerodynamics, center of mass and settings. It's recommended to test each vehicle and adjust the settings until the desired behaviour is achieved.

6. License

By purchasing this asset you are allowed to use it for unlimited games and/or 3D projects (like animations, simulation softwares, etc). Both personal and commercial use.

You are **NOT** allowed to resell or distribute the assets components individually or as part of another asset package (including, models, scripts, etc).

7. Contact Info & Support

If you have any questions, need support or have some business inquiries, feel free to get in touch.

The best way to reach us is by email on **wsmgamestudio@gmail.com**.

Asset Store
Discord
Sketchfab
Instagram
Facebook
Twitter
Youtube Channel