Part three of a series of tutorials for the Blender game engine by Smoking_mirror.

Document Description:

This is part three of a set of tutorials, it covers setting up a helicopter type character's weapons for use in the BGE*.
*** Blender Game engine**

Document Aim:

The aim of the tutorials is to introduce new users of the BGE to some of the concepts needed to produce a moderately complex game. The aim of this third tutorial is to show users how to set up their player character's weapons. A similar set up can be used for the enemy weapons

Document Goals:

- Describe how to make a weapon's effects object.
- Show how to integrate the shooting script.
- Show how to set up the ground and enemies so they can be damaged and register hits.
- Show how to make the first steps of a basic HUD (heads up display, or UI, user interface)

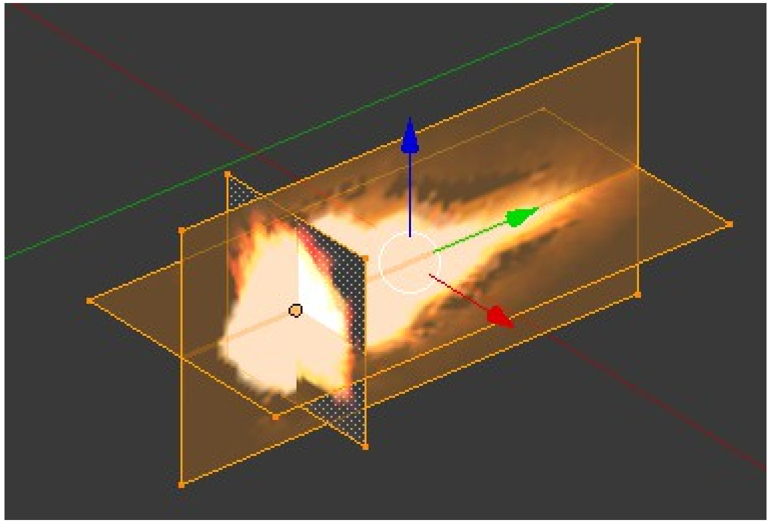
Introduction:

We've already made a game model and set up its movement profile, now we are getting to the fun part. In this tutorial I'm going to show how to add weapons to your character. Again, I'm going to be supplying the scripts, all you have to do is set up the game objects as shown and plug in the scripts to your blend file by cutting and pasting.

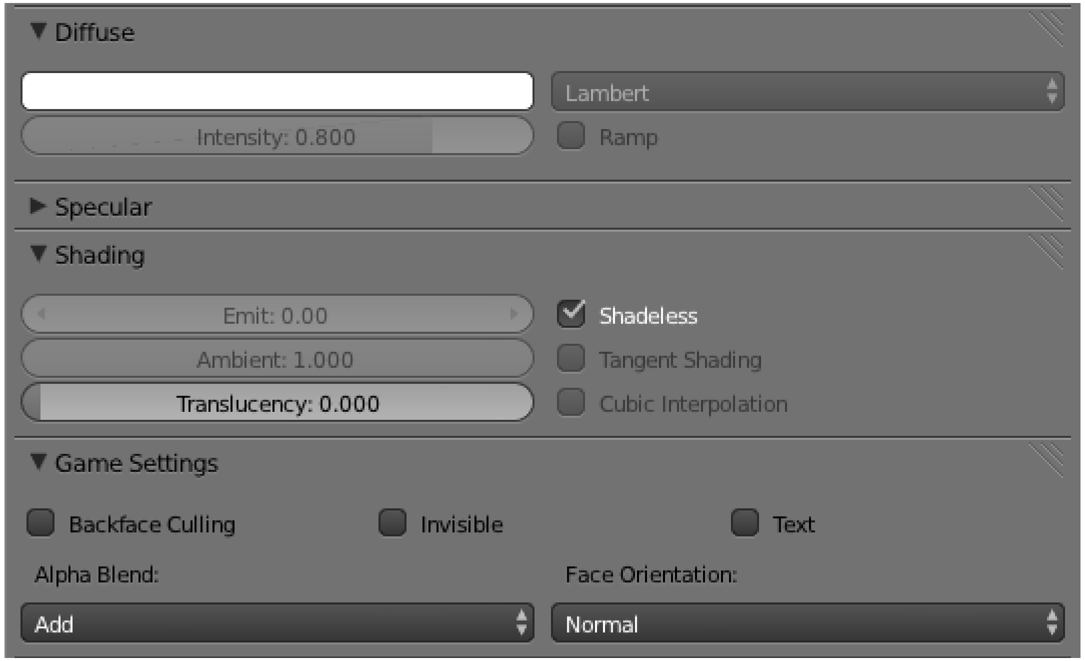
Document Index:

Part One – Creating the weapon effects:

We are going to give our character 4 different kinds of weapons. The original Desert Strike only had 3, but we want to add more tactical challenge to the game by including anti-missile flares. The first weapon is the Machine gun, or 30mm cannon as it will be called in the HUD.



When creating the weapons effects we have two options. One is to use a billboard type object, a single plane which always faces the camera and looks the same from every angle. The other is to use 3 planes set up like the gun flash above. This has the advantage of being able to look different from different angles. You should choose which to use in each case. A missile tail should use 3 planes, while a small explosion might use the single billboard. There are also different types of transparency you can use. “Alpha clip” and “alpha blend” require an alpha channel on your image. “Add” just requires that the background, and any part you want to be invisible be black. For these ones we are going to use “add” type transparency. This looks best with the 3 plane type object.


▼ Diffuse

Lambert

Intensity: 0.800

□ Ramp

▶ Specular

▼ Shading

Emit: 0.00

Ambient: 1.000

Translucency: 0.000

☑ Shadeless

□ Tangent Shading

□ Cubic Interpolation

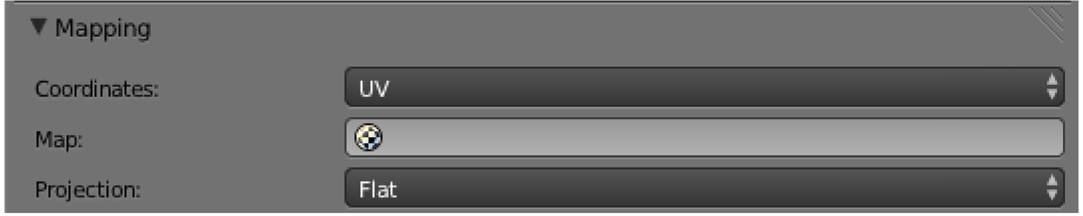
▼ Game Settings

□ Backface Culling □ Invisible □ Text

Alpha Blend: Add

Face Orientation: Normal

So add a material to your weapon effect. Be sure to check the shadeless box and set the game settings. When you add a texture don't forget to set the UV mapping:


▼ Mapping

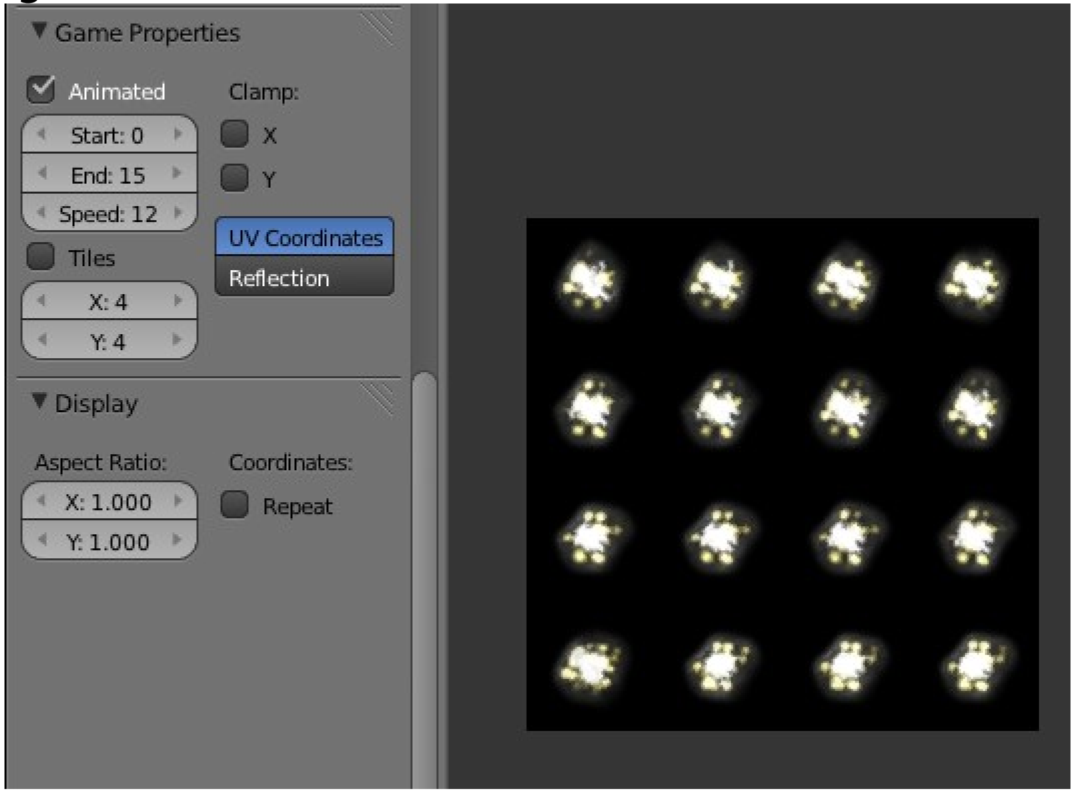
Coordinates: UV

Map:

Projection: Flat

How you set up your materials and textures will depend on whether you are using the GLSL mode or not.

You should go ahead and make all the weapons effects. You can also use animated textures as I've done with the “big_bang” effect:



▼ Game Properties

☑ Animated

Start: 0

End: 15

Speed: 12

□ Tiles

X: 4

Y: 4

Clamp:

□ X

□ Y

UV Coordinates

Reflection

▼ Display

Aspect Ratio:

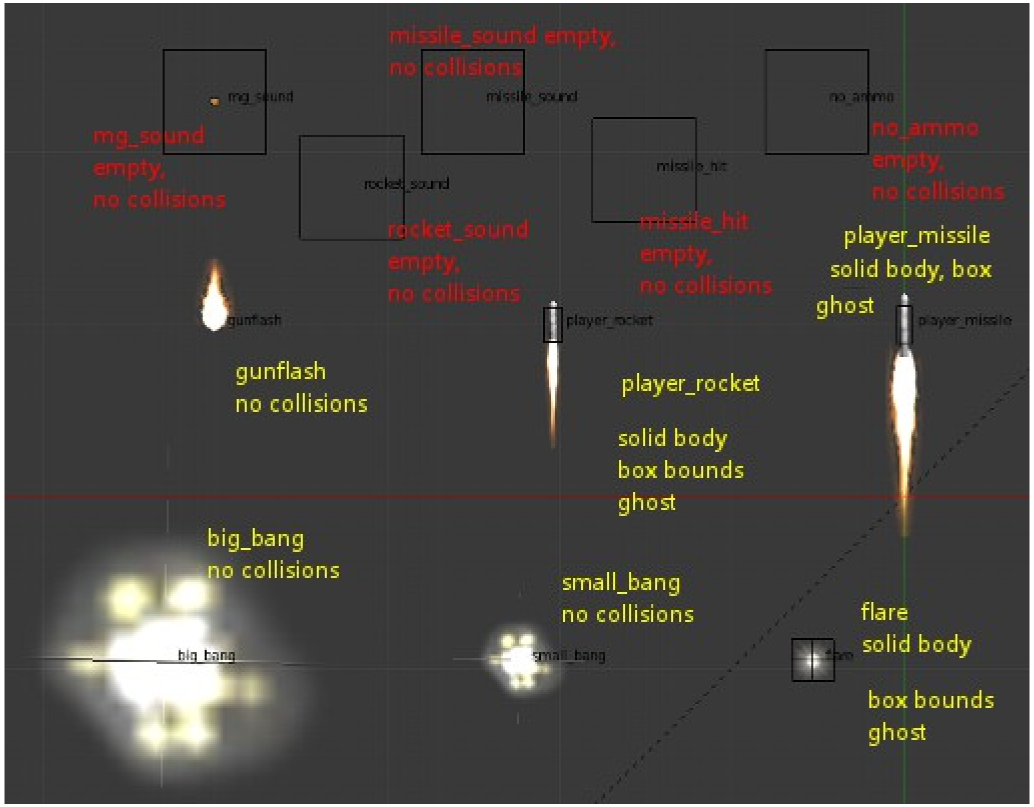
X: 1.000

Y: 1.000

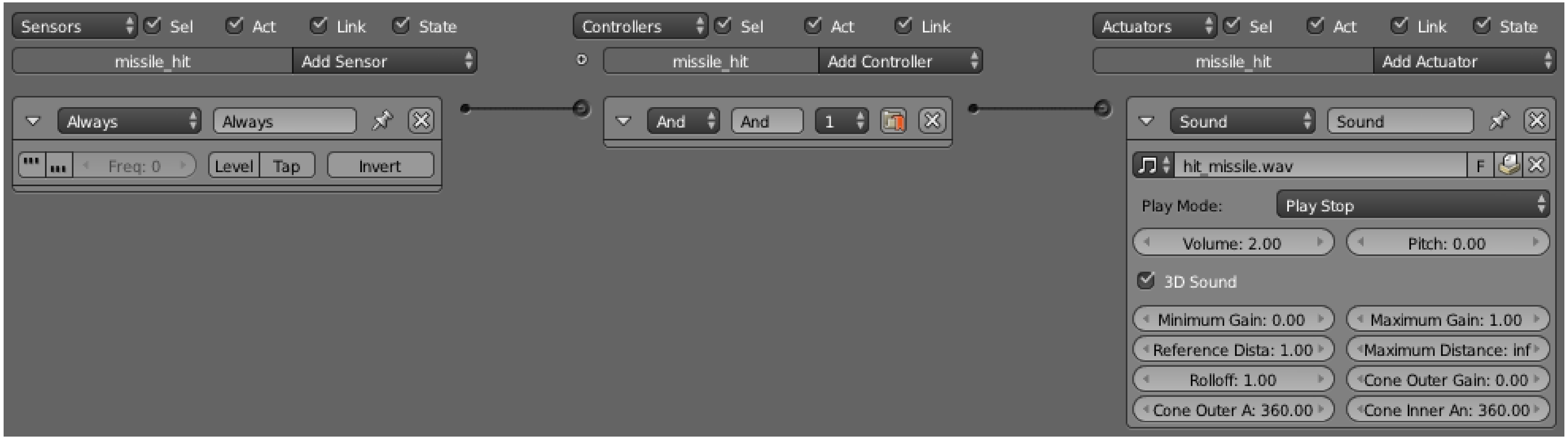
Coordinates:

□ Repeat

In the image window press “n” to open the option panel and set the game properties. When making an animated texture you should have a number of squares which can fit equally in to the size of the image. So if you have a 256x256 image, 4x4 animations work well, but 6x6 or 7x7 will give a strange effect.



We need the "gunflash" object as well as all the other pictured above. If the object is not going to have physics (set to "no collision") you just need the mesh. If it is going to have collisions it's better to parent the graphics mesh to a collision mesh. This can be a simple cube or rectangle, set to "solid body" and with the invisible and ghost boxes checked. This allows us to better control the collision. See the missile above, we only want the missile, not its tail, to register collisions. The boxes at the top are empties set up to carry a sound.

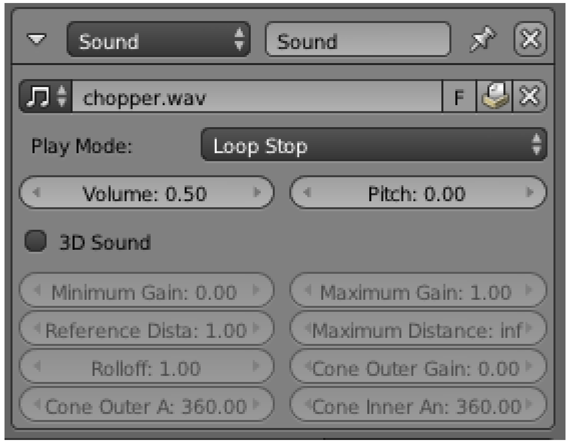

Sensors ☑ Sel ☑ Act ☑ Link ☑ State
missile_hit Add Sensor
Always Always
Freq: 0 Level Tap Invert

Controllers ☑ Sel ☑ Act ☑ Link
missile_hit Add Controller
And And 1

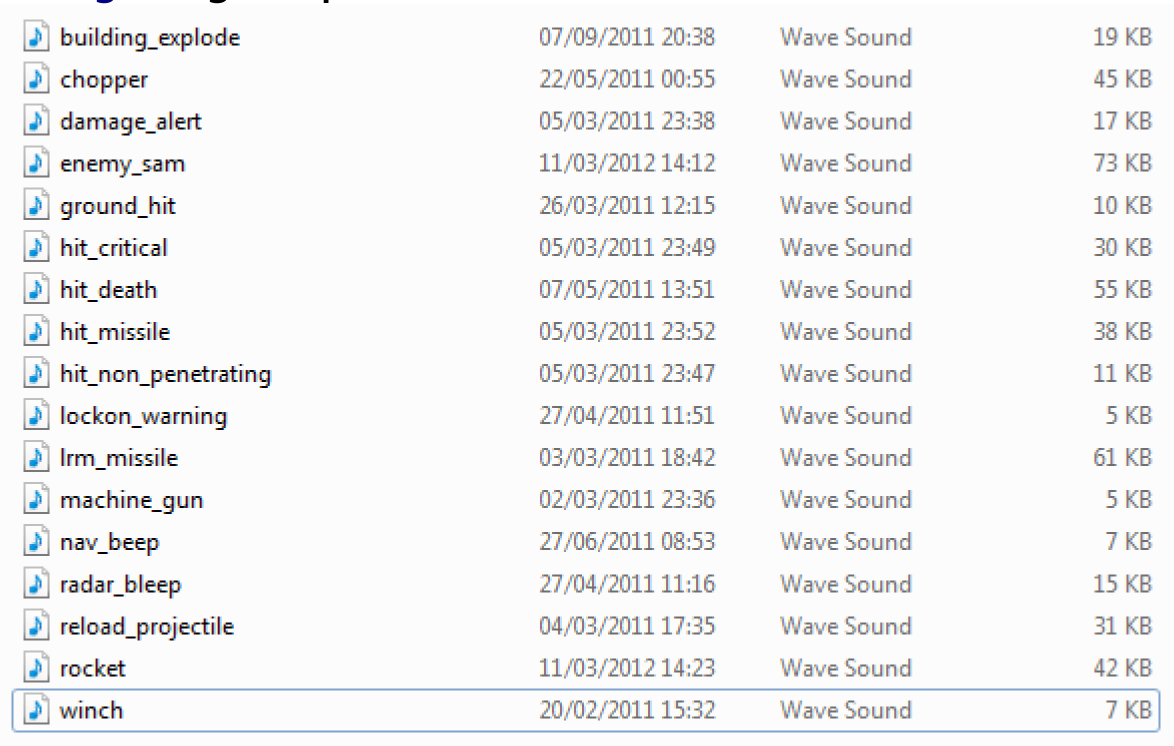
Actuators ☑ Sel ☑ Act ☑ Link ☑ State
missile_hit Add Actuator
Sound Sound
hit_missile.wav F
Play Mode: Play Stop
Volume: 2.00 Pitch: 0.00
☑ 3D Sound
Minimum Gain: 0.00 Maximum Gain: 1.00
Reference Dista: 1.00 Maximum Distance: inf
Rolloff: 1.00 Cone Outer Gain: 0.00
Cone Outer A: 360.00 Cone Inner An: 360.00

You can set up the sound logic like this. Open the .wav file you've prepared, check the 3d sound box and set the volume to whatever sounds right in game. You need the following sound empties:

You can also add the helicopter blades sound to your player object. Just give it an always sensor and an AND controller.


Sound Sound
chopper.wav F
Play Mode: Loop Stop
Volume: 0.50 Pitch: 0.00
● 3D Sound
Minimum Gain: 0.00 Maximum Gain: 1.00
Reference Dista: 1.00 Maximum Distance: inf
Rolloff: 1.00 Cone Outer Gain: 0.00
Cone Outer A: 360.00 Cone Inner An: 360.00

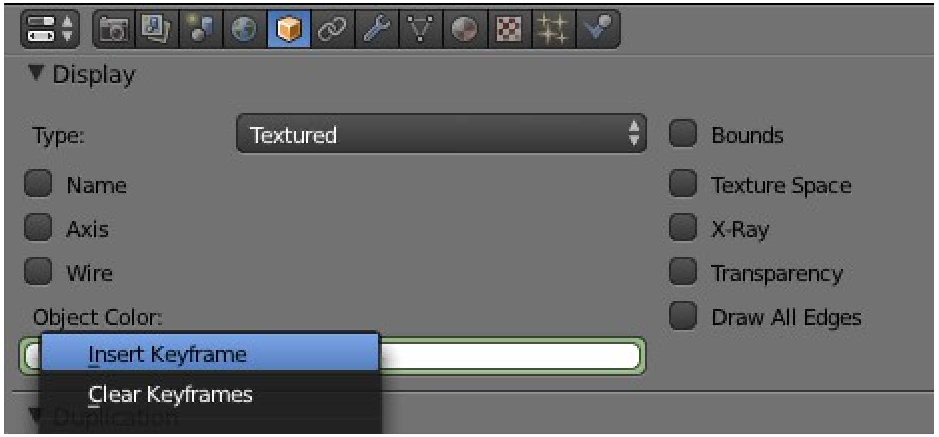
You will need quite a few sounds for your project.
http://www.freesound.org is a good place to look for sounds.



building_explode	07/09/2011 20:38	Wave Sound	19 KB
chopper	22/05/2011 00:55	Wave Sound	45 KB
damage_alert	05/03/2011 23:38	Wave Sound	17 KB
enemy_sam	11/03/2012 14:12	Wave Sound	73 KB
ground_hit	26/03/2011 12:15	Wave Sound	10 KB
hit_critical	05/03/2011 23:49	Wave Sound	30 KB
hit_death	07/05/2011 13:51	Wave Sound	55 KB
hit_missile	05/03/2011 23:52	Wave Sound	38 KB
hit_non_penetrating	05/03/2011 23:47	Wave Sound	11 KB
lockon_warning	27/04/2011 11:51	Wave Sound	5 KB
lrm_missile	03/03/2011 18:42	Wave Sound	61 KB
machine_gun	02/03/2011 23:36	Wave Sound	5 KB
nav_beep	27/06/2011 08:53	Wave Sound	7 KB
radar_bleep	27/04/2011 11:16	Wave Sound	15 KB
reload_projectile	04/03/2011 17:35	Wave Sound	31 KB
rocket	11/03/2012 14:23	Wave Sound	42 KB
winch	20/02/2011 15:32	Wave Sound	7 KB

This list should be enough though we may need to add more. I will include these sounds with the Blend files, they will be packed along with the textures.

Going back to the weapon effects, we need to set up the actions for the explosions. Add key frames to set the scale of the explosion (see tutorial 2 for this info) and then go to the object display settings. You can set the object color here, which will be used in the action to change the color of the explosion, making it fade out over time.



▼ Display

Type: Textured

□ Bounds

□ Name

□ Texture Space

□ Axis

□ X-Ray

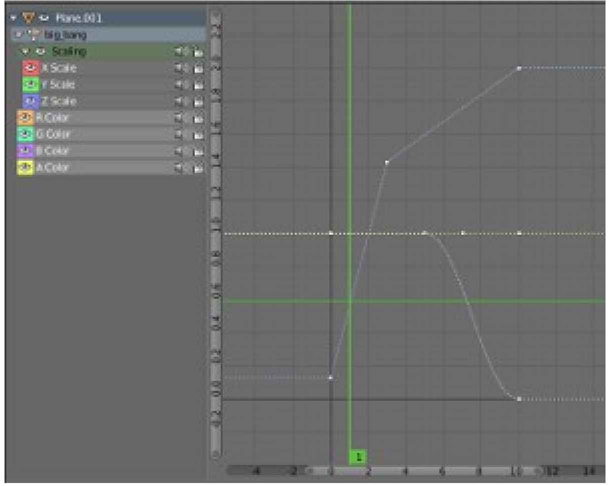
□ Wire

□ Transparency

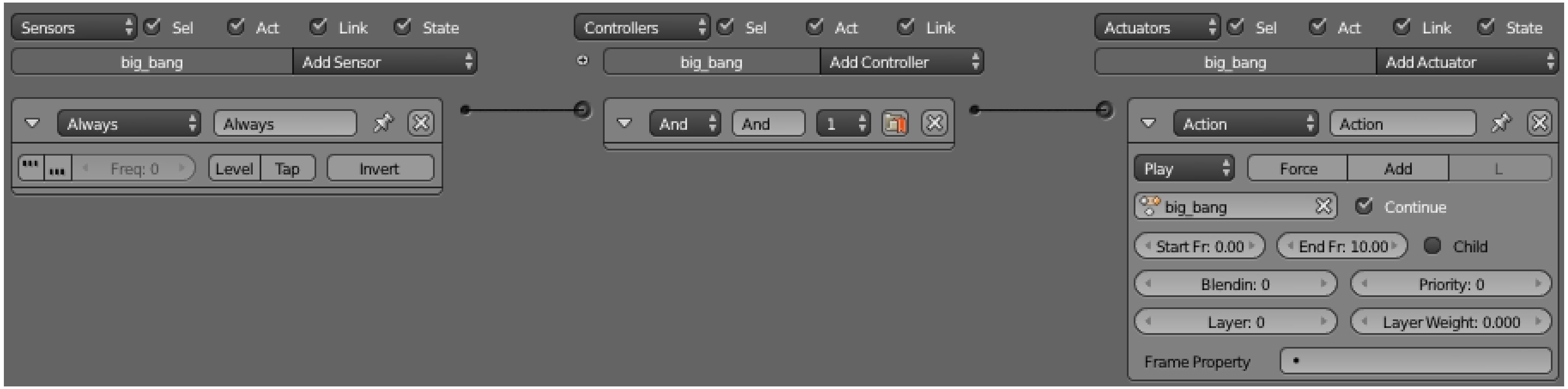
Object Color:

□ Draw All Edges

Right click on the object color box to add a keyframe.



You need to make an action like this. It gets bigger and fades out over time.



Sensors ☑ Sel ☑ Act ☑ Link ☑ State

big_bang | Add Sensor

Always | Always

Freq: 0 | Level | Tap | Invert

Controllers ☑ Sel ☑ Act ☑ Link

big_bang | Add Controller

And | And | 1

Actuators ☑ Sel ☑ Act ☑ Link ☑ State

big_bang | Add Actuator

Action | Action

Play | Force | Add | L

big_bang | ☑ Continue

Start Fr: 0.00 | End Fr: 10.00 | ● Child

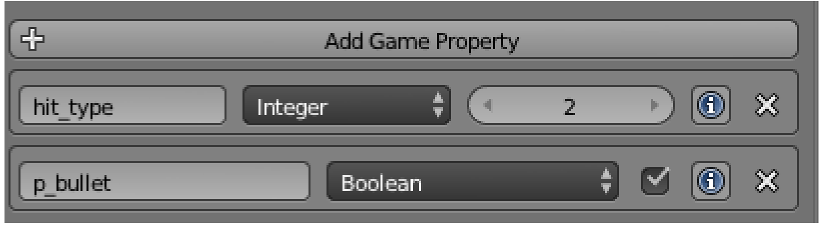
Blendin: 0 | Priority: 0

Layer: 0 | Layer Weight: 0.000

Frame Property

Set up the logic like this.

For the rockets and missiles you will have to add two properties:



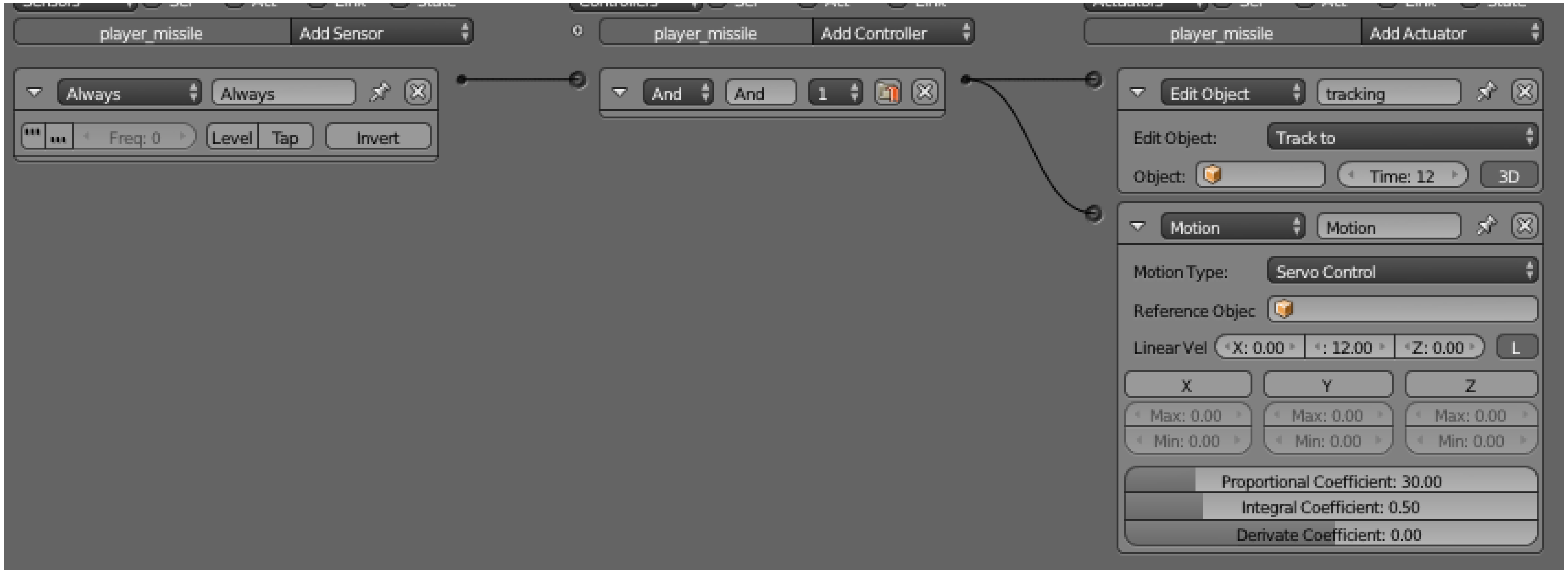
Add Game Property

hit_type | Integer | 2

p_bullet | Boolean | ☑

p_bullet means that this object will be detected by enemy checking to see if they have been hit. Hit type sets the damage level and makes the object be affected by flares (if hit type 2).

Rockets should be hit_type 1 while missiles will be hit_type 2.



player_missile Add Sensor

Always Always

Freq: 0 Level Tap Invert

player_missile Add Controller

And And 1

player_missile Add Actuator

Edit Object tracking

Edit Object: Track to

Object: Time: 12 3D

Motion Motion

Motion Type: Servo Control

Reference Objec

Linear Vel X: 0.00 : 12.00 Z: 0.00 L

X Y Z

Max: 0.00 Max: 0.00 Max: 0.00

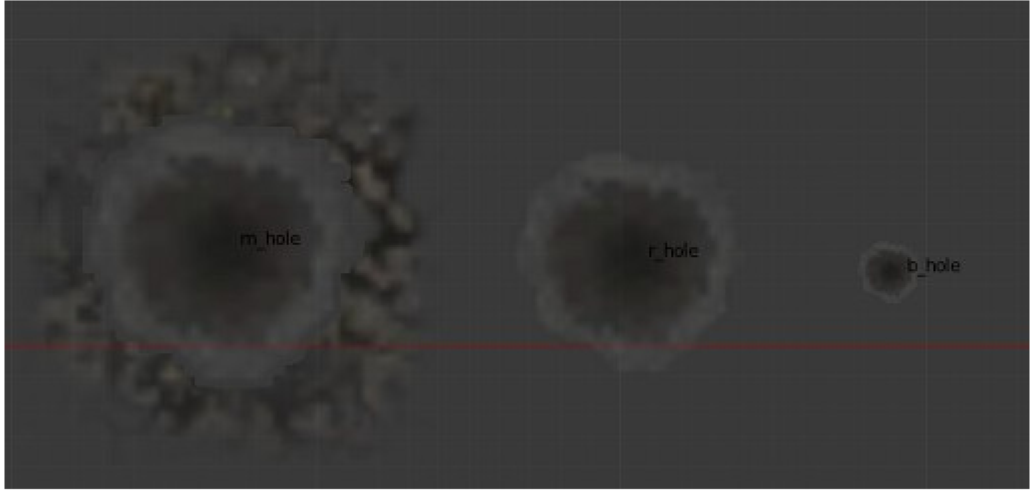
Min: 0.00 Min: 0.00 Min: 0.00

Proportional Coefficient: 30.00

Integral Coefficient: 0.50

Derivate Coefficient: 0.00

Your missiles will also need some logic to make them track to your target. Leave the tracking object box empty, it will be set by python.



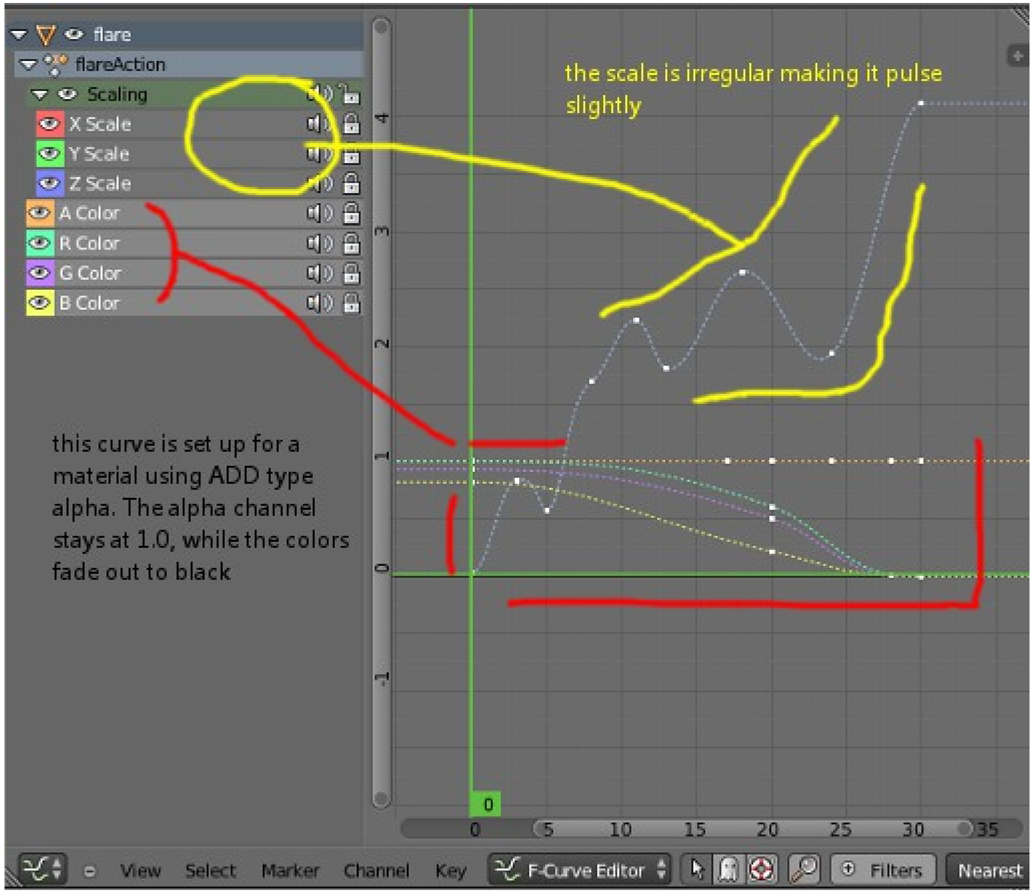
You also need some bullet hole type objects. They should lay flat on the ground.

You need “m_hole”, “r_hole” and “b_hole”. They should be set to no collisions and they don't need any special logic. In other games we might give them an animation to make their appearance more natural, but here they are going to be too small to notice.

So the objects you need are as follows:

Name	Type	Physics	Properties
“gunflash”	Weapon effect	No collisions	None
“player_rocket”	Weapon effect	Solid body, ghost	“hit_type” int=1, “p_bullet” bool=True
“player_missile”	Weapon effect	Solid body, ghost	“hit_type” int=2, “p_bullet” bool=True
“flare”	Weapon effect	Solid body, ghost	“flare” bool=True
“m_hole”	Weapon effect	No collisions	None
“r_hole”	Weapon effect	No collisions	None
“b_hole”	Weapon effect	No collisions	None
“small_bang”	Weapon effect	No collisions	None
“big_bang”	Weapon effect	No collisions	None
“mg_sound”	Weapon sound	No collisions	None
“rocket_sound”	Weapon sound	No collisions	None
“missile_sound”	Weapon sound	No collisions	None
“missile_hit”	Weapon sound	No collisions	None
“no_ammo”	Weapon sound	No collisions	None

You can set up the flare object to have animations, just like the explosions, but you need a slightly different set of animation curves:

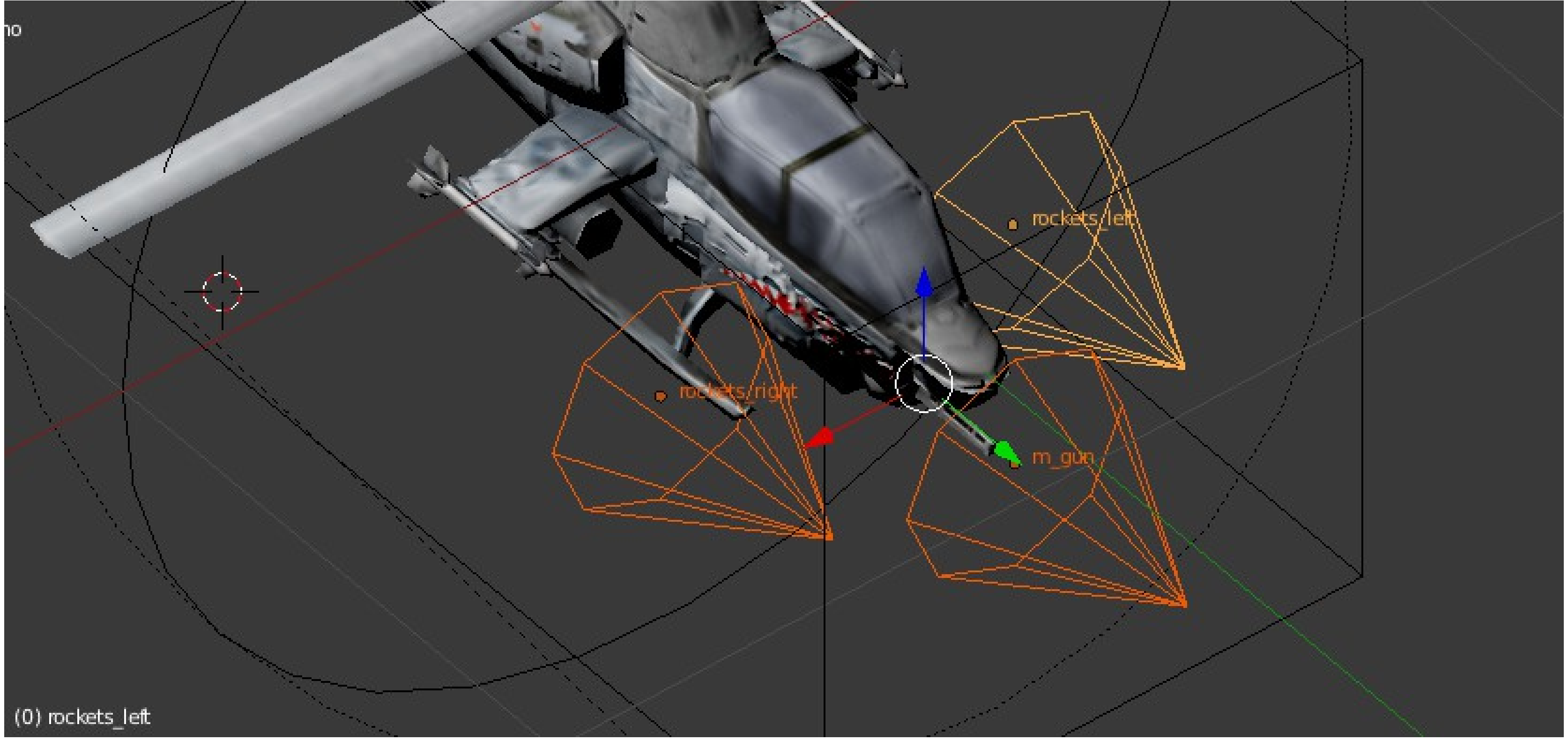


the scale is irregular making it pulse slightly

this curve is set up for a material using ADD type alpha. The alpha channel stays at 1.0, while the colors fade out to black

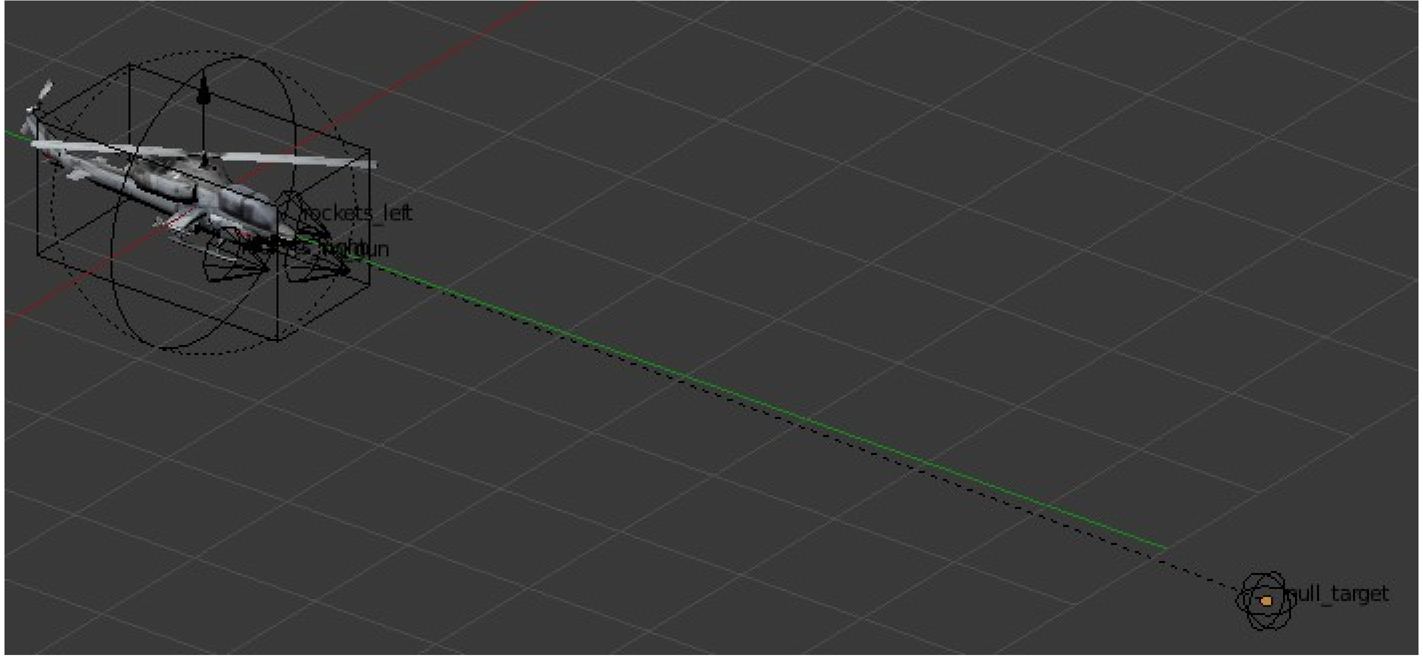
Part two – Setting up the player logic and objects:

We want to add some empties to our player objects, we need three empties called...

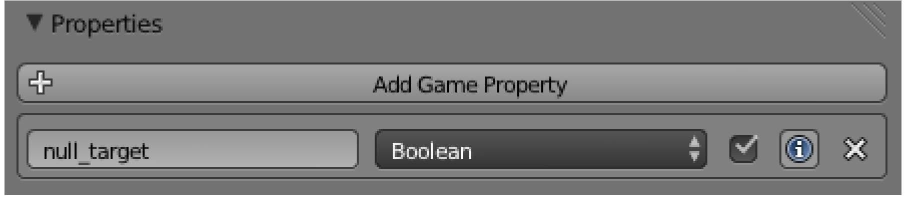


...rockets_right, rockets_left and m_gun. The empties are where the weapons are going to be fired from. Parent them to the player mesh, or to the roll action object (the circle).

We also need an empty set way out in front of the chopper called “null_target”.

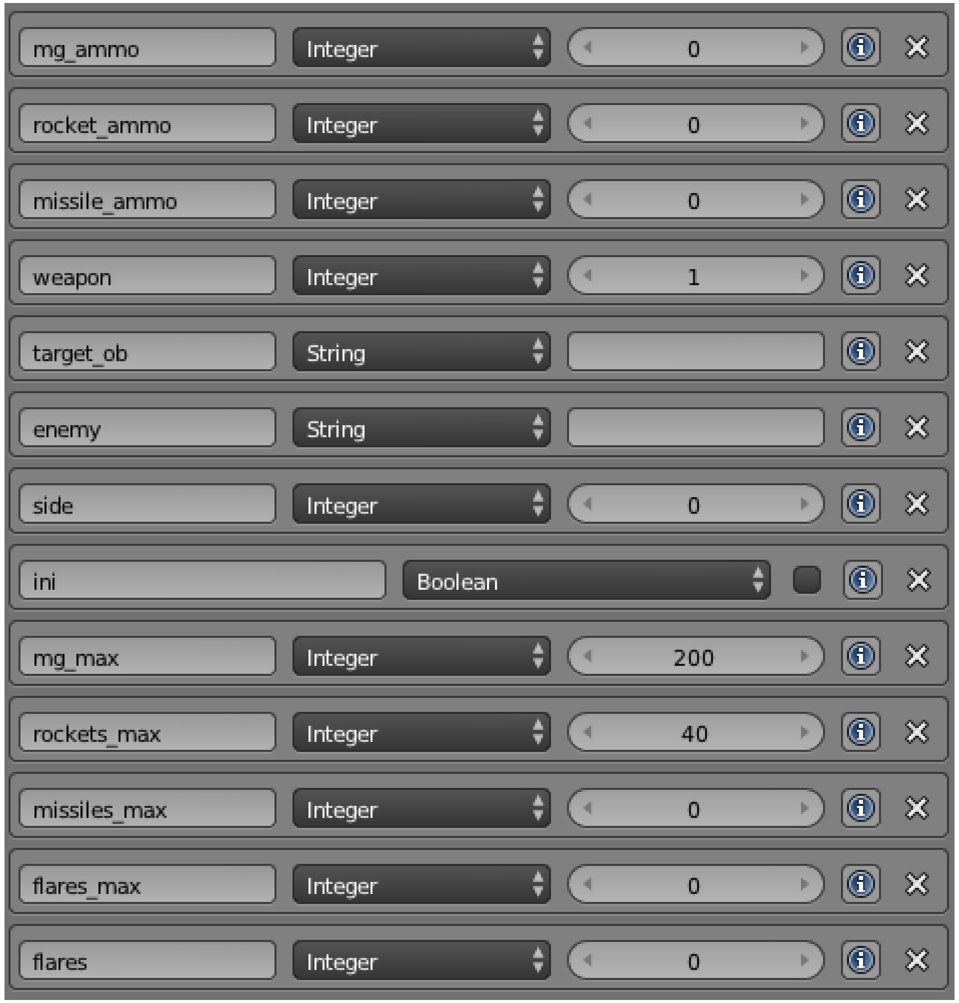


This also needs a property called “null_target”.



null_target Boolean ☑

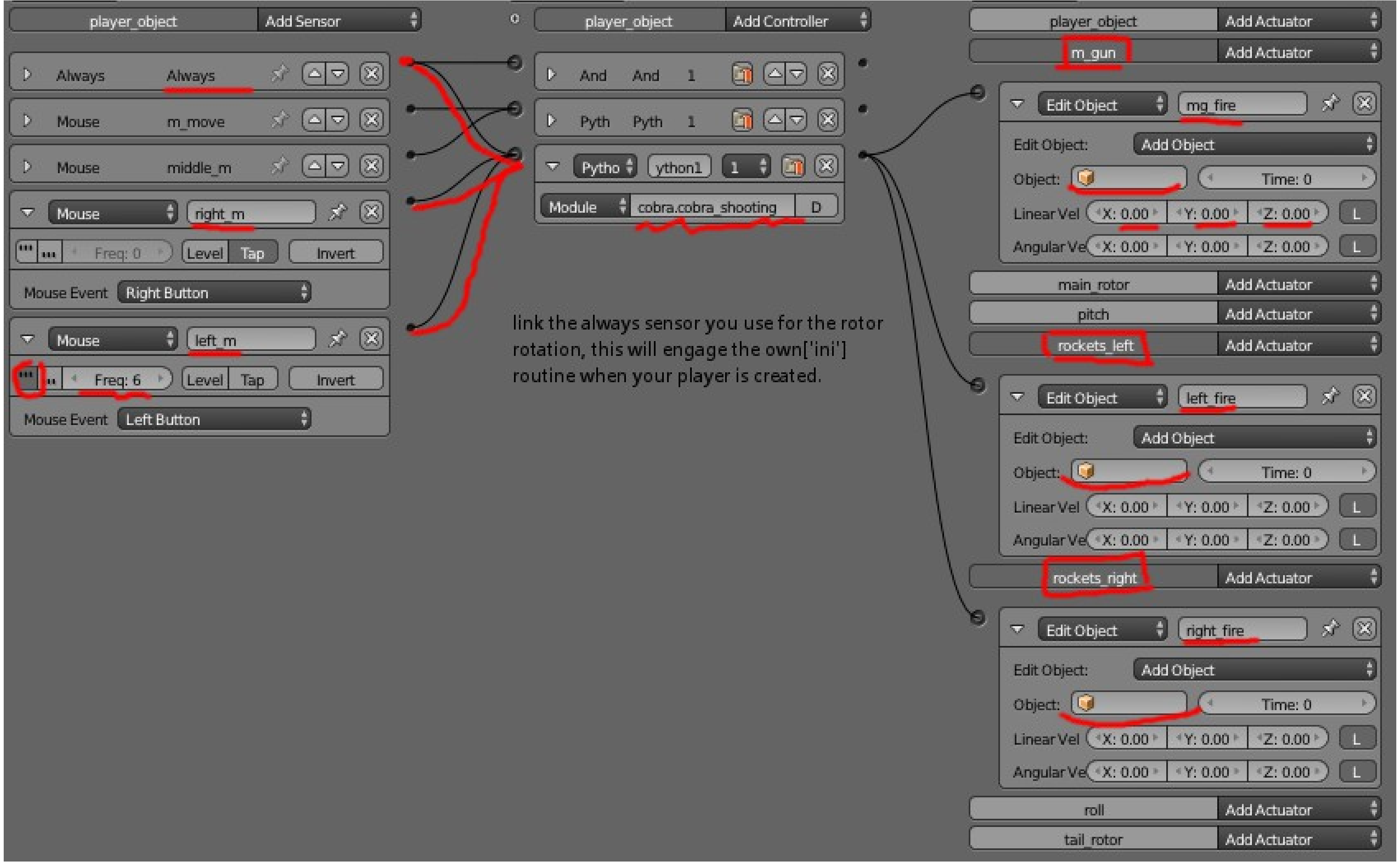
It's best to set his object a little lower than your chopper and parent it to the roll action object. This is what your guns will aim at if they have no enemy target, so you just want them to fire at the floor a little way in front of the helicopter.



mg_ammo	Integer	0
rocket_ammo	Integer	0
missile_ammo	Integer	0
weapon	Integer	1
target_ob	String	
enemy	String	
side	Integer	0
ini	Boolean	□
mg_max	Integer	200
rockets_max	Integer	40
missiles_max	Integer	0
flares_max	Integer	0
flares	Integer	0

Next we have to give our player object some new properties. Set them up just like in the picture above. “target_ob” and “enemy” are both strings, they can store any information here, in this case we are going to be storing references to objects in game. “target_ob” will be the “null_target” object we created above, while enemy will be the closest enemy to the player, if they are in the correct arc.

This is the logic set up. It has just two sensors and three actuators.



player_object Add Sensor

Always Always

Mouse m_move

Mouse middle_m

Mouse right_m

Freq: 0 Level Tap Invert

Mouse Event Right Button

Mouse left_m

Freq: 6 Level Tap Invert

Mouse Event Left Button

player_object Add Controller

And And 1

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Pytho ython1 1

Module cobra.cobra_shooting D

link the always sensor you use for the rotor rotation, this will engage the own['ini'] routine when your player is created.

player_object Add Actuator

m_gun Add Actuator

Edit Object mg_fire

Edit Object: Add Object

Object: Time: 0

Linear Vel X: 0.00 Y: 0.00 Z: 0.00 L

Angular Ve X: 0.00 Y: 0.00 Z: 0.00 L

main_rotor Add Actuator

pitch Add Actuator

rockets_left Add Actuator

Edit Object left_fire

Edit Object: Add Object

Object: Time: 0

Linear Vel X: 0.00 Y: 0.00 Z: 0.00 L

Angular Ve X: 0.00 Y: 0.00 Z: 0.00 L

rockets_right Add Actuator

Edit Object right_fire

Edit Object: Add Object

Object: Time: 0

Linear Vel X: 0.00 Y: 0.00 Z: 0.00 L

Angular Ve X: 0.00 Y: 0.00 Z: 0.00 L

roll Add Actuator

tail_rotor Add Actuator

Be sure to add each actuator and sensor as shown. You can increase or reduce the number of logic ticks on the left mouse button sensor to get faster or slow firing weapons.
The python module is:

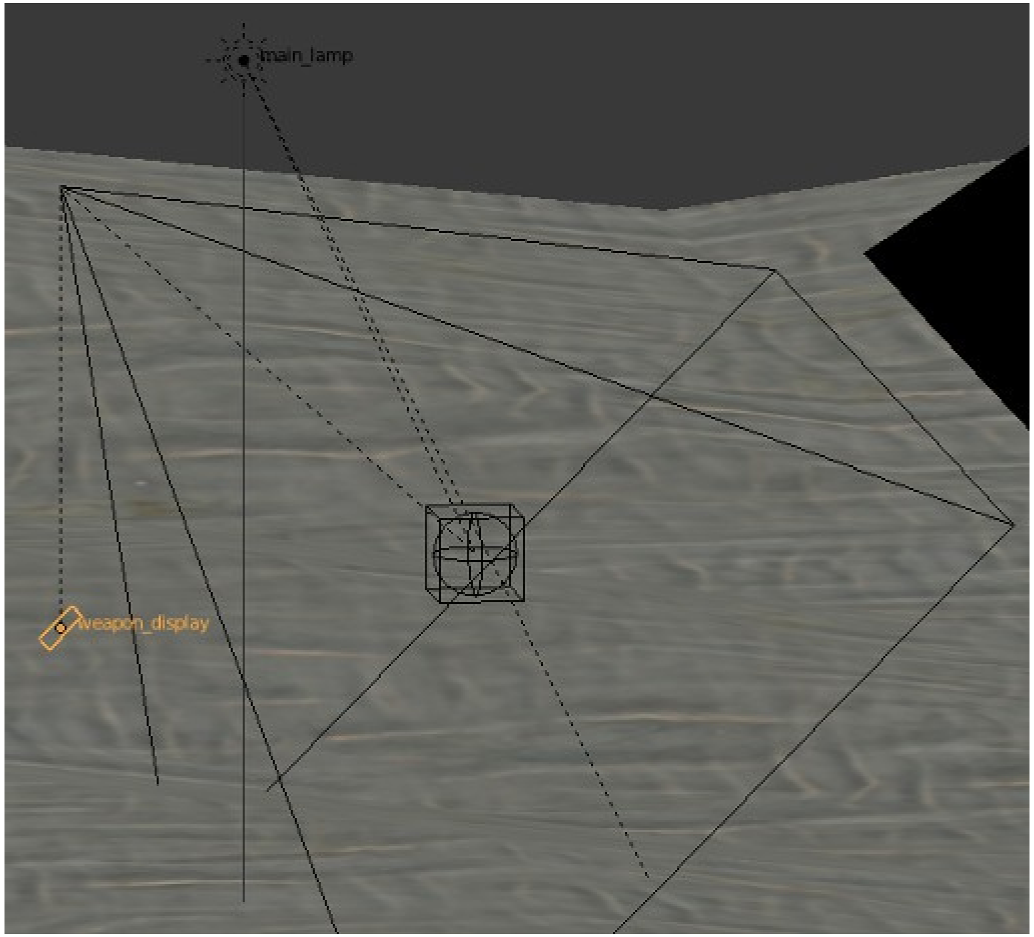
```
cobra.cobra_shooting
```

At this point you should get the new script from the place you got this tutorial. Just cut and paste it over the old cobra.py script in your text window. All the new code has been added to this script.

You may have already added the helicopter sound in the last section. Just connect it to the same always sensor as the helicopter blades. We will be changing that in future, but for now it's nice to hear the “whup-whup” sound as your chopper flies around the screen.

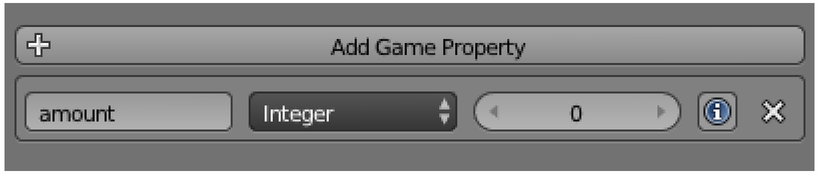
Part three – Adding a HUD:

There are several ways to handle adding a HUD or UI to your games. One of the most common is to add a overlay scene. However we are going to keep things simple and simply add some objects to the scene parented to our camera.



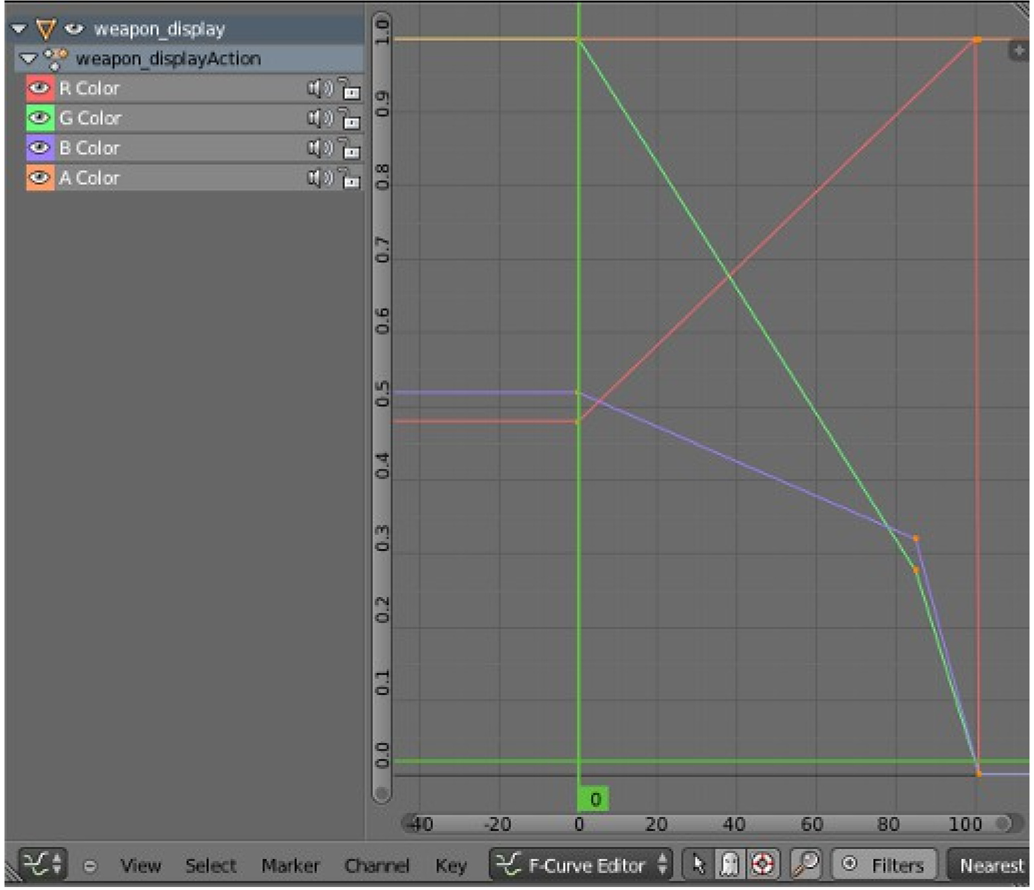
Add a simple plane to the scene and parent it to the camera so its rotation matches the camera.

Adjust the position in the view so it is in the bottom right hand corner.

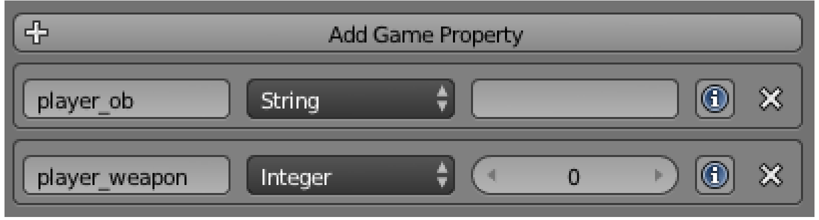


amount | Integer | 0

Give the object a property called “amount”. Create a new action for the weapon display object to set the object color (like we did with the explosions and flare above).



Next we need to add some more properties to the camera:

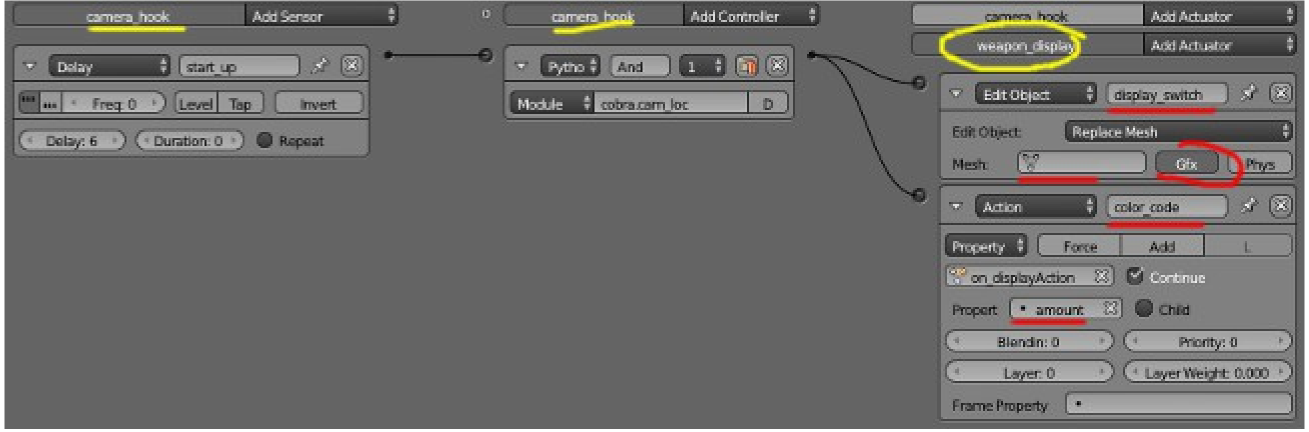


Add Game Property

player_ob | String |

player_weapon | Integer | 0

And we also need to add some more actuators to the camera and display object:



camera_hook | Add Sensor

Delay | start_up

Freq: 0 | Level | Tap | Invert

Delay: 6 | Duration: 0 | ● Repeat

camera_hook | Add Controller

Pytho | And | 1

Module | cobra.cam_loc | D

camera_hook | Add Actuator

weapon_display | Add Actuator

Edit Object | display_switch

Edit Object: Replace Mesh

Mesh: | Gfx | Phys

Action | color_code

Property | Force | Add | L

on_displayAction | ☑ Continue

Propert: amount | ● Child

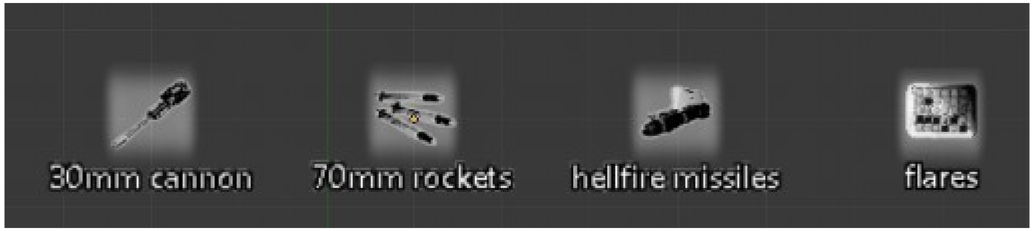
Blendin: 0 | Priority: 0

Layer: 0 | Layer Weight: 0.000

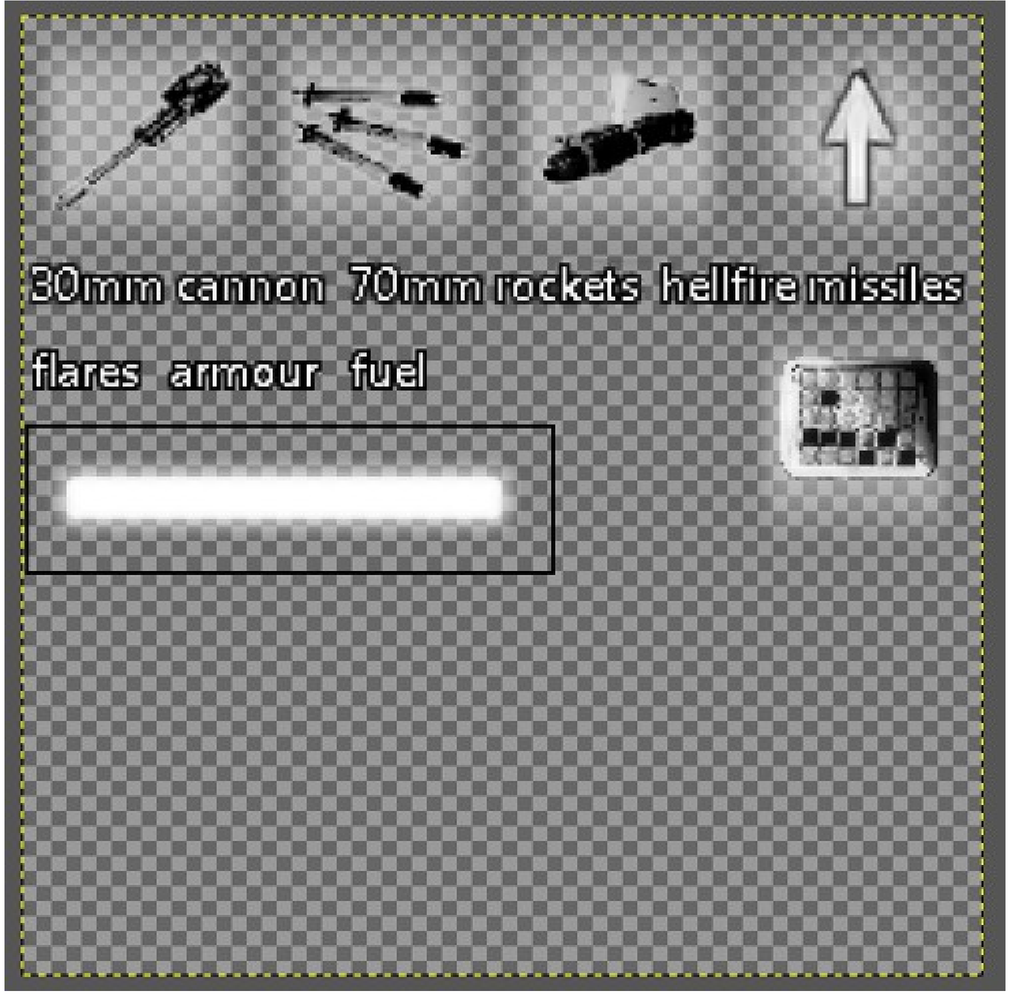
Frame Property

Make sure you set the action to “property” not “play”. The actions should be “display switch” and “color_code”. We want the player to see if they are running out of ammo, but we don't want to get in to using text yet, so we are going to show ammo levels by color.

“Amount” is the property which drives the color change of the weapon display object. It has to be on the object, not on the cam.



Create four objects on another layer, you will need a new texture for this, I'm using this one:

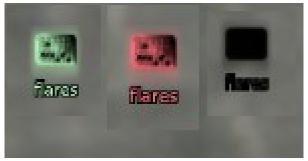


The arrow and power bar will be used later to show fuel, armor and nearest enemies and objectives.

Name the meshes of the objects as follows:

Name:	Represents:
weapon_display_1	Machine gun
weapon_display_2	Rockets
weapon_display_3	Missiles
weapon_display_4	Flares

You should be careful how you set up the object color action. It should fade from pale green at 0 frames towards dark red at 100 frames and then black at 101 frames.
This should give the following result:

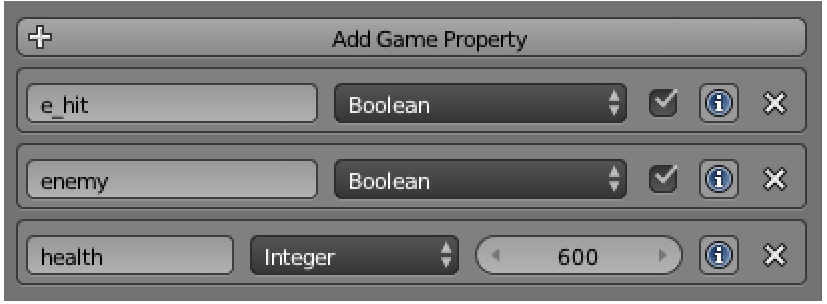


When you are out of ammo the image goes black.

You should also create a blank mesh (move the verts on the UV image so they are covering a transparent part of the image) and call it “empty_display”. This will be displayed if your chopper has no weapons. If you did everything correctly you should now be able to fly around and fire your missiles, but they don't explode. So how do we handle that?

Part four – Setting up the ground and enemies for collisions:

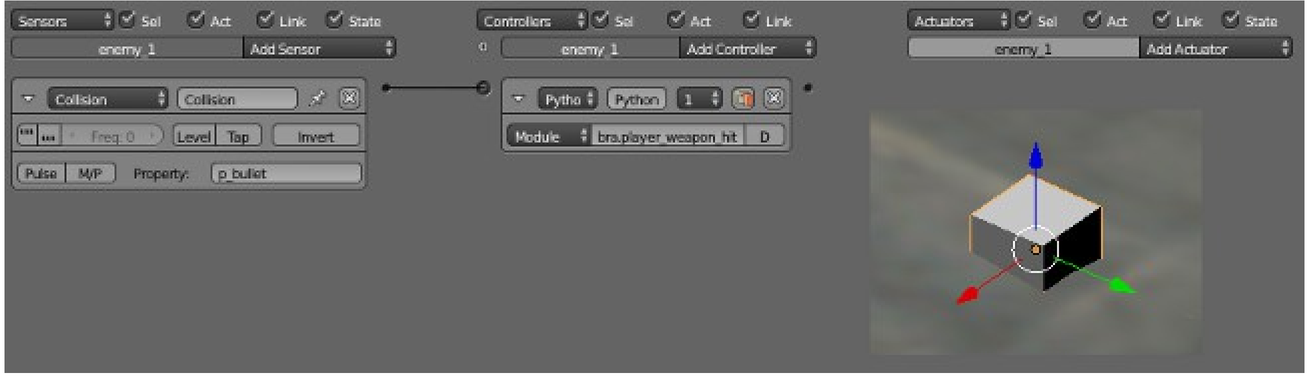
Add some cubes to your scene. Make them static and give them the following properties:



Add Game Property

e_hit	Boolean	☑	
enemy	Boolean	☑	
health	Integer	600	

Next set up their logic like this:



Sensors ☑ Sel ☑ Act ☑ Link ☑ State
enemy_1 Add Sensor
Collision Collision
Freq: 0 Level Tap Invert
Pulse M/P Property: p_bullet

Controllers ☑ Sel ☑ Act ☑ Link
enemy_1 Add Controller
Pytho Python 1
Module bra.player_weapon_hit D

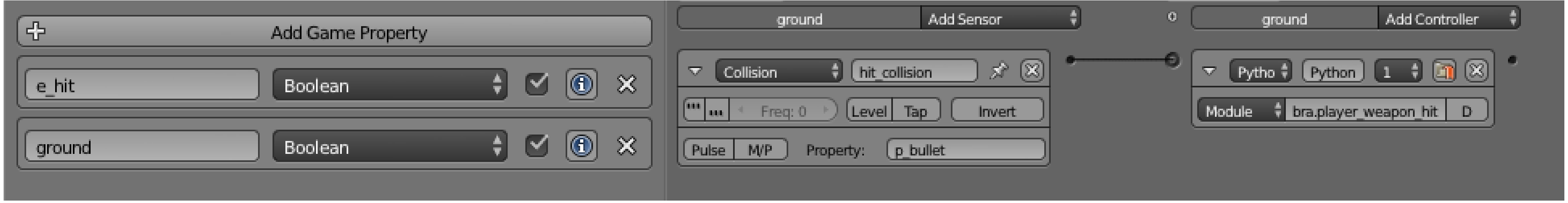
Actuators ☑ Sel ☑ Act ☑ Link ☑ State
enemy_1 Add Actuator

The python module is:

```
cobra.player_weapon_hit
```

and the collision sensor should be checking for the property "p_bullet" (remember it's the property you gave the player's missiles and rockets earlier).

Do the same with the ground in your scene:



Add Game Property

e_hit Boolean

ground Boolean

ground Add Sensor

Collision hit_collision

Freq: 0 Level Tap Invert

Pulse M/P Property: p_bullet

ground Add Controller

Pytho Python 1

Module bra.player_weapon_hit D

But don't give the ground the “health” property, instead it needs the “ground” property. You will need to give all enemies and buildings this set up if you want them to be shootable. Objects with the “ground” property will accept missile and rocket craters. You don't want to give this property to small objects such as flagpoles and people because they are smaller than the crater and it'll look like the crater is floating in mid air. Instead use it on things like large buildings.

Now when you fire your weapons the missiles and cannon should automatically track the enemy objects, and they should register explosions. If you cause enough damage you can destroy the enemy objects.

Later we are going to set up enemy so they explode when destroyed, but for now have fun firing your weapons.

I've added a new player model to the blend file that goes with this tutorial. If you change the player object adder to add "player_alt" you can enjoy flying around in a classic UH-1 Huey. This will be part of a later tutorial focusing on changing the player object to add more variety to missions (in the UH-1 you will be able to pick up passengers).

Next time we will look at making enemies and giving them simple AI. Thanks for reading. If you have any questions please post them in the Blender artists thread.

Smoking Mirror AKA Pickledtezcat AKA John Topple.

30th June 2013

If you want to write your own tutorials to be included in the series you should use the following formatting conventions:

Main Title: Segoe Print 26 point, Centered.
Subtitles: Segoe Print 16 point, left aligned.
Main text: Segoe UI Semibold 16 point, left aligned.
Image captions: Segoe Print 16 point, Centered.

The document should be landscape, not portrait for better viewing on wide screen monitors without splitting pages, and images included should be of a maximum with of 512 pixels and should be centered. There should be a roughly 50/50 mix of text and images

You can use the following image for title text background:

It's a simple gradient from pure white to “404040” gray on the right.

From now on all the tutorials can be found here:

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