

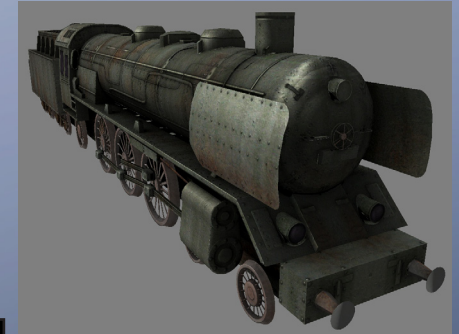
OLD SCHOOL

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LOW POLYGON TECHNIQUE FOR NEXT GENERATION SYSTEMS:

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00.09



2700 Polygon Flak Gun.



5200 Polygon Train and Coal Carriage.

This document aims to show you a pipeline for creating Next Generation Game objects within XSI. The primary goal is to show that you can do this without using as many polygons as you think you should.

Why use less when you could use more, you say? Because if you can make a low poly object look as good as a high resolution version, you will be able to fill the screen with them at a fast framerate, and this will always look more impressive. To make your game look great you need to look at the entire image and spread the detail according to screen space. The following techniques will help create objects that have all the detail required and will run fast enough to print large quantities of them.

Various techniques that worked for previous consoles can be taken a step further now that Normal mapping, Specular and Alpha can all be applied easily to a surface at the same time. How they are put together will now be described in detail.

The main Tool within XSI that we will use to help us create the textures and normal maps for our lower poly models is Ultimapper. Next, I will show you the basics of that utility.

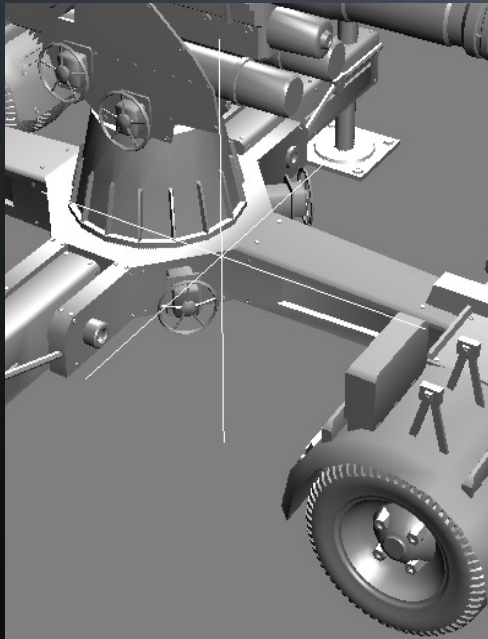
AMBIENT OCCLUSION AND NORMAL MAPPING WITH ULTIMAPPER:

The main tool within XSI that we will be using to create our Ambient Occlusion and Normal assets is Ultimapper.

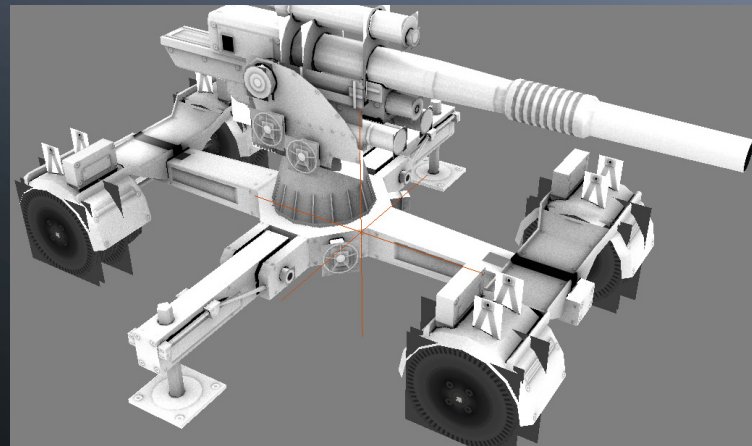
Ambient Occlusion is a form of light mapping. When applied to your model it makes it look like it has been lit from the sky. Inset corners become darker, objects close to other objects form soft shadowed areas. It is neutral in direction and thus works even when applied to dynamically lit objects.

One trick that I aim to discuss is generating the basis of a diffuse map with this technique. If you use a High Res model to create the Diffuse map with Ambient Occlusion you will save time texturing greatly. For instance, if on your High Res model you have placed lots of bolts, paneling and other detail, all of this will be lit and baked in to your low res model. You can pull the texture into an art package and add colour and extra detail with ease.

On top of all this, the same technique is used to create Normal maps. So by following the documented process you will be able to get great lighting and normal maps on your model quickly and easily.



Hi-Res Model close up.



Ambient occlusion map on Lo-Res object. Alpha materials inactive.

Final texture created from Ambient Occlusion map. Alpha materials active.



BUILDING THE HIGH RES MODEL:

For rendered normal maps, and ambient occlusion, a high resolution model is required. This will sit in the same space as the Lo-Poly model and its extra detail will be baked into the lower versions textures.

WHERE SHOULD THE DETAIL GO?

The Hi-Res version should contain detail that you would usually have applied only to the diffuse texture on a current gen console object. This detail cannot travel too far from it's intended surface on the low res model as a normal map.

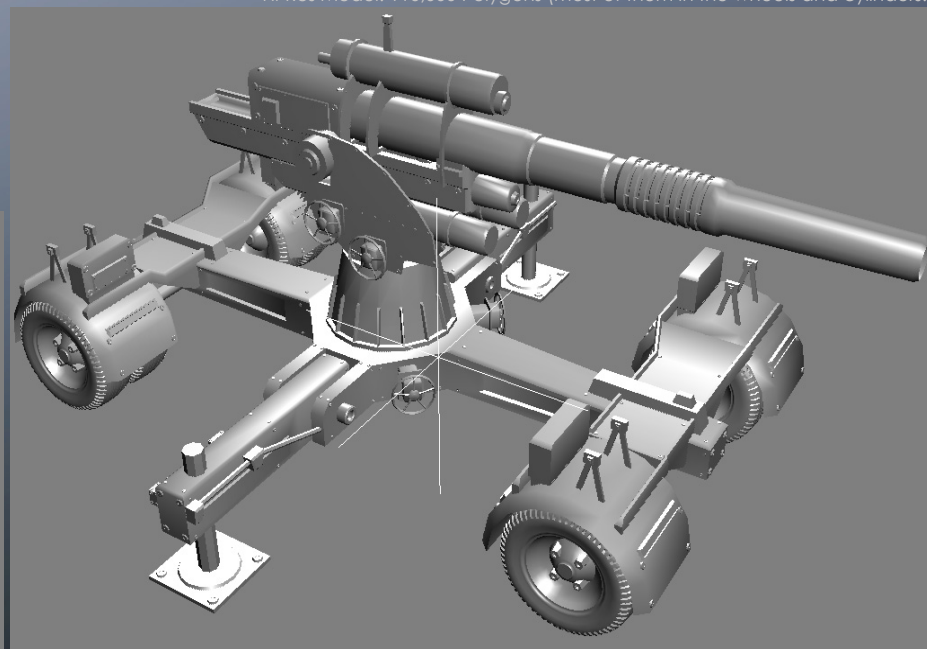
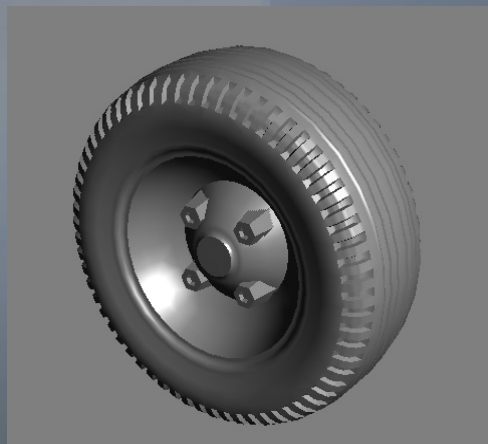
Long pointed structures wont work well at all as the polygon the map lies on is flat. More gradual curves and flatter detail bake themselves in the normal map with better results.

Allow the specular and diffuse to handle smaller indentations such as rust, tiny cracks and tiny bits of foliage or the final model can get 'bitty'.

BUILD IT HOW YOU LIKE. BUILD IT FAST!:

Building the High Resolution model need not be a slow process. You do not have to care how you build it. Vertices do not have to be welded precisely at all times. Multiple objects can penetrate each other. You can use any high resolution model building techniques you see fit. This should make the modeling process alot faster than you might think.

Hi-Res Model. 110,000 Polygons (most of them in the wheels and cylinders!)



FORGET UV's!:

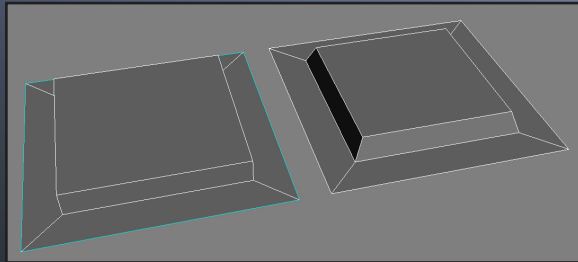
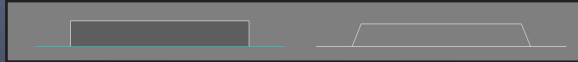
There is no reason to UV the high resolution model as it needs no texturing. At least not for ambient occlusion or normal map rendering. All you are wanting for this process is geometry.

However, if you do UV and texture your hi-res model you could bake it in to the lo-res model. This isnt my normal procedure but I will discuss its benefits later.

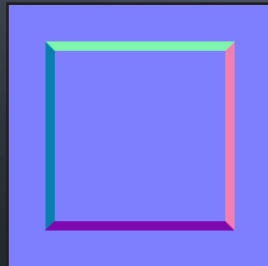
WARNING!: NO 90' ANGLES:

One thing to note is that any detail geometry you create should not have edges that travel away from the main surface at a 90 degree angle. If it is, it will be invisible on the normal/texture map as it needs to be at least a pixel wide on the final texture to be visible.

- 1) Detail 90' from surface.
- 2) Detail angled inward.



1) Normal map texture receives no detail in pixels.



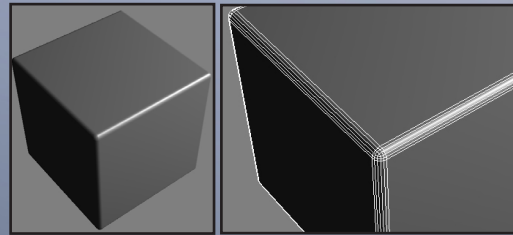
2) Normal map texture acquires detail from angled edges.

ROUND THE CURVES:

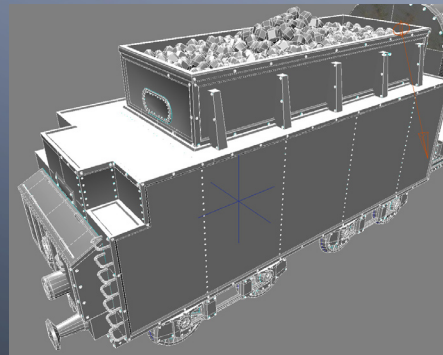
Anything that needs to be rounded can be very round on the high poly model. This helps the normal maps create a smoother look to a lower poly geometry.

BEVEL THE HARD EDGES:

If you bevel the edges of your high resolution model it will help soften the hard edges on the low version if baked into the normal map.

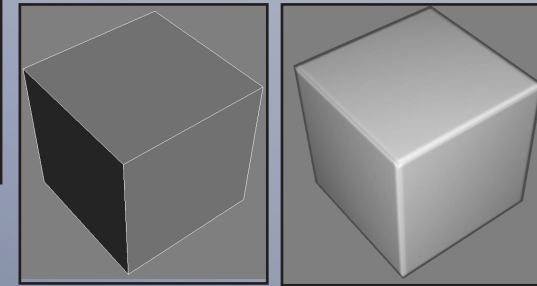


Hi Res: Cube with soft beveled edges.



Hi-Res Train Model. All hard outer edges beveled.

Lo Res: 12 Triangle Cube with Normal Maps.



MULTIPLE OBJECT USAGE: GROUPING IN XSI

The Hi Resolution model can be made from as many objects as you see fit. You will need to 'group' these objects together when you are finished with the 'Create Group' function so that Ultimapper knows which objects to use.

Fig.1 - Alt Right Click Menu

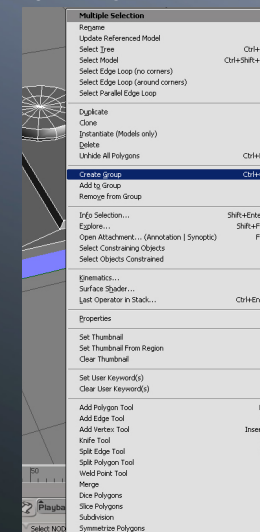
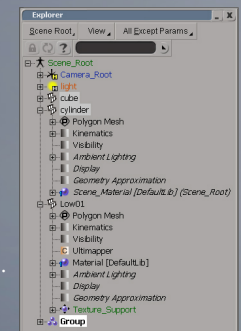


Fig.2 - Group in Explorer Window



To group your Hi Resolution objects together select them all. Now alt-right click over one of those objects and select 'Create Group' from the context sensitive menu that appears.

Bring up the Explorer window and you will see an object called 'Group' at the bottom of the tree. You may rename this however you like.

The group function is essential if you wish to create the hi resolution object from multiple objects, however, you can also use it to select all of those objects at once. It also allows you to hide/unhide and translate the entire group if you have selected it.

BUILDING THE LOW RES MODEL:

GENERAL RULES:

Observing Screenspace:

When building the low polygon model you must absolutely ask yourself, "How large will the section I'm building appear on screen during the game?". Many polygons are often wasted on small detailed areas of a model that are rarely even seen during gameplay. You are making a game object, not a movie render. Be harsh on yourself. If you are making a vehicle with an interior and yet your game is 3rd person, let normal mapping take care of most of that detail. You should take pride in the fact that you are making the game run faster.

Matching High and Low Poly Models:

The low res version should contain polygons that closely match the position of the main hi resolution surfaces. Any detail that extends from the main surfaces can easily be picked up in your normal map. You will enter a figure for the distance that detail is taken from the surface of your low poly model in the Ulimapper phase explained later.

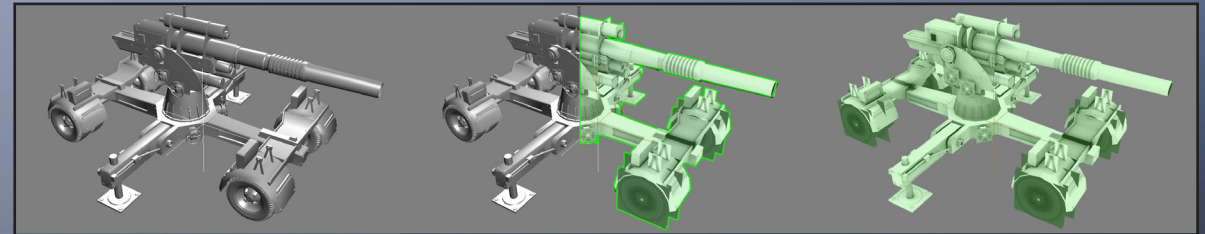
Reduce or Scratch build?:

Whether you reduce the high res model or build from scratch depends on what you consider the fastest. If your high poly version is very detailed it can take longer to reduce it than rebuild it. A good tip is to keep some of the basic shapes that you use to build the high res model as you are making it.

Hi Poly Version.

Hi and Low Poly occupy same space.

Low Poly Version.



USING ALPHA TO REDUCE:

A technique that can considerably reduce the polygon count of your game model is to use Alpha Tested textures. A textured Alpha when combined with a Normal map and specular can easily replace what would have been a considerable amount of polygons.

Basic Technique:

A good example is the end of a cylinder. A 16 sided cylinder will normally have 16 polygons capping it. With a round alpha based texture you can replace the 16 triangles with 2 and the end will look even rounder than without it.

If the alpha also has a normal map from the high resolution end with beveling it will look even more convincing.

An example is shown on the right. 'Fig.A' shows a 16 sided cylinder with a bevel on the top. This amounts to 80 polygons.

'Fig.B' shows our hi-resolution source for which we will get the normal map. This has been created by subdividing the original low polygon model.

'Fig.C' shows our original model with all the capping polygons replaced with a two triangle, alpha'd polygon. It's reduced the count by roughly 60%.

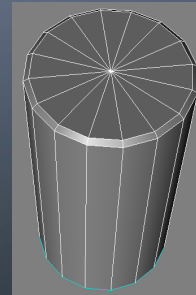


Fig.A - Low Poly 16 Sided Cylinder - 80 Tri's

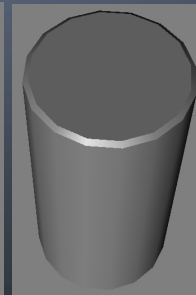


Fig.B - Hi Poly 32 Sided (SUB D) - 352 Tri's

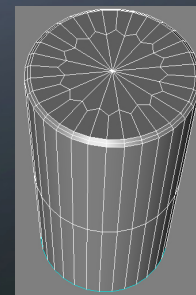
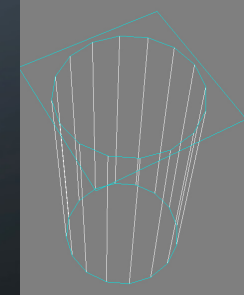


Fig.C - Low Poly 16 Sided + Alpha - 34 Tri's



This technique can be passed on to any other complex shapes as long as they have a flat end.

USING ALPHA TO REDUCE: CONTINUED

Where to use it?:

Basically, the main aim is to place an alpha'd 2 triangle flat polygon where multiple polygons exist to make the same flat shape.

In 'Fig.1' you can see where I've chosen to use alpha'd polygons on the Flak Gun object. Everywhere you see a red rectangle of any size, it consists of just two triangles.

'Fig.2' shows just the selected polygons with their textures and Alpha testing switched on. As you can see, it has been used for a manner of different instances. I've marked the image with numbers to reference some of these. 1) Ends of low poly cylinders. 2) Turning wheel. 3) Complete curved panel section. 4) Top cylinder holding braces. 5) Vertical hinges.

'Fig.3' shows some of the alpha'd polygons in close up detail. Note the large polygon used for the entire curved side panel. All the cylinders are only 8 sided with an alpha tested polygon on the end to round them off.

'Fig.4' shows the end result in the game engine. As you can see, all the cylinders look far more rounded than they actually are.

Alpha Test not Alpha Blend:

There is not reason to use Alpha Blended mode unless your graphic needs to be transparent.

Alpha Blended textures will often sort badly and draw far slower than Alpha tested materials.

So in summary: USE ALPHA TEST.

Fig.1 - Alpha Polys on Flak Gun (Excluding Wheels)

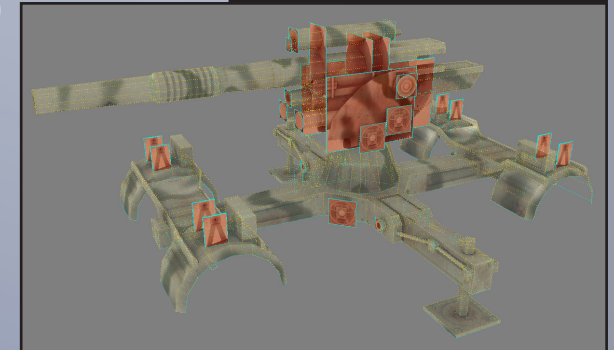
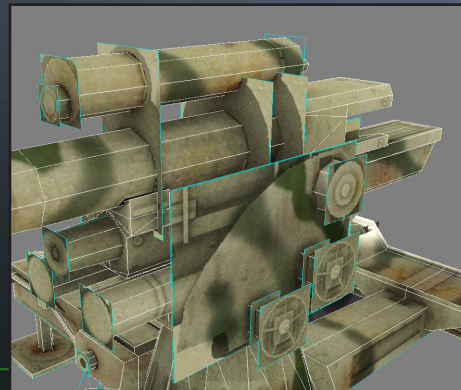


Fig.2 - Alpha Polys with Alpha Tested Textures switched on.



Fig.4 - Final object with Alphas in game engine.

Fig.3 - Close up. Note flat polys in front of 8 sided cylinders.



BUILDING THE LOW RES MODEL:

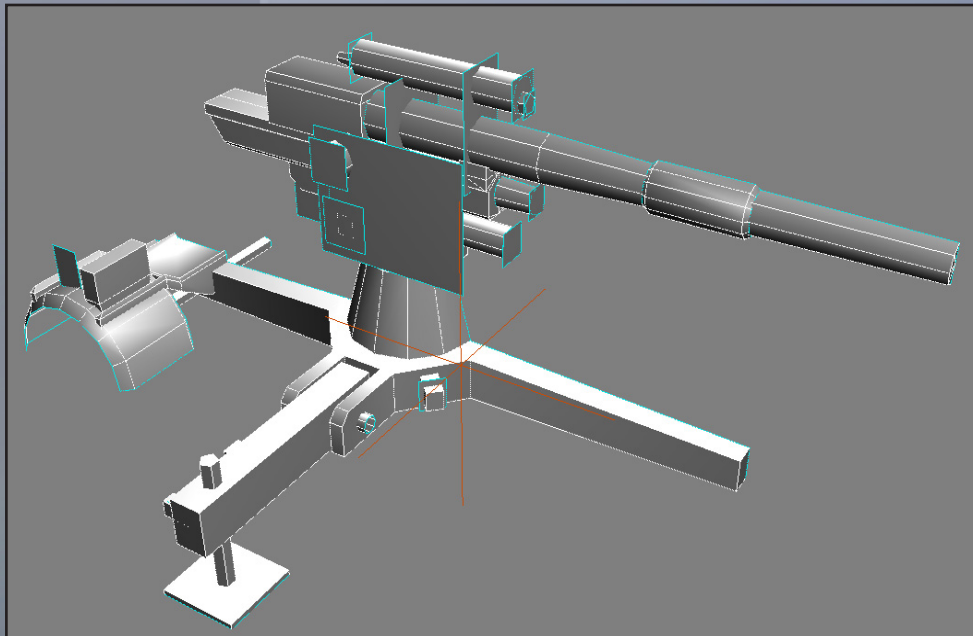
ADDING UV CO-ORDINATES:

Unique UV model building:

To prepare yourself for the UV stage of this process, you should look for duplicate areas of a model. This will help you maximize the use of space on the texture page. You need only the unique sections of your model in the low res version at first. For many occasions you will build only one half of your model as we can flip one side to become the other using the same textures.

This version of the model will be the one that gets detail from the High Res version projected onto it.

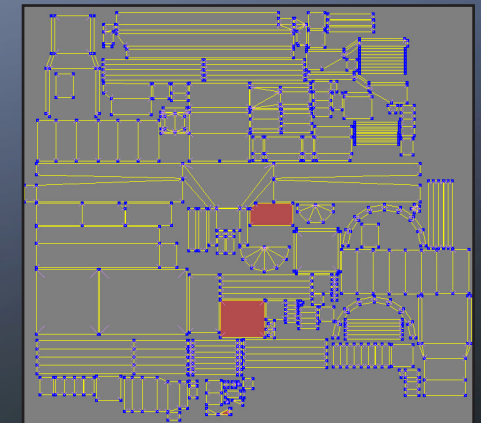
Unique polys on Flak Gun, ready for UV's to be applied.



Basic UV Technique:

Once you have built the unique sections you can UV them. My recommendation would be to Cubic map the model as a starting point and then move the co-ordinates off the texture page. You can now start selecting planar areas that are linked together nicely and start placing them back into your texture page area. The aim is to get every UV onto the one page so be clever with your placement to get the best fit. Also, try to keep the scale for each polygon in proportion with one another.

The low poly version should consist of one object per texture page that you intend to use on it.



Keep Alpha UV's together:

It is beneficial to move the alphas textures to one section of the texture page. This makes it easier to manage some of the complex alpha shapes you might create. It also helps with mip mapping as if you have an alpha texture next to a solid section, the solid part can end up partially in the alpha's mip.

ULTIMAPPER SETUP:

1) Applying Ultimapper to the Low Poly Object:

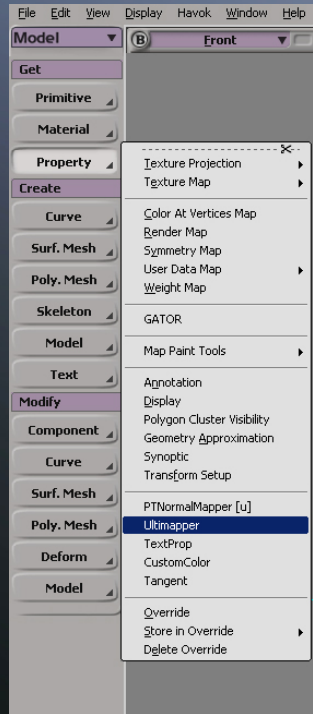


Fig.1 - Ultimapper in Property menu.

Once you have UV'd the Low Poly model you have done most of the hard work.

The next step is to add Ultimapper to your Low Poly object. Do this by going to the Property menu and selecting Ultimapper. ('Fig.01')

2) Choose the High Resolution Source:

Now you can open up the explorer ('Fig.02') and double click on the Ultimapper instance. This will bring up its UI ('Fig.03').

Look at the first section called 'High Resolution Source'. Next to the box it has a button called 'Pick'. Click on this and select your High Resolution model. You can do this by clicking on the object in the scene or by clicking on the model name in the explorer. If your hi res source is a group of objects, then select the group from the explorer.

3) Select your Distance to Surface:

This is the distance that detail will be taken from the surface of your low poly model. The greater the distance, the further that detail will be baked from the hi poly version. This value should be kept the same for your normal and ambient occlusion map creation.

For example, 'Fig.4' shows a blue polygon which is going to acquire detail from the high resolution models above it. 'Fig.5' shows the normal map texture created with a short distance to surface. Notice that it hasn't captured the disc above. In many cases this will be a good thing.

'Fig.5' shows the normal texture created with a larger distance to surface value. It has captured the disc as well as the closer detail.

The default value is 0.1 and is a good figure to start with.

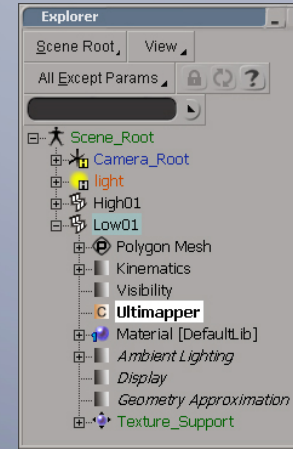


Fig.2 - Ultimapper in Explorer.

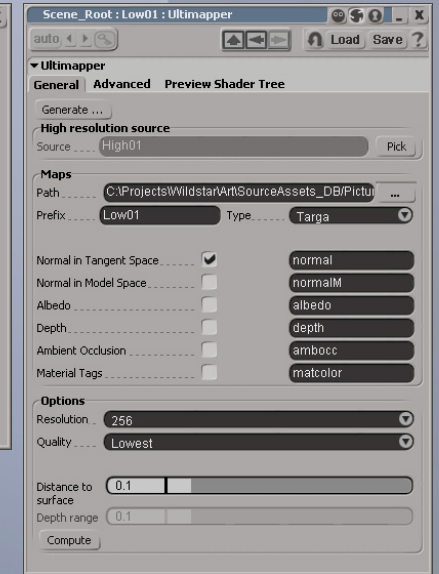


Fig.3 - Ultimapper Window.

Fig.4 - Polygon with Detail for Normal map above.

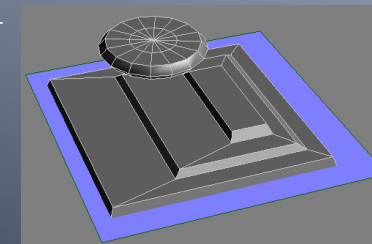


Fig.5 - Short Distance.

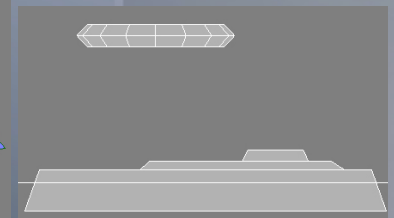
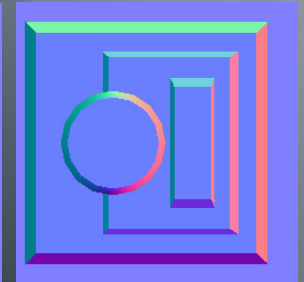
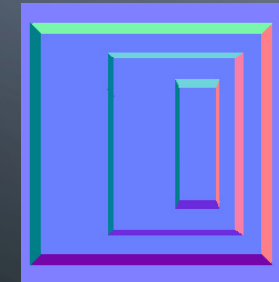


Fig.6 - Long Distance.



NORMAL MAP CREATION:

Select 'Normal in Tangent Space':

To create a normal map from your hi res model you need to check a few boxes before generating it.

Click on the 'Normal in Tangent Space' box ('Fig.1').

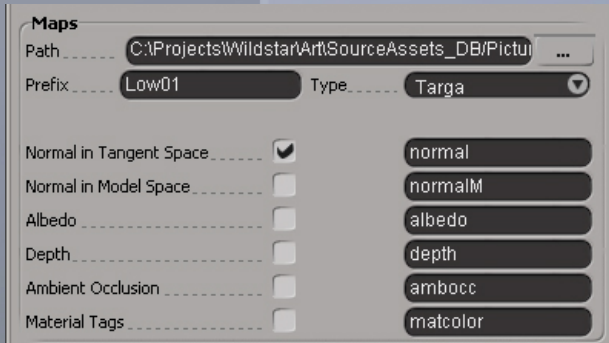


Fig.1 - Normal in Tangent Space checkbox.

Select Output Resolution:

Select the resolution you would like the texture to be ('Fig.4'). There are a set amount of sizes for you to use. If they do not suit your needs, pick the nearest one and then resize it in an art package. For instance, all the output options are square but your texture page might not be so you will need to squash it.

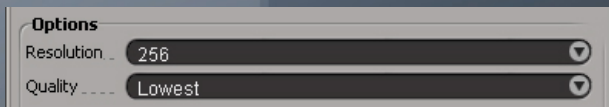


Fig.4 - Output Options 02.

Select Output Filename:

Type in the Prefix for the texture output name ('Fig.2'). UltiMapper will add '_normal' to the end of this prefix to create the final texture name. The prefix usually adopts the name of the object UltiMapper is applied to.

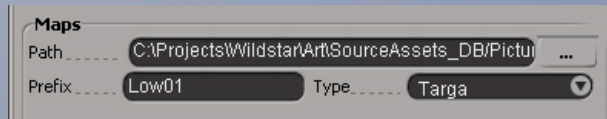


Fig.2 - Texture map output window.

Select Output Quality:

Select the Quality you wish the Normal map to be rendered as ('Fig.3'). Use a lower setting at first to see roughly what the result is. When you are happy with it you can re-render it later at a higher setting. Medium is a preferred setting.

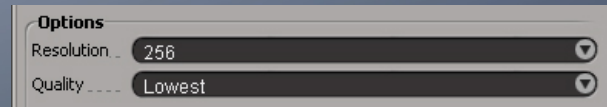


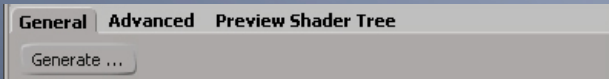
Fig.3 - Output Options 01.



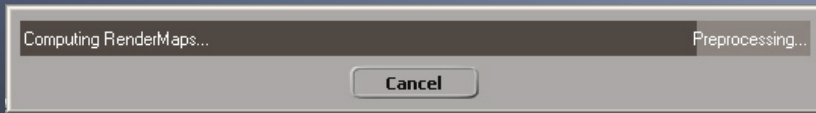
Normal Map Texture for Flak Gun.

FINAL STEP:
Generate Normal Map:

When you have set all these figures you can click on the 'Generate' button at the top of the Ultimapper window.



Ultimapper will now generate your normal map and show you a progress bar. This will take a little time but is far quicker to calculate than Ambient Occlusion. The time taken is proportional to the complexity of your high resolution model.



Previewing the Normal Map from Ultimapper:

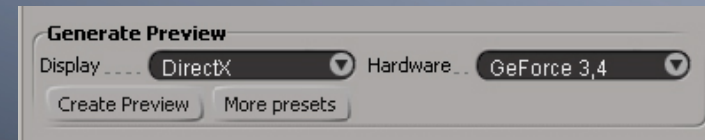
Select Preview Shader Tree Tab:

You can quickly view the result of your normal map on your low poly object by first switching to the third tab called 'Preview Shader Tree' at the top of the Ultimapper window.



Switch to Direct X:

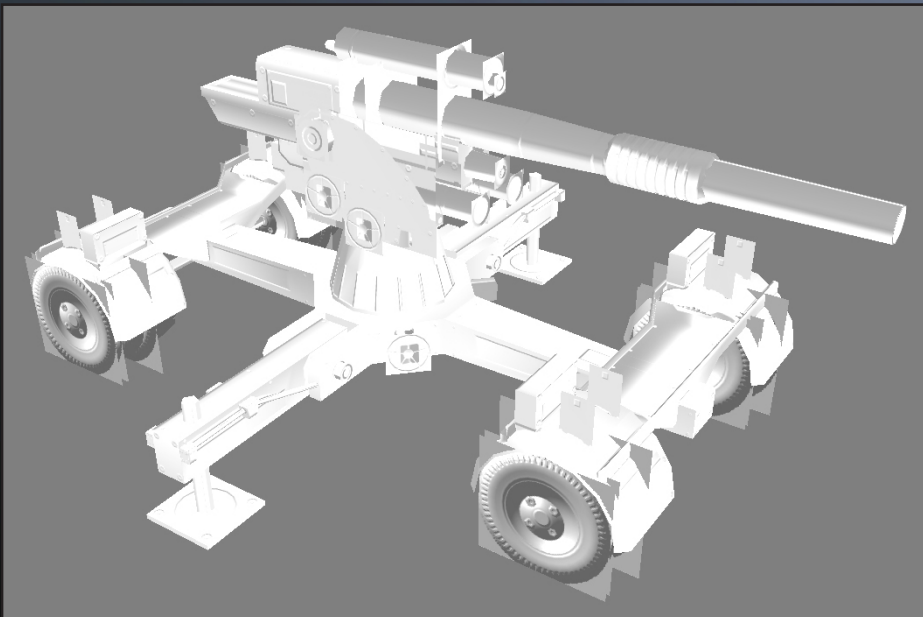
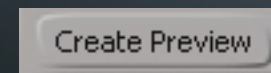
In the 'Generate Preview' section at the bottom switch the 'Display' to Direct X.



Generate Preview:

Now click on 'Create Preview' to see your object displayed in Direct X mode. This actually creates a real-time shader and applies it to your model with the generated normal map in the correct slot.

If you wish to go back to another view mode just select it in your viewport as usual. If you wish to see it with normals working just select Direct X for your viewport view mode.



Flak Gun with Normal map and plain white diffuse added.

AMBIENT OCCLUSION CREATION:

The process for creating an Ambient Occlusion map is almost identical to creating Normal maps. You should keep the 'distance from surface' amount at the same value as when you created the normal map.

Select 'Ambient Occlusion':

Click on the 'Ambient Occlusion' box ('Fig.1').



Fig.1 - Ambient Occlusion checkbox.

Select Output Resolution:

This will normally be the same size as your Normal map texture. However, you can choose a different size if you wish. It might be that you want to use the diffuse as a basic colour/shade map but let the normal map detail do a lot of the work.

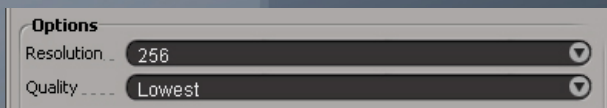


Fig.4 - Output Options 02.

Select Output Filename:

Type in the Prefix for the texture output name ('Fig.2'). Ultimapper will add '_ambocc' to the end of this prefix to create the final texture name. The prefix usually adopts the name of the object ultimapper is applied to.

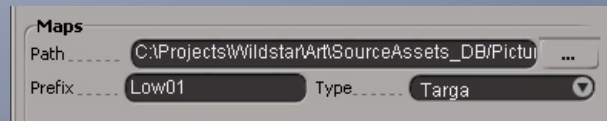


Fig.2 - Texture map output window.

Select Output Quality:

Select the Quality you wish the Ambient Occlusion map to be rendered as ('Fig.3').

NOTE: Use the lowest setting to test the results of the ambient occlusion render. Ambient occlusion rendering is much slower and intensive on the processor than creating normal maps but the lowest setting will speed it up considerably. The result will be more grainy and aliased, but you will get a good impression of how well it has worked in a much shorter space of time. On man made objects the grain it creates is often useful to have anyway but for skin you may want to render it later on a higher setting to get a smoother result.

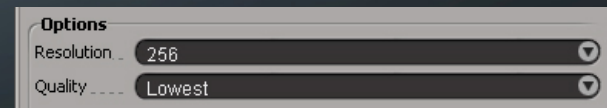
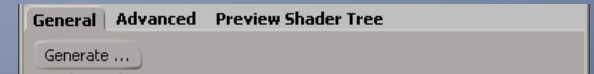


Fig.3 - Output Options 01.

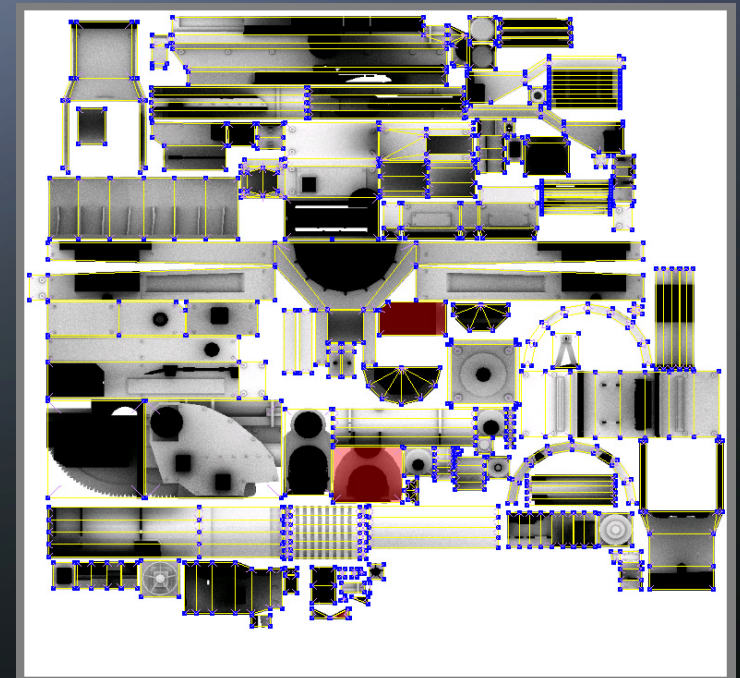
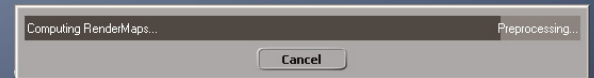
FINAL STEP:

Generate Ambient Occlusion Map:

When you have set all these figures you can click on the 'Generate' button at the top of the Ultimapper window.



Ultimapper will now generate your Ambocc map and show you a progress bar. This will be a fairly long process and will slow your machine down. The time taken is proportional to the complexity of your high resolution model. See 'Select Output Quality' to see how to make it faster.



Ambient Occlusion map for Flak Gun with UV's. Rendered on Lowest Setting.

QUICK PRE VIEWING WITH THE PANDEMIC SHADER:

You cannot preview the Ambient Occlusion map instantly, as you can a normal map within Ultimapper. You will now need to add a Pandemic shader to your model instead of the preview material.

Apply the Pandemic material to the object, bring up the material schematic ('fig.A'). Now find and delete the detail map slot as you will not normally be using it. ('fig.B')

Add the Ambient occlusion map to the diffuse slot. ('fig.C')



Fig.C - Ambient Occlusion map added to diffuse.

Add the same Ambient occlusion map to the specular channel. ('fig.D') This is a temporary measure but will help you see what you have created quickly.

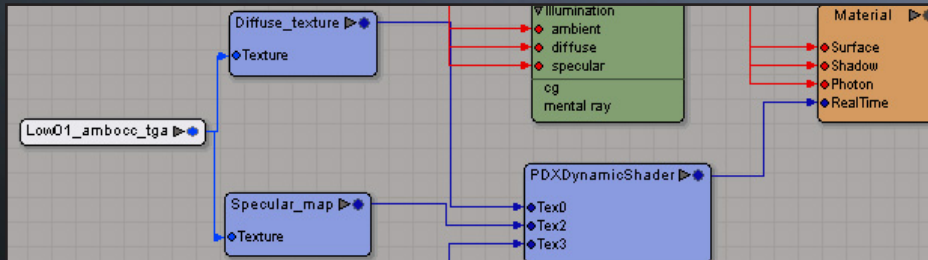


Fig.D - Ambient Occlusion map also added to Specular.

Now place your normal texture in the Normal Map slot. ('fig.E')

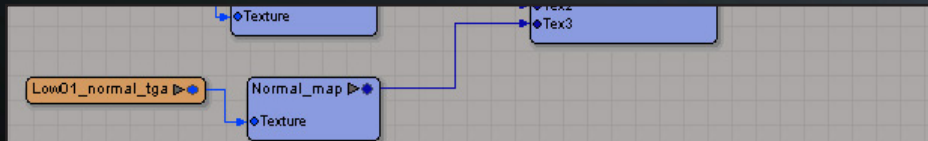


Fig.E - Normal map texture placed in slot.

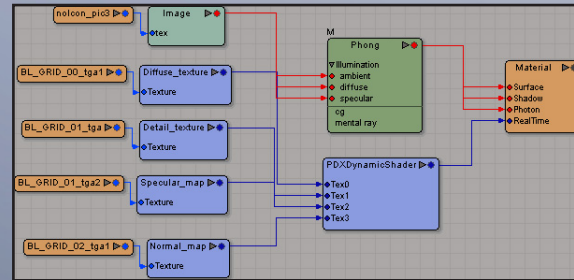


Fig.A - Pandemic Shader when first applied to object.

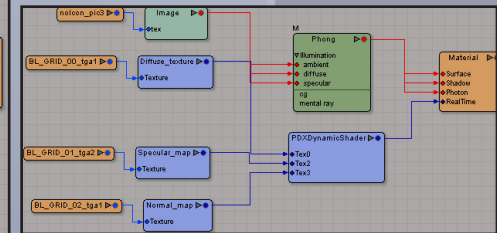


Fig.B - Detail map segment deleted.

Double click on the PDX Dynamic shader box and get to the last segment called PDXset_CommonShader. ('fig.F'). Turn the specular multiplier down considerably. ('fig.G'). A recommended amount is 0.25. This will give you a rough idea of how the specular will look in combination with the normal maps.

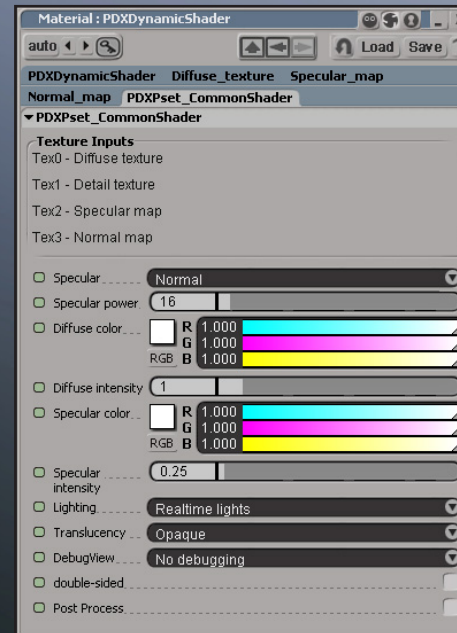


Fig.F - PDXset_CommonShader.

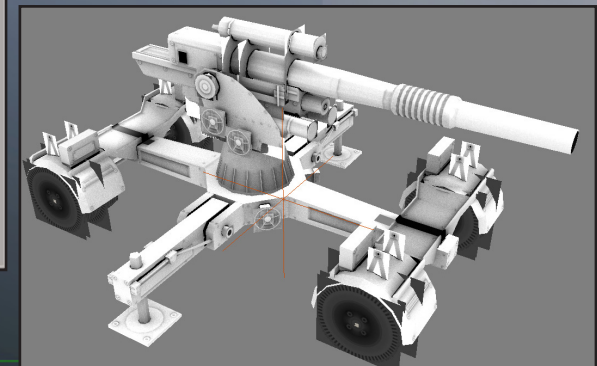


Fig.G - Specular Intensity set to 0.25.

FINAL STEP:

Switch to Direct X Viewing Mode:

Once you've applied and tweaked the material you can simply switch to DX viewing mode in your window and see the result.



Alpha Creation:

At the moment the least error prone way to get an alpha mask for your alpha textures is to create it manually. This is due to be fixed in Ultimapper soon but for now I find the following method fast enough.

The train in ('fig.1') was created in 5300 triangles. Much of the saving came from its Alpha usage in the wheels which cut it down considerably from a much higher polygon count.

This section will briefly show you how the Alpha channel was made in Photoshop and at the same time you will see how the low poly object was created.

Wheel Building Technique:

'Fig.3' shows the high poly wheel that was used to bake ambient occlusion and normal maps into the low poly wheel shown in 'Fig.2'. As you can see the low poly mesh is made from a 32 sided tube with its front and back faces removed. A smaller 16 sided cylinder exists in the centre of the wheel with its front and back faces also erased.

Two polygon alpha textures exist on the front and rear of the cylinder. The front polygon has just the front rim of the outer cylinder and the front face of the inner cylinder. The rear polygon has the outer rim and front face of the cylinders but also contains the spokes of the wheel.

You can see the end result in the game engine in 'Fig.4'.

Fig.2 -170 Triangle wheel split.

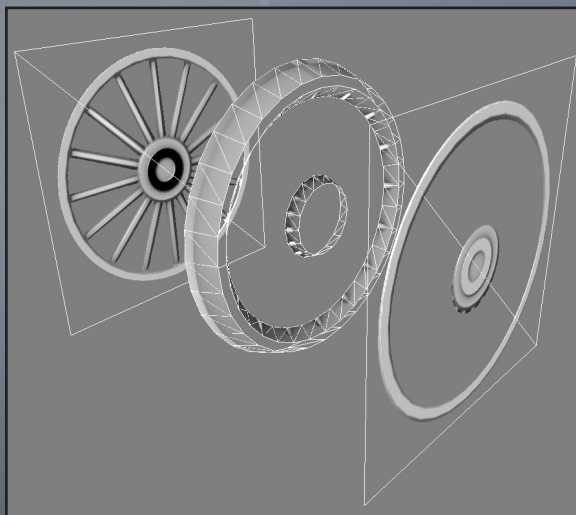


Fig.3 -Hi Res Wheel Model.

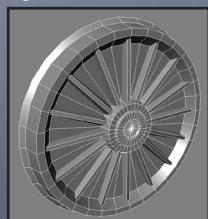


Fig.4 -Result in Game Engine.

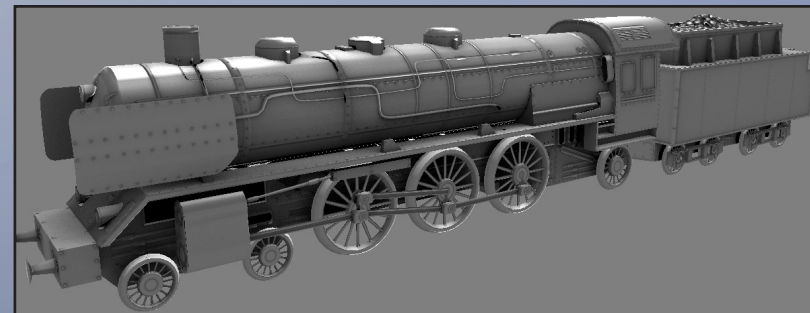


Fig.1 - 5200 Triangle train with Ambient Occlusion and Alpha Test.

Drawing the Alpha:

First load the ambient occlusion map into photoshop as this will become the diffuse texture that you will require an alpha channel on ('Fig.6').

To create the Alpha for the wheel it is helpful to create a layer set in Photoshop called 'Alpha'. Inside that set create a new layer that is filled with solid black. On top of that layer create a new blank layer. ('Fig.5')

The new blank layer inside the Alpha set is where we will draw the alpha channel in white. Turn down the opacity of the entire set and you will be able to see the Ambient Occlusion texture below. ('Fig.7') Now you can draw the opaque section directly over the main texture. You could use as many layers inside the Alpha set as you feel necessary.

Now make the alpha set opacity 100% again and flatten the image. ('Fig.8') Copy the entire page with Ctrl+C and then undo the flatten step so that your layers are back.

Finally paste the clipboard into the Alpha Channel to create the alpha. Hide the Alpha set and save the image as a TGA.

Fig.5 -Alpha Layer Set.

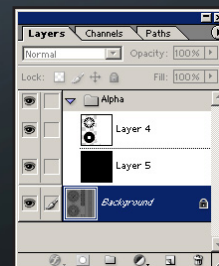


Fig.6 -Ambocc Map.

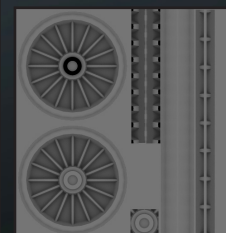


Fig.7 -Alpha Set Fade.

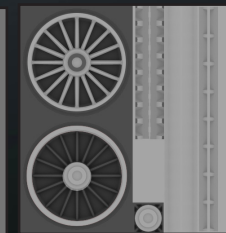
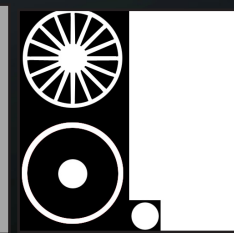


Fig.8 -Alpha Layer.



CREATING THE FINAL TEXTURE.

The Ambient Occlusion has given you some nice lighting as a base so now its time to add colour and detail to finish it off. This section will describe one way of creating the final diffuse texture but you should use whatever way that you are comfortable with.

Basic Photoshop Technique:

If you have created the alpha for your texture (as shown in the previous section) you will be starting with a Background layer that is your Ambient Occlusion map, and an Alpha layer set which can now be hidden. ('Fig.A + Fig.A1')

You should now duplicate the background layer above the original. Rename the new layer 'Ambient Occlusion' and set it's Blending mode to 'Multiply'. ('Fig.B')

Now fill the original background layer with solid black. ('Fig.C')

Add a new layer in between the background (black) layer and the ambient occlusion layer. This will now become your base colour so name it appropriately. Fill it with your main colour of choice. ('Fig.C') You will see that the shading from the ambient occlusion layer is working on top of your new base coat. ('Fig.C1')

Add another layer above the base colour layer and use this to add secondary base coats to other areas of the texture page. Its shown as Secondary Colour in the image. ('Fig.D + Fig.D1')

Now you can add detail layers with different blending modes in the same way you would normally create a texture page. ('Fig.E')

Train with Final Texture Applied



Fig.A

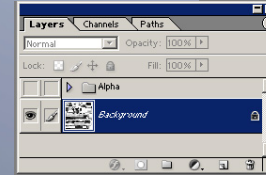


Fig.A1

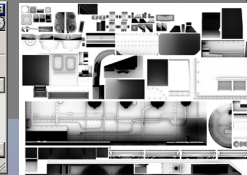


Fig.B

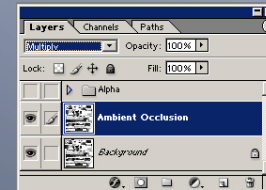


Fig.C1

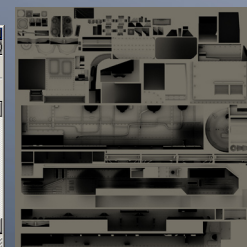


Fig.C

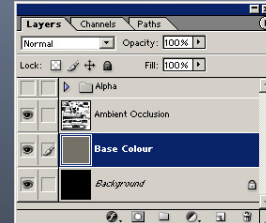


Fig.E - Final Texture

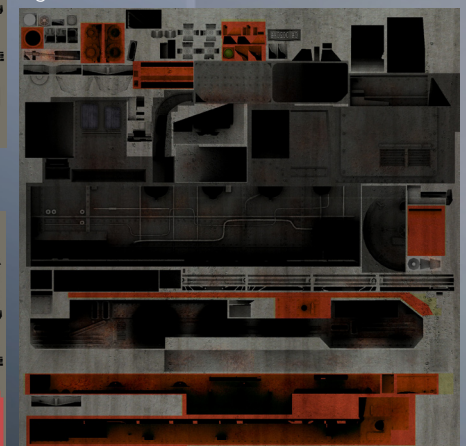


Fig.D

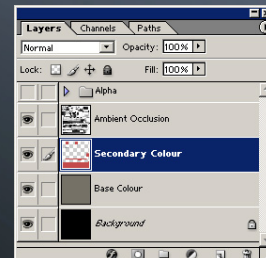


Fig.D1



LOW POLYGON TRICKS:

ROUNDING CYLINDERS:

This technique has already been discussed with more detail in the 'building the low res model'. Its been abbreviated here for those that have skipped the Ultimapper pipeline and just want to see the 'tricks'.

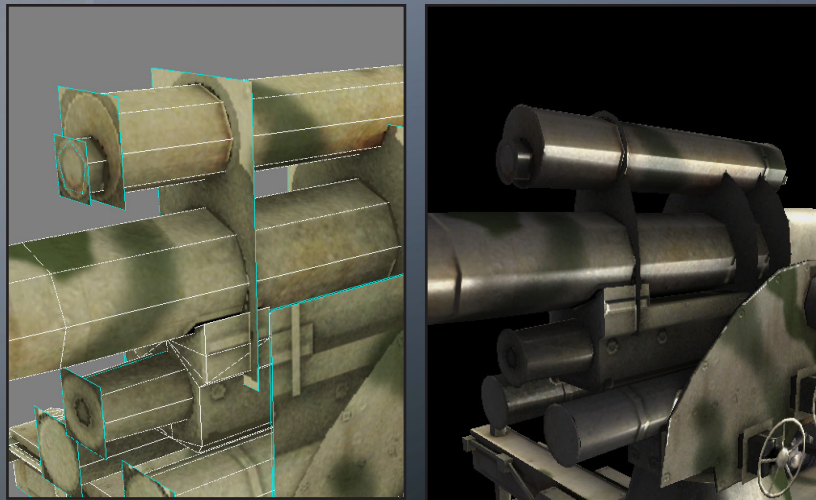
The idea is to use a low poly cylinder with circular alphas on a flat polygon capping the ends to create the illusion of a high polygon object.

NOTE: This technique could be used on a variety of complex shapes to cap them, its not restricted to cylinders.

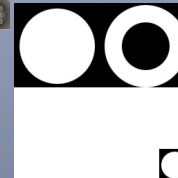
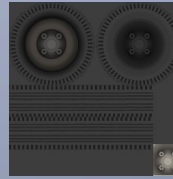
This works well with cylinders that do not contain obvious lines wrapping around the mesh. If you do have this sort of detail it is worth upping the count slightly in that area.

When creating normal maps for the low polygon version, a good tip is to bevel the edges of the end of your high res cylinder. This will help the normal map pick up lighting on the edges of the circumference and sell the effect to a greater level.

All cylinders on the Flak Gun below are 8 sided with alpha polygons on each end.



TYRE:



The tyre is made up from a 32 sided cylinder with a bevel on one side making the total amount of triangles 128.

On the front is a flat square polygon which has taken the ambient occlusion and normal from the front of the tyre. This has been alpha'd around the circumference and on the inner hub cap area so it looks like a donut shape.

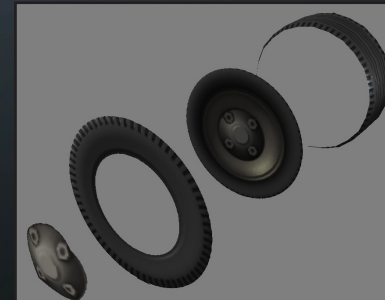
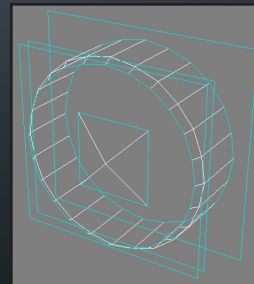
Another polygon was further inset from the first one using the same Ambient Occlusion/Normal information. This had just been Alpha'd around the circumference.

Finally a small round section on the hub cap was created from the same information and alpha'd around its smaller circumference. This section was made into a pyramid to give it a small amount of depth.

Finally a small round section on the hub cap was created from the same information and alpha'd around its smaller circumference. This section was made into a pyramid to give it a small amount of depth.

The internal alpha polygon was also duplicated to the rear of the tyre to create the other side which is rarely seen.

Total Polycount: 138 Polygons.



138 Polygon Tyre.



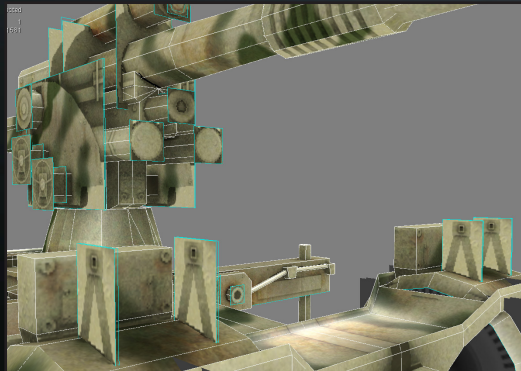
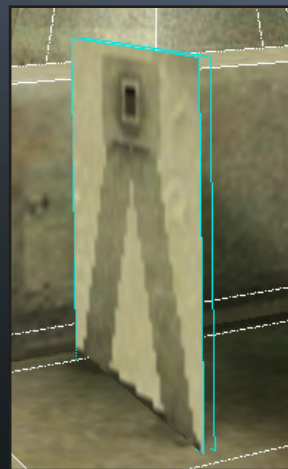
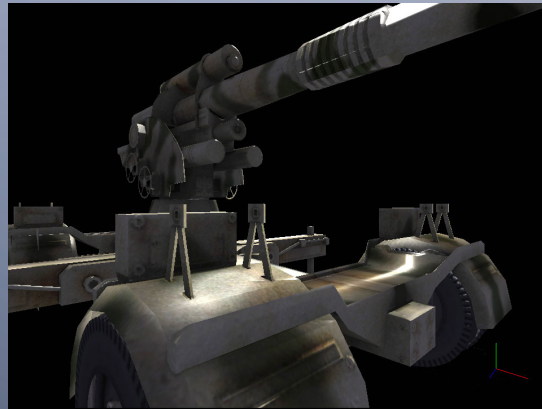
FADING DEPTH:

You will need to set the material to double sided to make the following effect work.

Take an alpha'd flat polygon, duplicate it, rotate it and make it face the opposite direction. Now make a small space between the two polygons.

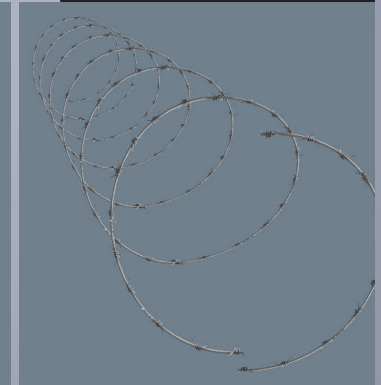
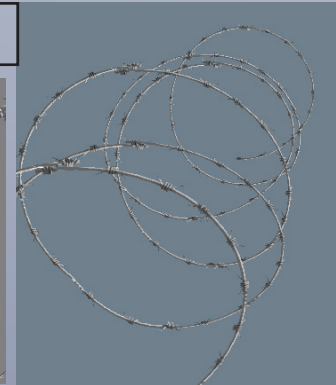
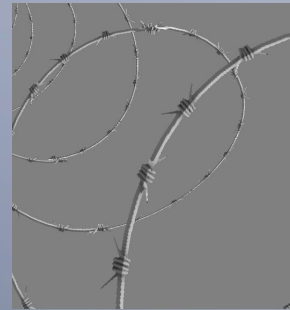
You will see when you view in Direct X an interesting effect. The light that is picked up on one side of polygon is shown on the other as it is a double sided polygon. When you are viewing on the dark side of the object you will be able to see a rim created from the rear side of the polygon receiving the light.

The opposite happens from the other direction as you see the dark rear side of the opposite polygon. This creates the illusion of thickness to a flat set of polys.



LOW POLYGON TRICKS:

BARBED WIRE:

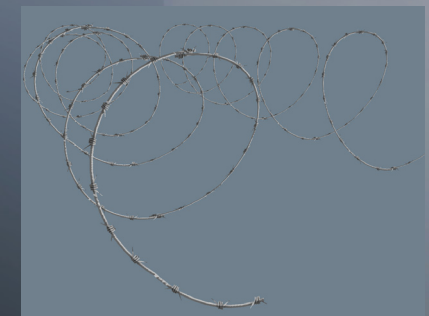
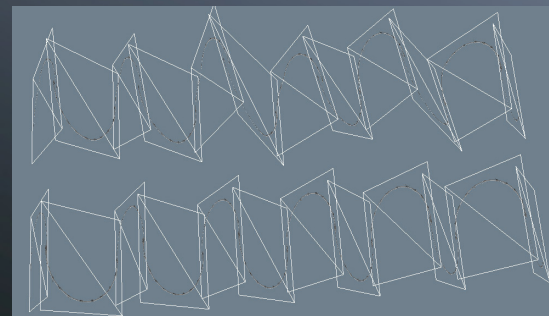
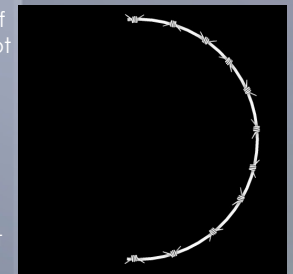


A great method of making barbed wire coils is to create them out of a simple series of peaks and valleys made from flats. This method not only looks better than texturing a cylinder but uses a fraction of the polygon count.

An alpha texture of half a coil ring is drawn required for the texture. The texture is applied to the first poly in the strip and then flipped on the other side. This continues until the end of the entire strip.

The vertices can be pushed and pulled to create a random amount of distortion and gives a very convincing look.

In the examples a normal map has been added to enhance it further.



LOW POLYGON TRICKS:

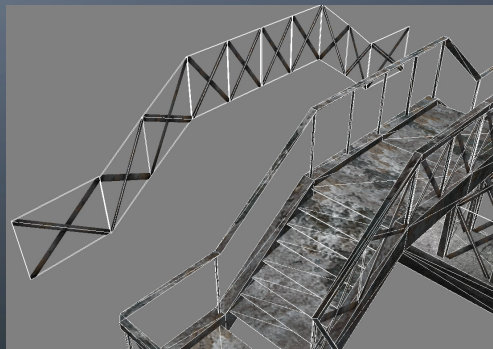
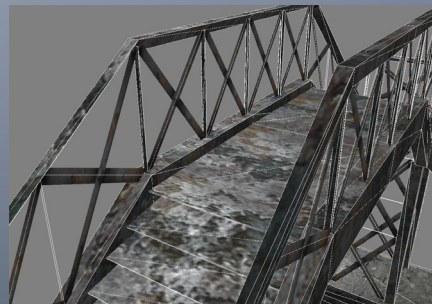
GIRDERS:

Using the 'Faking Depth' technique to create the illusion of thickness on a flat set of polys this can reduce your poly count greatly.

Create a high resolution version of some girders ensuring that the edges are beveled so the normal maps created from them will catch the light. Place the normal map onto two flat polys, spaced apart and facing in the opposite direction.

You will need to surround the flat polys with solid geometry. This masks the fact that the girders they surround are actually flat.

It is worth making the surrounding geometry out of a triangular shape with a flat top rather than square. This reduces the polygons again and no one will really notice in the end result.



RIVETS:

The following technique allows you to add rivets to any part of your object without having to include them in the texture page itself. This is useful if you are tiling a texture page but only want to include rivets on certain parts.

A high resolution model was built of the rivets to allow the creation of a normal map with lighting information.

The rivets were given an alpha channel and now, when they are placed near to the surface of the main object they will get lit accurately with the rest of the object.

