

UV UNWRAPPING GUIDELINES

FOR LIVERY/DECAL SYSTEMS

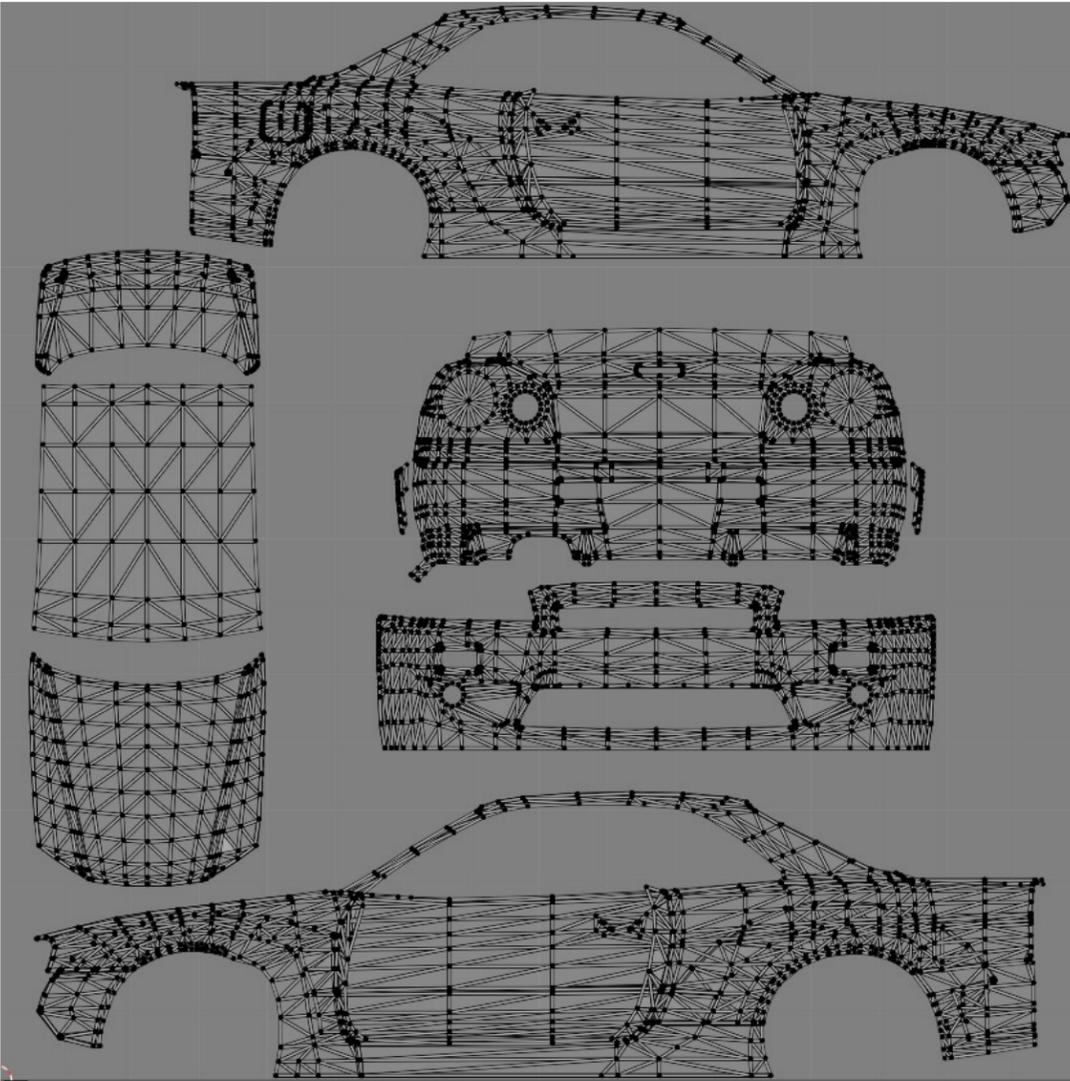


Figure 1: UV Map used in UV Set 0 of Simple Livery Creator

UV Baking

What if instead of the texture, the UV is baked.

A shader can assign up to 4 UV sets for a single model. These sets can be switched in real time. This means that a model can have 4 different ways of being UV unwrapped. This is very useful to take advantage of for real time texture painting.

When a texture is baked for a UV map, it occupies the spaces specified by the UV map. Since the UV Map is fixed projection, the texture is distorted to fit the UV map. But if the texture is fixed, the UV map can be varied to fit the model without the textures looking distorted.

This is where the capability of a shader having 4 UV sets comes in. There is a technique in UV unwrapping wherein overlapping UV islands paint the corresponding regions with same texture colors. The mirroring feature in "Simple Livery Creator" asset utilizes the UV1 (Second UV also known as the lightmap UV) to store the overlapped UV Map in UV set 1 so that painting both sides of the vehicle at the same time is possible.

```
Properties
{
    _MainTex ("First", 2D) = "white" {}
    [Enum(UV0, 0, UV1, 1, UV2, 2)] _FirstTexUVSet ("First UV Set", Float) = 0.0

    _SecondTex ("Second", 2D) = "white" {}
    [Enum(UV0, 0, UV1, 1, UV2, 2)] _SecondTexUVSet ("Second UV Set", Float) = 0.0

    _ThirdTex ("Third", 2D) = "white" {}
    [Enum(UV0, 0, UV1, 1, UV2, 2)] _ThirdTexUVSet ("Third UV Set", Float) = 0.0
}
```

UV Map – A Shaders' Friend

UV maps hold the projection information of a 3D model.

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UV Maps or texture coordinates are generated per vertex of a 3D model. These are projections – Cube, Cylinder, Sphere, Equirectangular, Projected from angle or normals and many more.

Artists often create UV Maps tailored to their needs as per the complexity of the model.

Often, baking a texture for a UV unwrapped model is done in a 3D model so that the colors in the texture are suited for the UV unwrapped model.

Several 3D modelling software packages can generate an auto-UV unwrapped map with a high texel density. This saves immense amount of time. Baking has been built into the 3D software packages, so they go hand in hand to form appropriately textured models for game engines to utilize. Game engines then assigns one of the UV sets to the texcoord and render out the textured model.

UV texturing is an alternative to the default projection mapping and one can take advantage of projecting a face or a collection of faces in a different manner than the rest.

A shader uses `_ST` parameter in CG/HLSL to move and scale the texture around, but unfortunately this does not change the UV mapping, it only changes the translation and scaling of the texture.

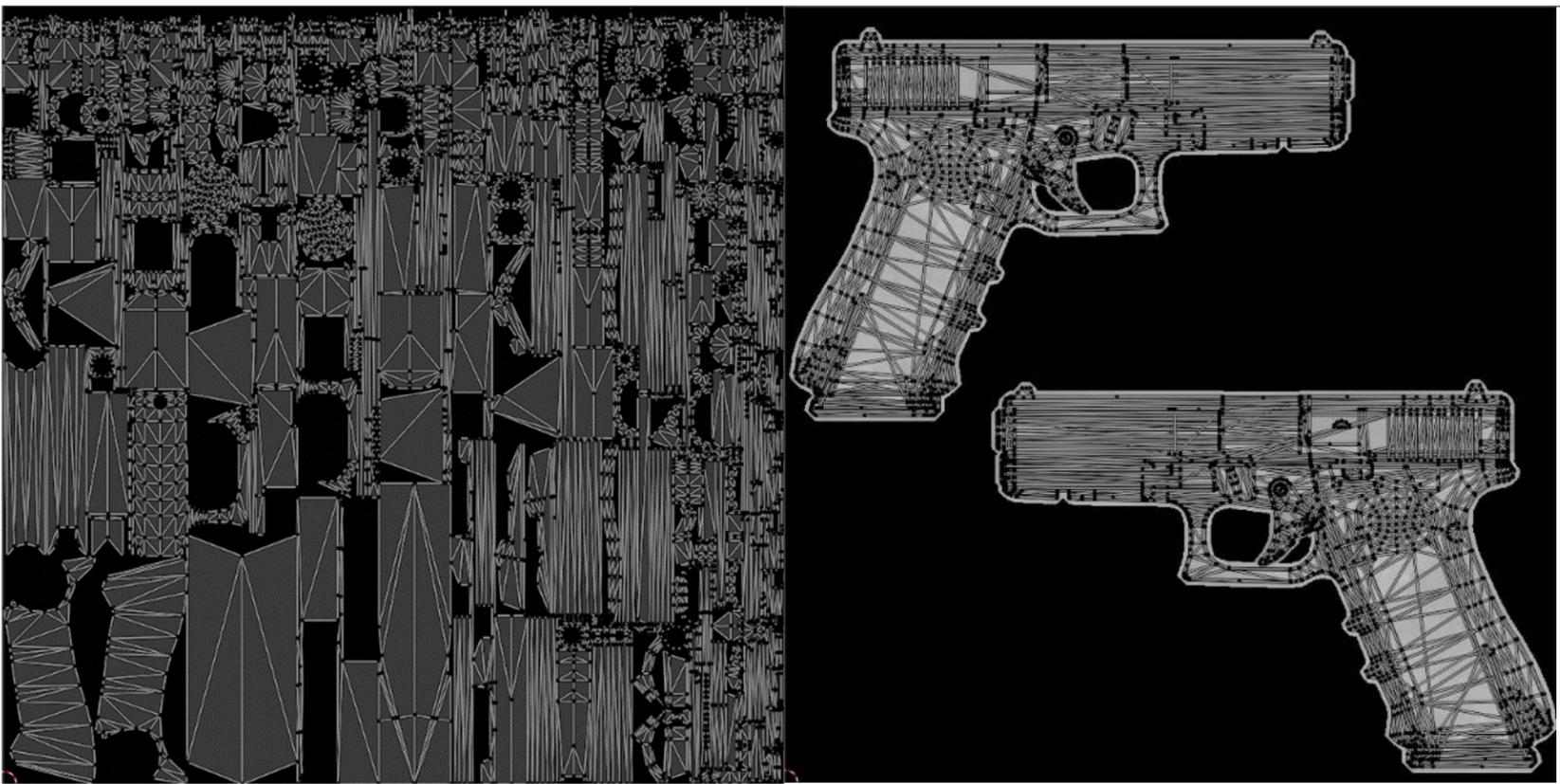
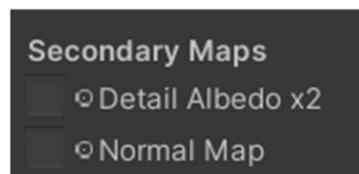


Figure 2: UVs auto generated by 3D Modeling Software for a Glock Model (left) Vs Manually Baked/Made UV Map (right)

Guidelines for UV Maps

Get the most out of livery/decal systems by perfecting UVs

Even though painting on the auto generated UVs will work for the model, the decal placement will not be continuous. This is due to the fact that a decal is pasted completely intact and in its entirety. On the left of figure 2, since the model is auto unwrapped to maximize texel density, the UV map is cut into a lot of tiny pieces aggressively. This will make the decal show up on random seemingly random places on the 3D model. The livery creator script can detect the UV island that is an active raycast object and paint on it but is not able to adjust the decal to the nearby UV islands. This is because the algorithm has no knowledge on where and how the islands connect to each other hence almost every texture painting system in a game engine works best with a continuous unwrap. Since a continuous UV unwrap is not always possible for complex models, those UV maps need to be custom made. One could use a 3D modelling software to make a custom UV unwrap suited to their needs. Please note that any texture baked on the original UV map will be distorted once the custom UV map is made. This is due to the fact that the vertices in the original map have been changed to make a more continuous custom UV map. One could however rebake the original texture and still have it on the model. This can be done by utilizing the detail albedo property of the shader for displaying the **original texture + stickers**.



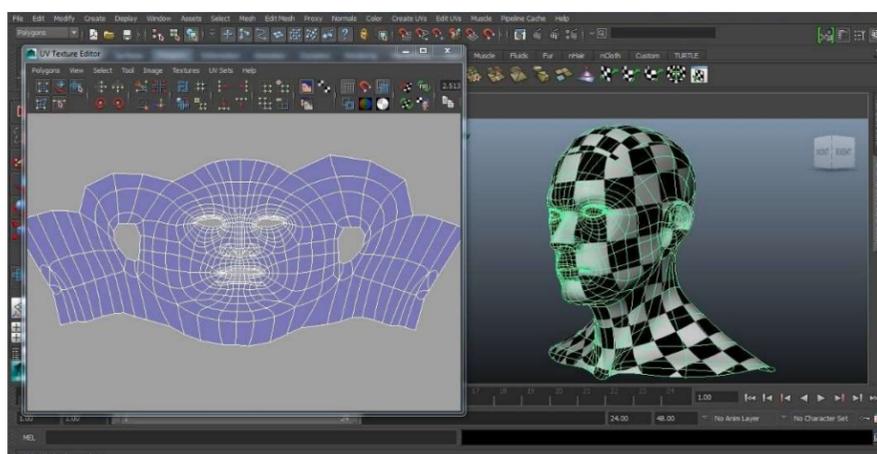
Creating a custom UV map can range from a 2-minute job to an hours' worth of work depending on the complexity of the model and where one wants to paint on it. There can be obvious creases on the model where the UV discontinues from the adjacent mesh. The fastest method to get the biggest chunks of the model is to project the model from side view which will get the entire object flat and paint both the sides (as the mesh on the opposite side is overlapping) or select linked meshes and try getting a continuous unwrap.



Decal placement on an auto generated UV map (left) vs Decal placement on a Manually Baked UV Map (right).

A UV unwrap that is perfect for your model should:

- Be as continuous as possible unless a crease is required to demarcate the portions that cannot be painted.
- Should cover most of the space inside the map. This helps in obtaining a higher resolution (visually) image.
- Refrain from placing the UV's on non-absolute axes (anything other than 0 or 90 degrees). Doing so may cause warping or rotation of the decal although the user can rotate the decal as per their wish in the livery creator systems offered by AiKodex.



A good example of a continuous UV unwrap.