TI 3D Surround View MeshGen Tool

Customer User Guide

MeshGen Introduction

Vision technologies are some of the most important contributors to safety in assisted and autonomous driving systems. Surround view monitoring has been a foundational ADAS application for years, specifically in parking and low-speed driving scenarios. As the market demands grow for more realistic 3D modeling of the vehicle environment, so do the processor requirements. The automotive industry standard has been to use a powerful SoC GPU to do 3D modeling of the car. Here at TI, we believe we are changing this standard. By using the MeshGen tool along with TI's TDA3 SoC, automotive developers can design 3D surround view systems without the use of a dedicated GPU. In the end, this innovation enables more efficient and cost-effective systems. This user guide will help TI's customers understand and utilize MeshGen to develop innovative 3D surround view systems.

MeshGen Keyboard Controls

Input	Function
c	Adjust view: Camera
t	Adjust view: Target
a	Adjust view: Angle
b	Toggle bowl on/off
v	Toggle car on/off
i	Sets delta change to + direction
d	Sets delta change to - direction
x	Adjust view by delta in x direction
y	Adjust view by delta in y direction
z	Adjust view by delta in z direction
m	Increase delta size
l	Decrease delta size
1	Choose assigned view 1

Input	Function
2	Choose assigned view 2
3	Choose assigned view 3
j	Turn repeated view animation on
k	Turn repeated view animation off
q	Exit tool
n	Toggle mesh grid on/off
w	Change car model
L	Reshape left side of bowl
R	Reshape right side of bowl
F	Reshape front side of bowl
B	Reshape back side of bowl
.	Set bowl reshape to + direction
,	Set bowl reshape to - direction

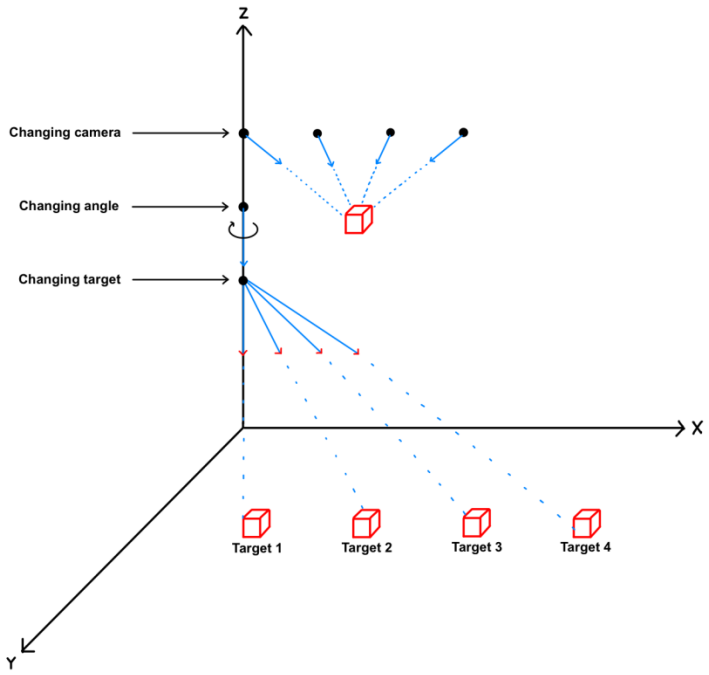
Figure 1: Default Increment Sizes

	Camera	Angle	Target
x	20	0.5	5
y	20	0.5	5
z	20	0.5	5

View Generation

There are three adjustment modes in the process of defining views: camera, angle, and target. By combining variations of these adjustments the user can define specific views for any 3D surround view application.

Figure 2: View Adjustment Modes



Camera || this mode allows the user to change the position of the virtual camera in 3D space (x,y,z). The target is fixed at the center of the view. Because of this, changing the position of the camera causes the angle to change accordingly (see figure 2).

Angle || this mode allows the user to change the angle of the virtual camera about a desired axis (x,y,z). AS the target stays fixed, the camera position changes with each angle adjustment from the user.

Figure 3: angle adjustment

Target || this mode allows the user to change the target location that the camera view is centered on. While keeping the camera position fixed, this mode centers on a new position by adjusting the camera angle (see figure 2).

Importing 3D Car Models

Step 1: Install required software packages

- Go to https://community.imgtec.com/developers/powervr/installers/
- Choose the correct operating system and install the PowerVR Tools & SDK

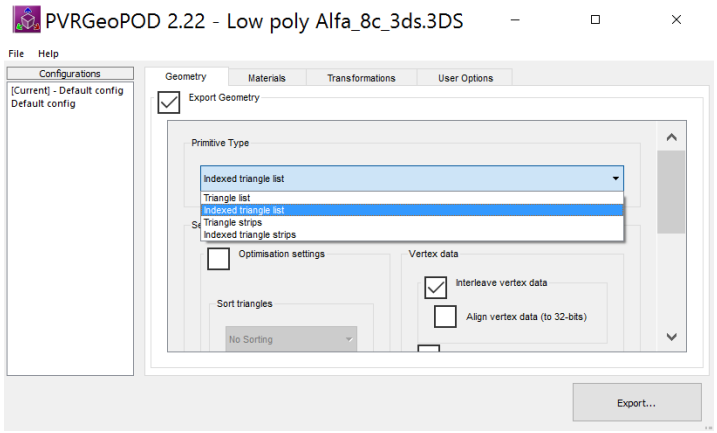
Step 2: Download/purchase 3D car model (if necessary)

- Example source: www.turbosquid.com
- Make sure one of the following image file formats are supported in your download: .3ds, .obj, .fbx, .dae
- Purchase and download file to your PC (most likely will download .zip folder with multiple image files inside

Step 3: Convert 3D model image to POD file

- Open PVRGeoPOD program
- **Click file -> open -> "select the downloaded 3D format file (.3ds, .obj, .fbx, .dae)"**
- Choose "Indexed triangle list" as Primitive Type (see figure 4 below)

Figure 4: POD conversion in PVRGeoPOD



- Click "Export…" and select desired folder to export POD file to

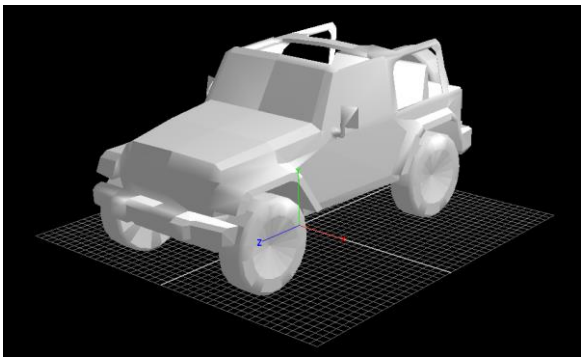
Step 4: Convert texture image files to .bmp format

- Use any trusted online image converter
- Convert the downloaded image files (usually .jpg) to .bmp format
- Save .bmp files to same folder as POD file from step 3

Step 5: open and edit 3D POD model

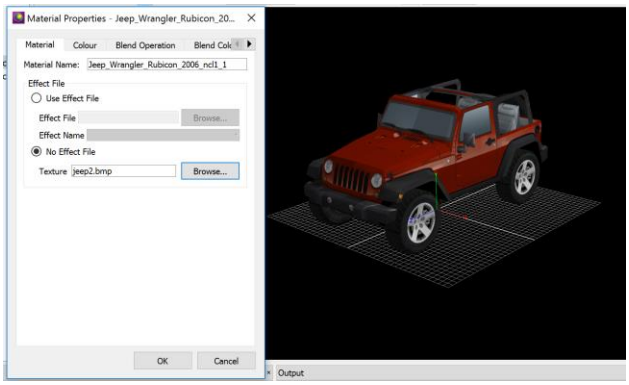
- Open PVRShaman program
- **Click file -> open POD -> "select POD file from step 3".** This should yield something like figure 5 below:

Figure 5: POD import into PVRShaman



- To add textures:
  - Double click the part of the car that you want to add a texture to. The part will be highlighted by a red grid when selected.
  - click the  button
  - Name your new material (example: "red car body", "windows", etc.)
  - select "No Effect File"
  - Select the desired .bmp file from step 4
  - With the same part of the car selected, click the  button.
  - Under the "Material" list, choose the material you just added (see figure 6)

Figure 6: Adding materials to POD model



  - Repeat this for all your .bmp files
- When all textures are added, create new folder in **<install dir> -> srv -> models** and save POD and all .bmp files to this folder
- **IMPORTANT**: the imported car model needs to be centered about the origin and scaled properly in order to function properly in the MeshGen tool (see example below).

Step 5: Add new car model to source code

- Inside “srv” folder, open **car.cpp** file
- Add model specs to car_data[] struct on line 120
    - Example: in step 4, I created a folder called red_sports_car and saved the POD file as red_sports_car.pod. I enter the info as shown below:

```
{
    "jeep",
    "jeep.pod",
    NULL,
    NULL,
    NULL,
    NULL,
    90,
    180,
    0,
    25.0f,
},
```

Example

When importing a new car model, it is important that it is centered and scaled properly. As an example, here is a model that is not centered and scaled correctly when imported into the PVRShaman program. In figure 7, the car is clearly not centered about the origin on the grid shown. When this POD file is imported into the MeshGen tool, the model will not show up in the surround view bowl. Similarly, figure 8 shows the scaling of the car. The values in the “current view properties” window are orders of magnitude higher than those of the values in the working model from shown on the left in figure 8.

Figure 7: offset car model

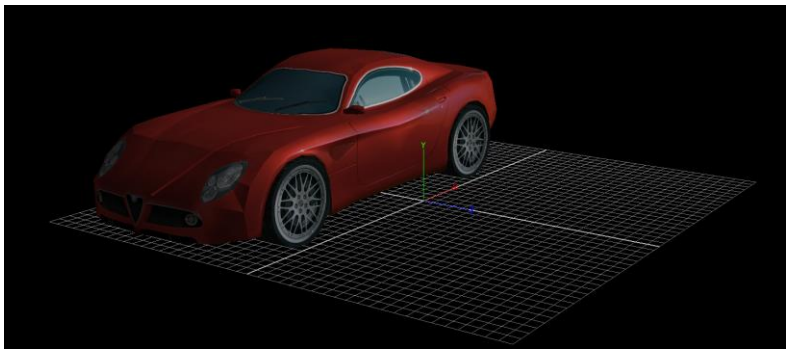
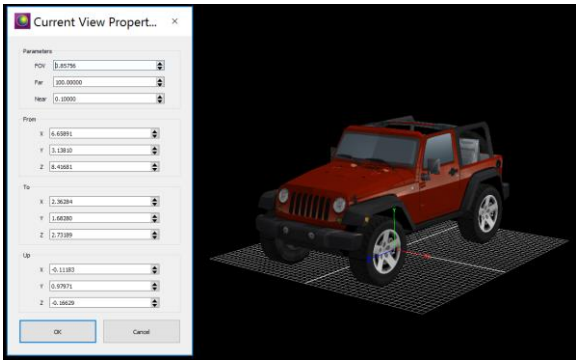
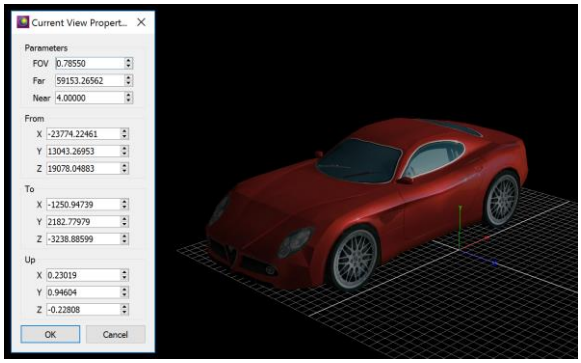


Figure 8: car model scaling (correct – left, incorrect – right)





MeshGen Operation Instructions

Step 1: Import 3D car model (see above)

Step 2: Generate Desired Views

1. Open srv_params.txt in your favorite text editor
2. On code line 9, set Srv_genV2WFile flag to 0 to enter view generation mode
3. Build solution and run executable file: 3dvis.exe
4. Use keyboard controls (page 1) to navigate to desired view
5. In MeshGen command prompt, highlight generated view parameters (9 total values), click the upper left window -> edit -> mark, and then copy them (CTRL+C)
6. Open srv_views.txt
7. Paste (CTRL+V) view parameters onto new line and save file
8. Repeat steps 4-8 for your desired amount of views

Step 3: Generate V2W table

1. Open srv_params.txt in your favorite text editor
2. On code line 9, set Srv_genV2WFile flag to 1 to enter V2W generation mode
3. On code line 24, set number of views you chose from step 2 (generating desired views)
4. On code line 27, set the number of transitions between views (default = 30)
5. On code line 35, set desired car model
6. Save srv_params.txt and run 3dvis.exe
7. The generated V2W binary will be stored in the srv directory

Step 4: Load V2W binary onto device