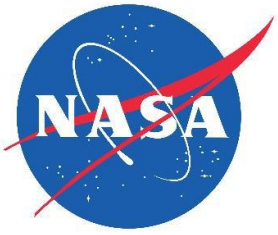
RAPID MODEL IMPORT TOOL

(RMIT)

User Guide



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1.1 Overview

The NASA Rapid Model Import Tool (RMIT) is designed to import 3D models built in commercially available Computer Aided Design (CAD) and Digital Content Creation (DCC) development software such as; Catia, Creo, 3DS Max, Maya, etc. Upon import, RMIT processes the models to reduce file size and exports the results in a format compatible with Augmented Reality (AR) and Virtual Reality (VR) development software applications. RMIT intends to make CAD models directly accessible to engineers from local AR/VR compatible laptops and desktops.

1.2 High Level Architecture

The diagram shown in Figure 1 displays high-level RMIT architecture.

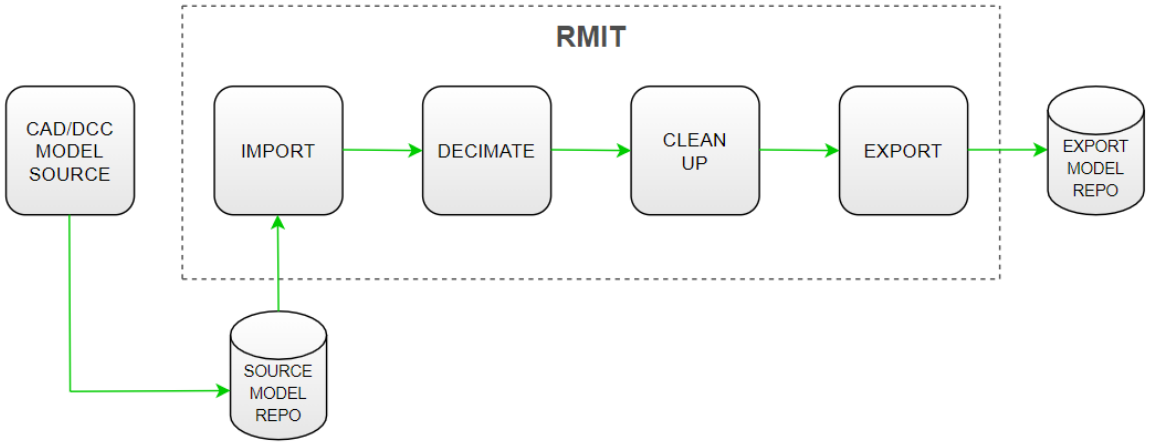

Figure 1: RMIT Architecture

a. Import
   RMIT is designed to import popular file types (e.g. FBX, DAE, STL, OBJ, GLTF) generated by CAD/DCC development tools on today's market. File types may be expanded with "Datasmith".

b. Decimation
   Decimation refers to reduction in polygon count of the imported model, with the goal of reducing the file size of the result.

c. Clean Up
   RMIT has several built-in functions to help make the model more usable in the virtual environment and will be detailed in subsequent sections of this document.

d. Export
   RMIT exports models in the GL Transmission Format (glTF) format, which is compatible with the Unity development tool. The glTF format is gaining significant support amongst the AR/VR, gaming, and entertainment industries as the model format of choice

2. Getting Started

Download RMIT from the NASA Software Catalog (https://software.nasa.gov)

2.1 Installation

Unzip the downloaded zip file and save to the chosen file directory.

2.2 Startup

Click on the RMIT desktop icon or use RMITGUIProcess.exe from the directory.

3. User Interface

RMIT's user interface is comprised of the initial Launcher Window & Settings Window, Control Window and "Headless Mode" option. The user has the option to use "interactive mode" which is keeping the RMIT Control Window and Blender Window visible upon importing the model or "Headless Mode" which hides these windows upon import.

3.1 Launcher Window

Upon launching RMIT; users will be presented with the RMIT Launcher Window (see Figure 2) which contains options for the user to select import, modification, and export specifications to apply to the chosen imported model. Figure 2 shows the RMIT Launcher Window.

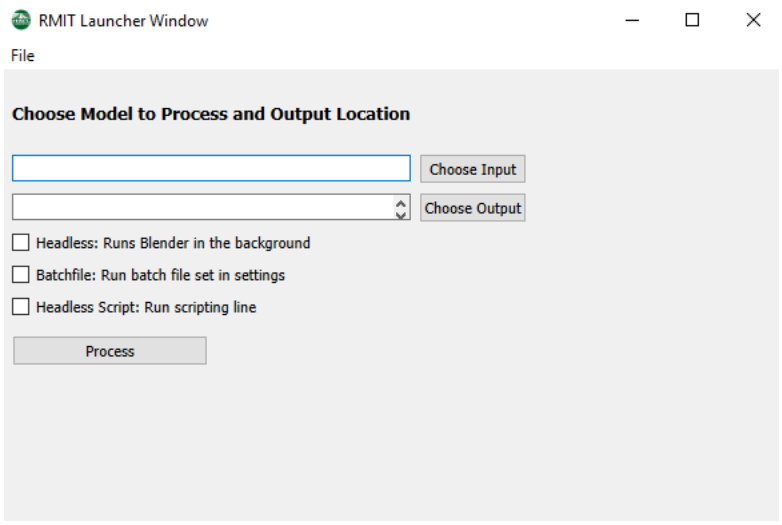

Figure 2: RMIT Launcher Window

3.2 RMIT Support Window

Located in the "File" drop down menu, the Support Window (See Figure 2) provides a form for users to submit their inquiries and feedback along with an RMIT.log file to the development team. Uses may send the report via Outlook or save directly to desktop to attach and email.

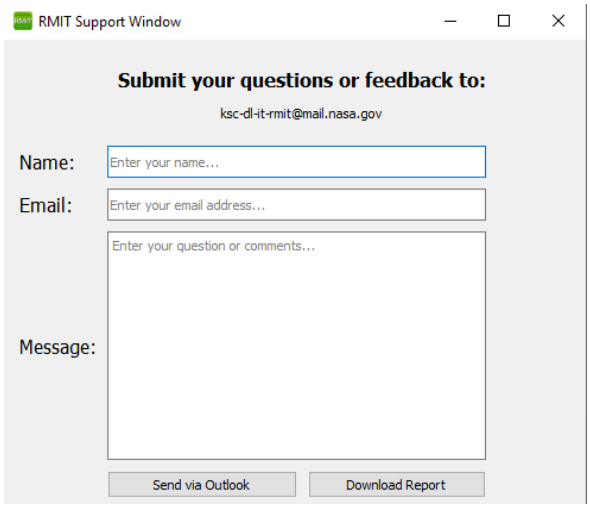

Figure 3: RMIT Support Window

3.3 Headless Mode

"Headless Mode" is selected by checking the box in the Launcher Window which will cause the RMIT Control Window and the Blender window to not appear upon importing the model because it is running in the background. This will require the user to input all modification functions using the RMIT Launcher Window. All RMIT functions behave identically regardless of whether the user is in "interactive mode" or "headless mode". Once selected the processing functions will appear an expanded Launcher Window. Figure 3 shows the RMIT Launcher Window with "Headless Mode" selected.

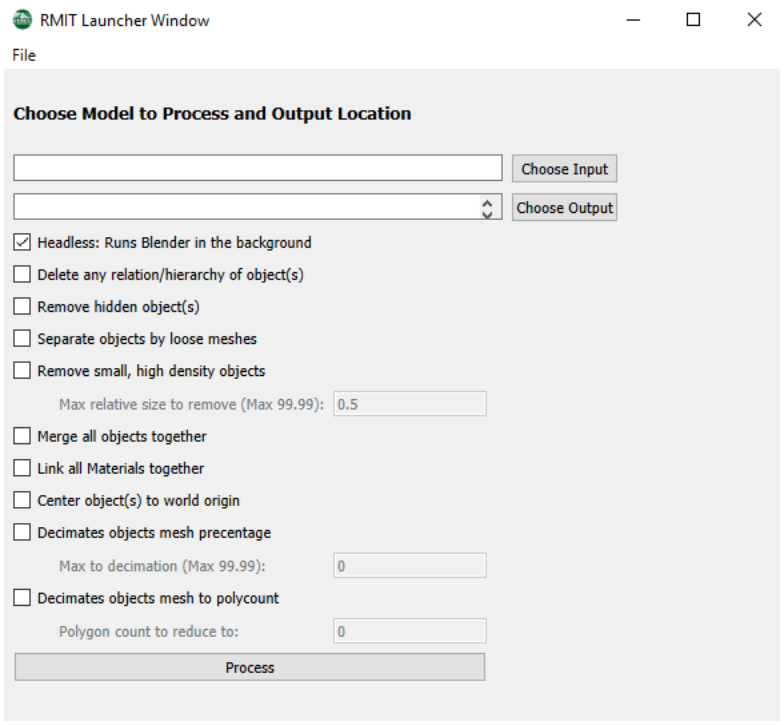

Figure 4: RMIT Launcher Window – "Headless Mode"

When in headless mode, the RMIT Launcher Window will lock while the selected functions are executed. The window will unlock once the process is complete and the model is exported to the location specified by the user.

3.4 RMIT Control Window

Once the “Process” button is selected from the RMIT Launcher Window, the RMIT Control Window will appear. Figure 4 shows the RMIT Control Window GUI.

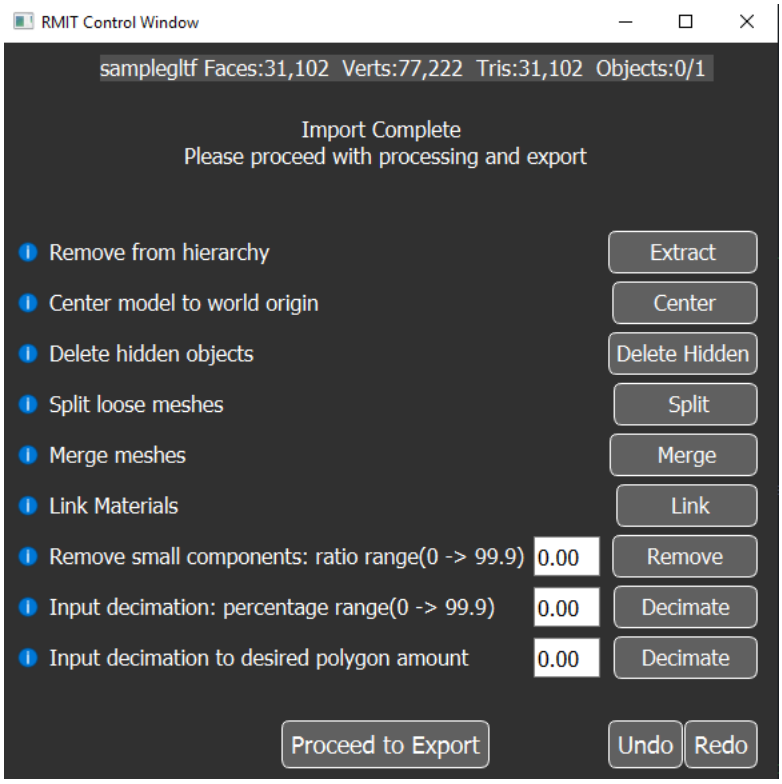

Figure 5: The RMIT Control Window

This window contains information about the model being processed in the first line; the file name, size, number of objects, number of faces, and number of triangles, and the file size. Underneath this line is a status message to the user about the current state of the model processing.

4.0 Application Features

RMIT is comprised of four main core functions; Import, Export, Decimation, and Clean up.

4.1 Import

***NOTE*:** If importing files beyond the following types you will need to download Unreal Engine 5.0 to take advantage of the Datasmith File Parser. Once installed, this is the file path to the Unreal Command Line Executable.

"C:\Program Files\Epic Games\UE_5.0\Engine\Binaries\Win64 \UnrealEditor-Cmd.exe"

Choose input models formatted in the following extension types (.OBJ, .FBX, . DAE, .PLY, .GLTF, .STL, .SVG). **To import a model in an unsupported format**, select "Settings" from the File menu in the Launcher Window and select the Unreal Engine CMD path to enable "Datasmith". This will require the installation of Unreal Engine. Once the launcher window is open; upon clicking "File" and then "Settings", the "Settings" window will open with a prompt to set an Unreal.exe path. Once this path is set, accepted filetypes are expanded. Figure 5 shows the RMIT Settings Window GUI.

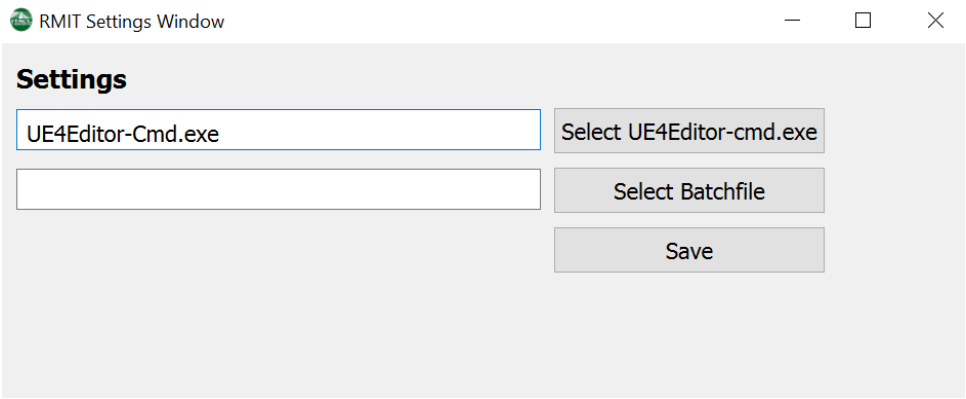

Figure 6: The RMIT Settings Window

4.2 Remove from Hierarchy

If selected, this feature flattens the tree structure of the model while preserving the required object dependencies. This is used to help reduced the exported file sizes by removing empty nodes that can be present in more complex models.

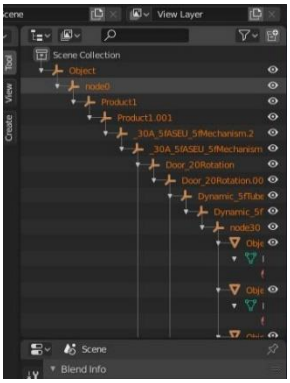

Figure 7a: Before flattening

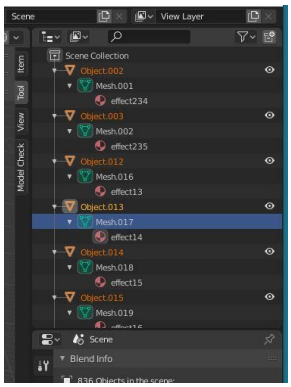

Figure 7b: After flattening

4.3 Center Object(s) to World Origin

The option to center objects to the world's origin will run on parts selected or otherwise will default to all. After calculating the center of all mesh objects using world coordinates as the reference this function will center all objects. The blender scene is then updated with the applied changes. Figure 8 shows the model after being centered at the Blender world origin.

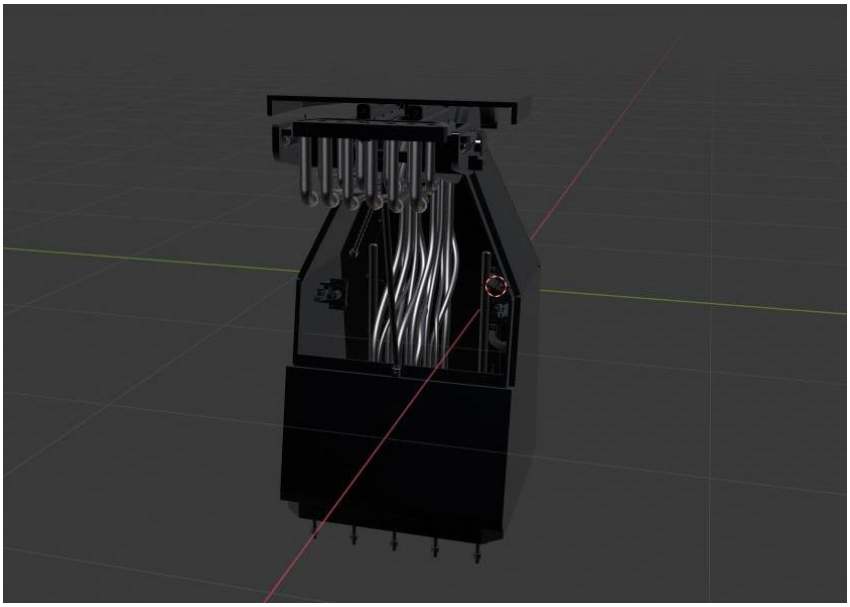

Figure 8: Model centered at origin

4.4 Delete Hidden Objects

If a model contains object(s) that are completely enclosed by other objects and therefore hidden from view, this option removes these objects.

4.5 Split Loose Meshes

Objects may be split into a set of objects that each contain an individual mesh for objects that are comprised of multiple disconnected meshes that do not share vertices.

4.6 Merge Meshes

Merge all meshes in the model into a single mesh by pressing the “Merge” button without selecting any meshes or select a group of meshes to merge while the meshes unselected remain unchanged.

4.7 Link Materials

This option will link similar or exact materials together within a model. This operation will merge materials of objects in order to reduce materials. Select specific objects whose materials will be linked. If no objects are selected, this operation will by default, process all objects in the scene.

4.8 Remove Small Components

Select between a ratio range of (0 -> 99.9) to set the size of a bounding box by percentage and remove objects whose sizes fall inside this bounding box. This function will record the bounding box of the scene, calculate the percentage threshold for component removal and then compare items to the removal threshold. Objects that fall within this range will be deleted. Figure 9a and 9b show a before and after of this process.

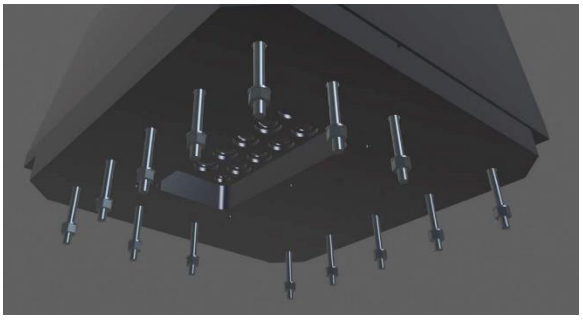

Figure 9a: Before small object removal

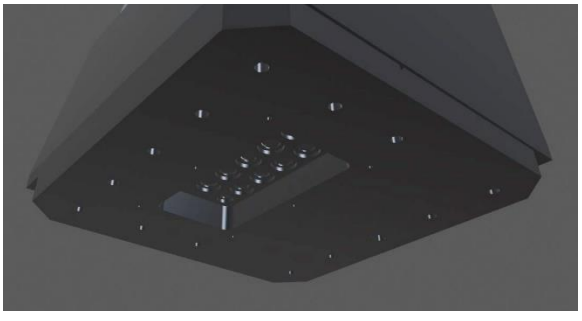

Figure 9b: After small object removal

4.9 Input Decimation

This selection will un-subdivide the triangle count of the model using “edge collapsing” which will result in a reduction of overall model density. Select the number of polygons by percentage within the range (0 -> 99.9) or by exact polygon count in the Control Window for reduction. This will lower the level of detail in a model and result in a reduced file size upon exporting. Figure 10a and 10b show a before and after of this process.

Figure 10a: Before decimation

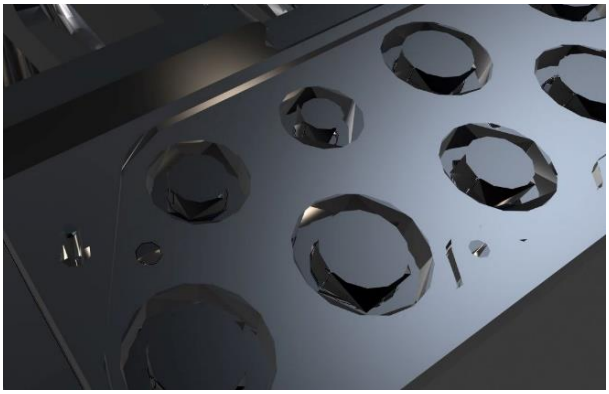

Figure 10b: After 50% decimation

4.10 Export

Complete model processing by exporting the model to a location by choosing the output in the RMIT GUI window. This will export the scene into a GLTF format that will result from the specified modifications made by the user to this specific location. The processed model will now be compatible and can now be imported into AR/VR software tools.

Appendix A: glTF models in Unity

Unity requires downloading and installing a glTF import asset in order to import glTF models.

Steps to install glTF import asset in Unity:

1. Go to https://github.com/ousttrue/UniGLTF/releases/tag/v1.27
2. Download **UniGLTF-1.27.unitypackage**
3. Open a new Unity session
4. Click on **Assets->Import Package->Custom Package...**
5. Navigate to the location where UniGLTF-1.27.unitypackage is stored
6. Click on **UniGLTF-1.27.unitypackage**, then click on **Open**
7. When the Import Unity Package window opens, click on **Import**
8. Note that **UniGLTF-1.27** is added to the Unity task bar

Steps to import a glTF model in Unity:

1. Click on **UniGLTF-1.27** on the task bar
2. Click on **Import**
3. Navigate to the location where the glTF model you wish to import is located
4. Click on the model
5. Click on **Open**
6. When the **Save prefab** window opens, click on **Save**
7. From the Assets folder, drag the model into the scene

The Rapid Model Import Tool (RMIT) was developed and is maintained by NASA Kennedy Space Center – I.T. Advanced Concepts Lab. For all inquiries contact: ksc-dl-it-rmit@mail.nasa.gov