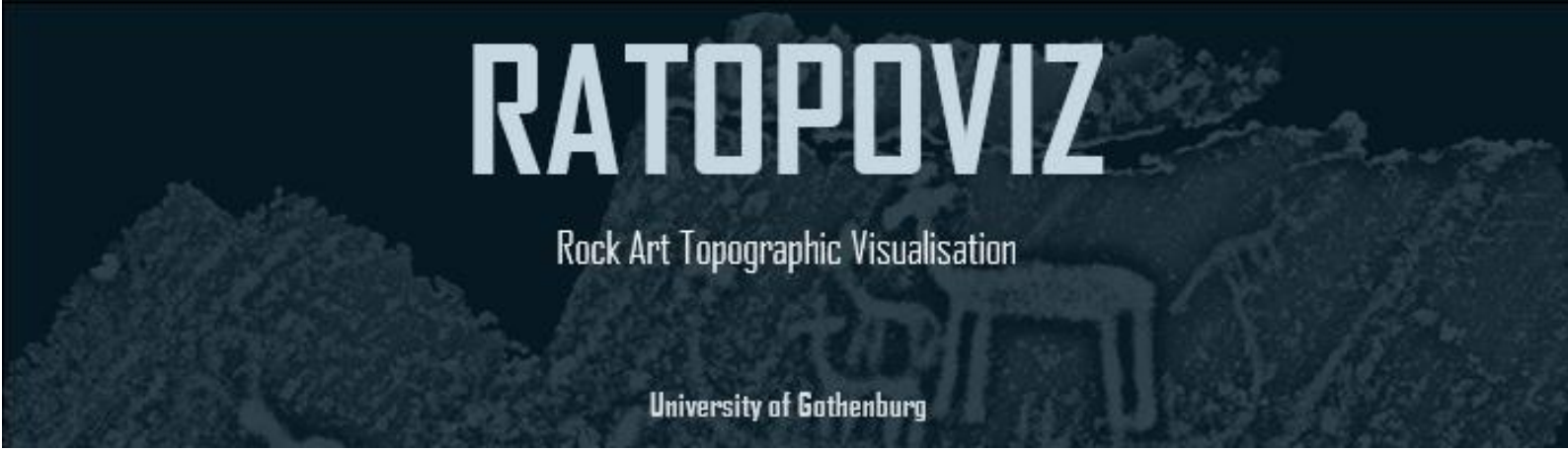

Introduction

ratopoviz (Rock Art Topographic Visualisation) is a tool developed using landscape archaeology methods to highlight the detail of rock art in 3D meshes. The image output from ratopoviz includes depth maps, topographic maps, enhanced topographic maps, normal maps, and blended maps in colour and greyscale. The methods used to generate each image are detailed in Horn, C., Ivarsson, O., Lindhé, C. *et al.* (2021).

Using ratopoviz

Users should save the ratopoviz files to the Documents folder, or anywhere on the drive if there are no permissions restrictions, and keep the folder structure. Mesh and output data can be stored anywhere on the drive. If you receive missing file error(s) in the ratopoviz output, check that your anti-virus software has not automatically quarantined files from the 'dist' subfolder.

Before running the ratopoviz tool, a json file must be generated with the tool's parameters. Users must select the input and output file settings as well as any additional processing steps.

File Settings

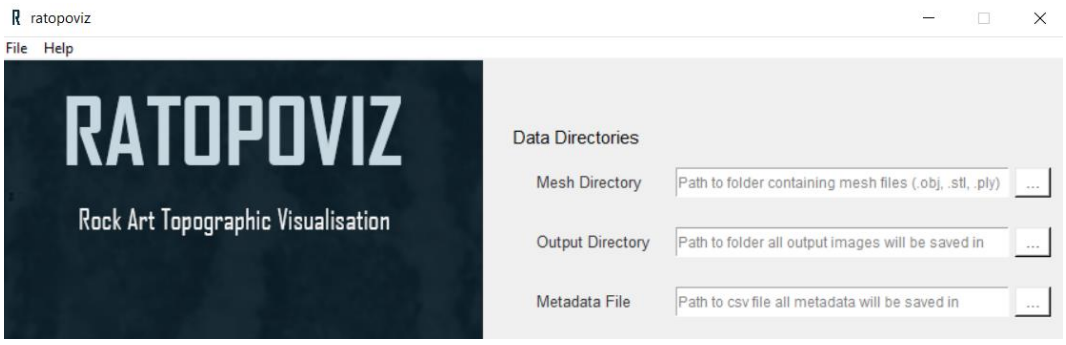

Figure 1: File settings section of the ratopoviz app

1. **Mesh Directory**: Path to the directory where mesh files are stored. The mesh files must be in .stl, .ply, or .obj format. File path should use **'/'**, rather than **'\'**. Due to scaling concerns, it is recommended to process meshes from different instruments separately. See **Suggested Parameters** for reference scales for the instruments that have been tested.

2. **Output Directory**: Path to the directory where the images created by ratopoviz will be saved. File path should use **'/'**, rather than **'\'**. The output will be a directory for each mesh processed, with three subdirectories in each folder for the blended maps, topography maps, and enhanced topography maps.

3. **Metadata File**: Path to a csv file where the metadata recorded by ratopoviz will be saved. File path should use **'/'**, rather than **'\'**. Ratopoviz records the mesh size, resolution, and output image size.

**Note: Data will be overwritten if the file paths are not updated after each run.

Mesh Settings

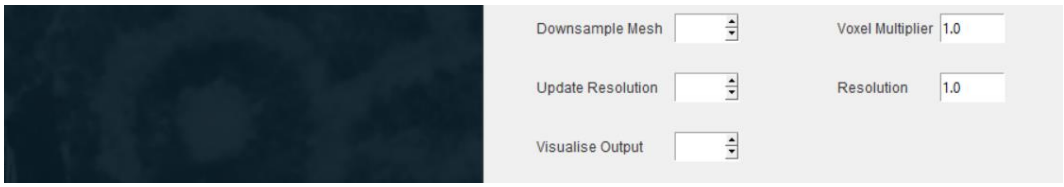

Figure 2: Additional processing options section of the ratopoviz app

1. **Downsample Mesh** allows the option to simplify the vertex clustering of the input mesh. If downsampling (select 'Yes'), the **Voxel Multiplier** field must also be updated to set the voxel size for downsampling.
2. **Update Mesh Resolution** changes the scale of the input mesh. This parameter is sometimes necessary when using certain instruments (e.g. HandySCAN 3D scanners) and can help improve the output images depending on the depth range of the mesh. Select 'Yes' to scale the mesh or 'No' to keep the original resolution. If selecting Yes, the **Resolution** field needs to be updated with a value greater than zero. The default scale value is 1.
3. **Visualise Processing Output** allows the option to view the output from ratopoviz while the tool is running. The images generated by the tool will be displayed in pop-up windows that must be closed to force the tool to continue running.

Running ratopoviz

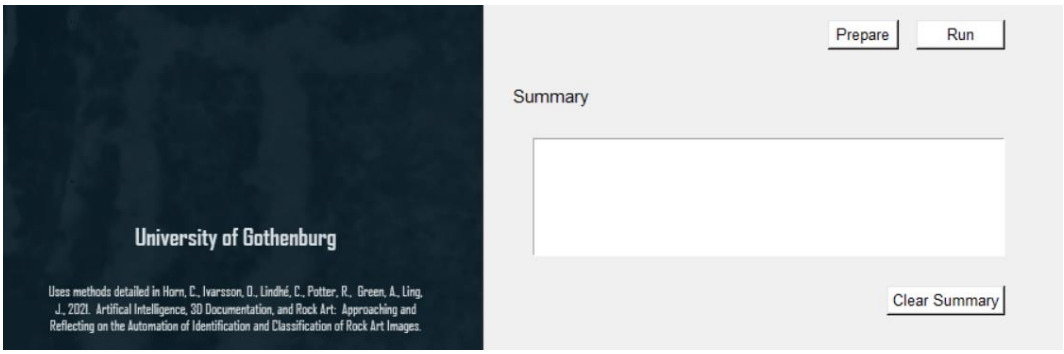

Figure 3: Running ratopoviz and saving the text output

1. **Prepare** writes the above information to a file called 'config.json' in the project folder. This file must be generated and saved in the project folder to run the program. You only need to rerun **Prepare** when you update the tool's parameters.
2. **Run** initiates the ratopoviz tool. When running, a Processing button will be displayed instead. Processing can take up to 10 minutes per mesh; if the program is not responding to other button clicks, it is still processing in the background.
3. **Print Summary** (located in the **File** menu) writes the output in the summary field to a text file, with an automatically generated filename, in the project folder.

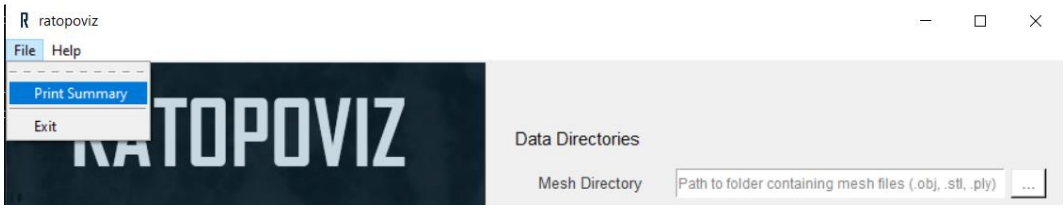

Figure 4: Saving the text output from ratopoviz to a text file

4. **Clear Summary** removes all data from the summary field.

Suggested Parameters

Instrument	Tested Scale
HandySCAN 700	0.01
Leica	10
General SfM	10
DJI Mavic 2 Pro Drone	0.1

The scale will depend on the depth range of each mesh, it is recommended to process only similar meshes in a batch, and each mesh may require testing a range of scales to obtain the best result.

Further Reading

Horn, C., Ivarsson, O., Lindhé, C. *et al.* Artificial Intelligence, 3D Documentation, and Rock Art—Approaching and Reflecting on the Automation of Identification and Classification of Rock Art Images. *J Archaeol Method Theory* (2021). https://doi.org/10.1007/s10816-021-09518-6

Horn, C., Pitman, D., and Potter, R. An evaluation of the visualisation and interpretive potential of applying GIS data processing techniques to 3D rock art data. J Archaeol Science: Reports (2021). https://doi.org/10.1016/j.jasrep.2019.101971