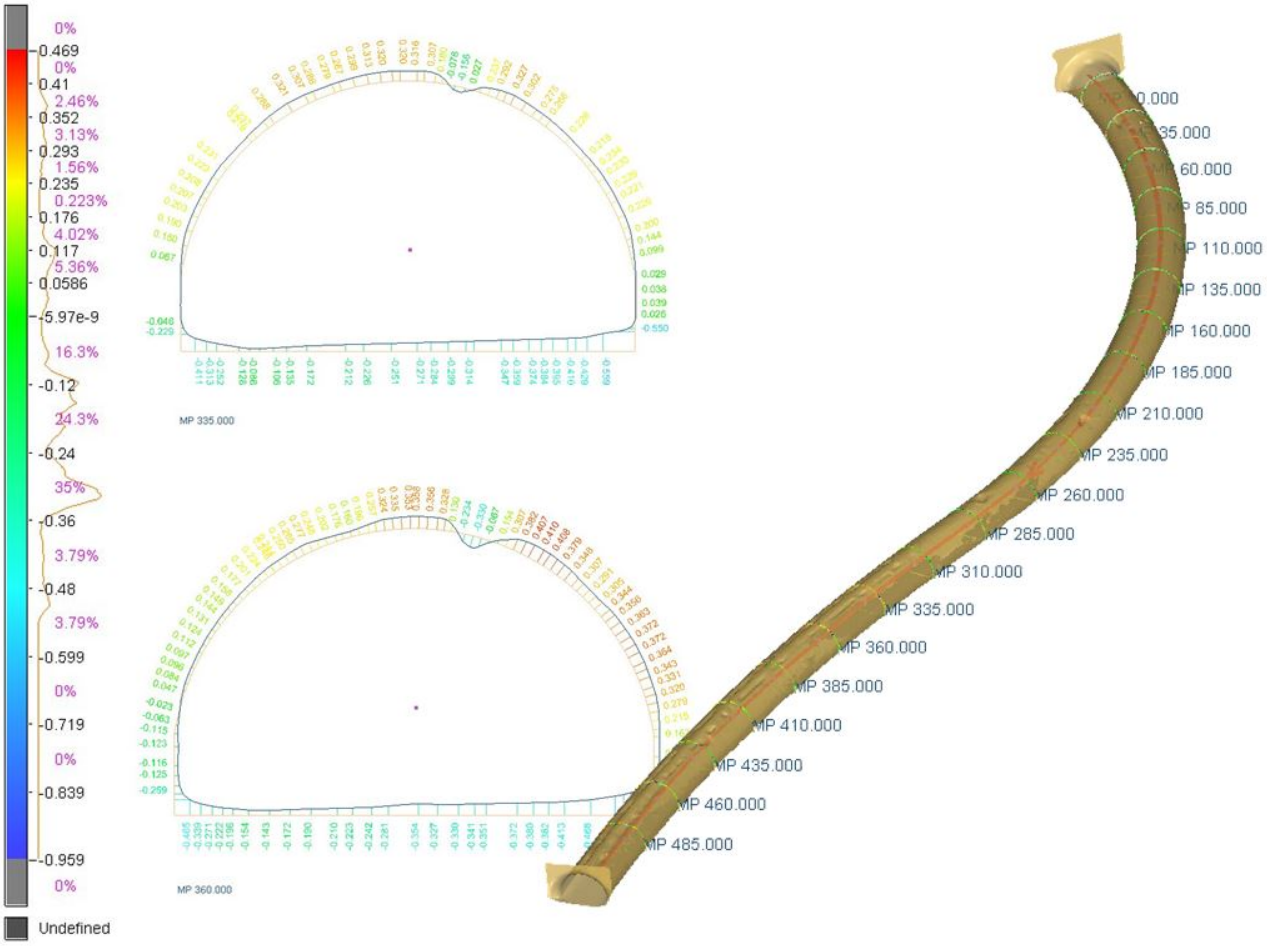
3DReshaper Practical Exercise

Ex8 - Tunnel inspection and animation



Introduction

In the software, you can process a tunnel inspection thanks to several commands:

- Compute neutral axis,
- Create cross sections along an axis,
- Compare cross sections,
- Print in a specific template,
- Compute volumes of overbreaks and underbreaks,
- Create a 2D inspection map,
- Create a video animation.

The file used in this tutorial is **TunnelInspection.rsh**

1 Computing the neutral axis of the tunnel

First we need to reconstruct the neutral axis of the tunnel.

- Select the mesh and launch the command Polyline \ Neutral Axis.
- Choose **Circle** section, don't define the diameter, and uncheck both **Reconstruction** options as we don't need to reconstruct the tunnel. Click on **Preview** to see the resulting neutral axis.
- Click on **OK** to validate the axis in the scene.

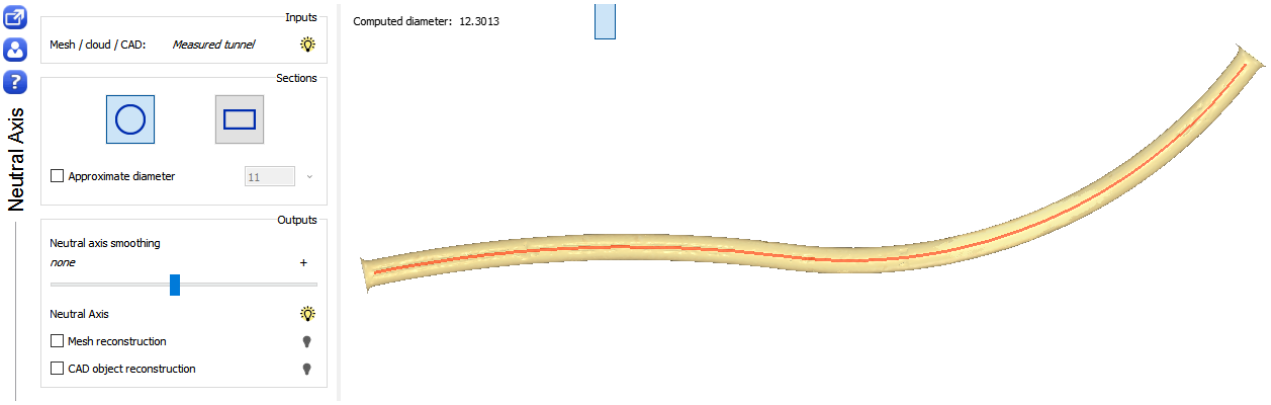


Figure 1: Neutral axis of the tunnel.

2 Creating the theoretical model of the tunnel

In order to inspect the mesh of the measured tunnel, we will create the mesh of the theoretical tunnel.

- Hide the **Measured tunnel**.
- In the contour group, show the **Theoretical section** and select it.
- Launch the command Mesh \ Extrusion.
- Choose **Select a path** and click on **Select 1st path** to select the neutral axis. The section will be extruded along it.
- Tick the options **Make perpendicular to the path** and **Turn with the curve** as in the picture.
- Press **Preview** and **OK** to create the mesh.

You can rename this mesh as **Theoretical tunnel**.

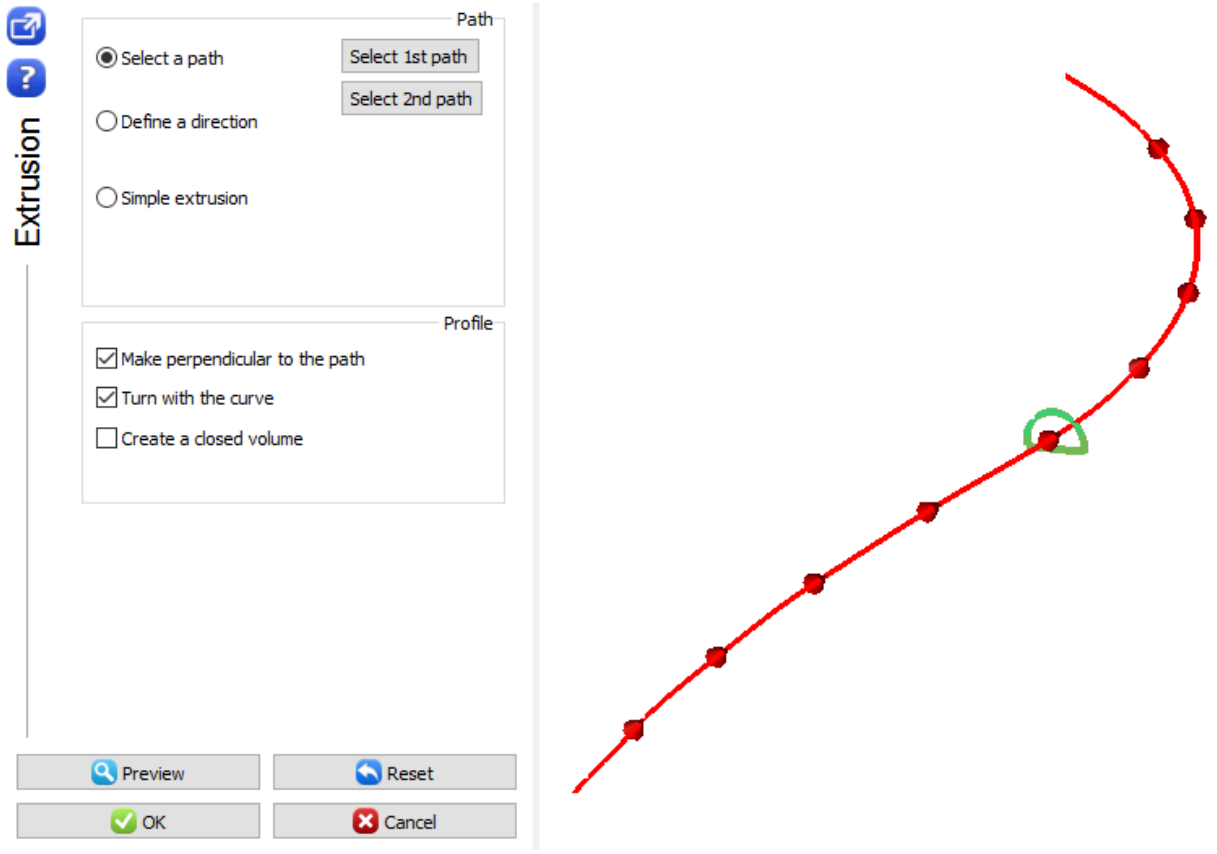


Figure 2: Creating the theoretical model by extrusion of a theoretical section along the neutral axis.

3 Creating cross sections along the neutral axis

Now we will create cross sections on both meshes in order to compare them in the next step.

- Select the mesh of the measured tunnel, the mesh of the theoretical tunnel and the neutral axis.
- Launch the command Surveying \ Create along axis and fill the dialog box as in the picture.
- Press **Preview** to create the sections. Sections are displayed in a 2D layout. You can show them in 3D with the option **3D**.
- Then press **OK** to create the sections and leave the command. You can also press **Compare/Inspect** to go directly to the next step.

A new folder containing all the sections is created in the tree.

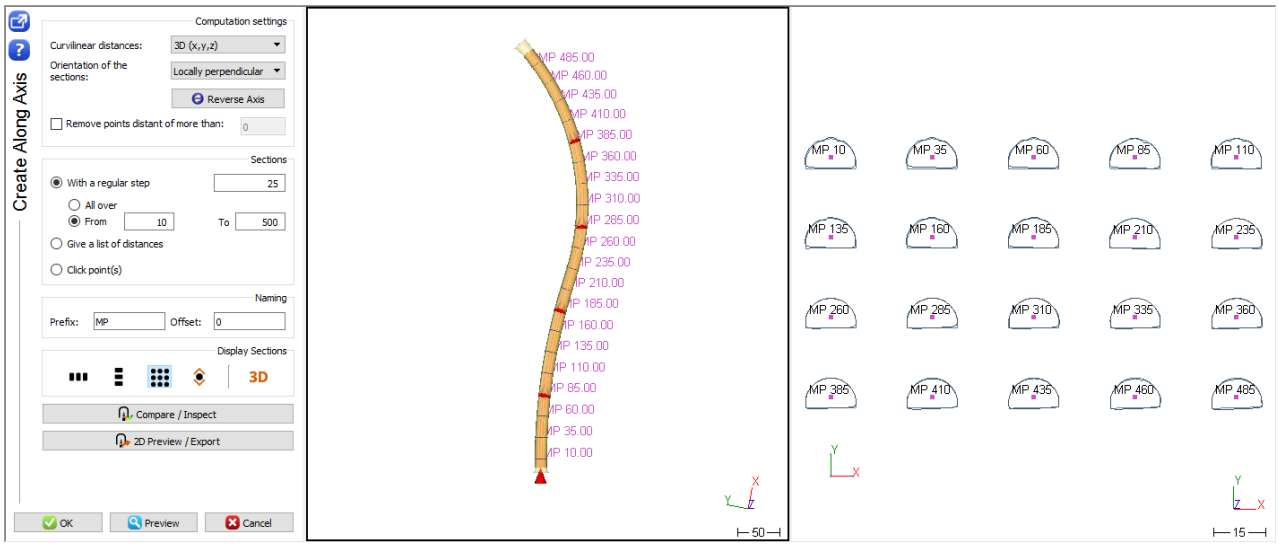


Figure 3: Creating cross sections on both meshes, along the neutral axis. 3D and 2D views of the cross sections

4 Comparing the cross sections

We can now compare these cross sections in pairs.

- If you left the previous command with **OK**:
  - Select the new folder called “Cross sections: …”.
  - Launch the command Surveying \ Compare/Inspect.
- Choose **Tunnel (3D inspection)**.
- Choose which sections will be taken as reference. In this case it is the sections from the Theoretical tunnel.
- Press **Preview** to see the result.
- Modify the colors of overbreaks and underbreaks.
- Press **OK** to validate and exit the command or **2D Preview / Export** to export the results into dxf or to Autocad.

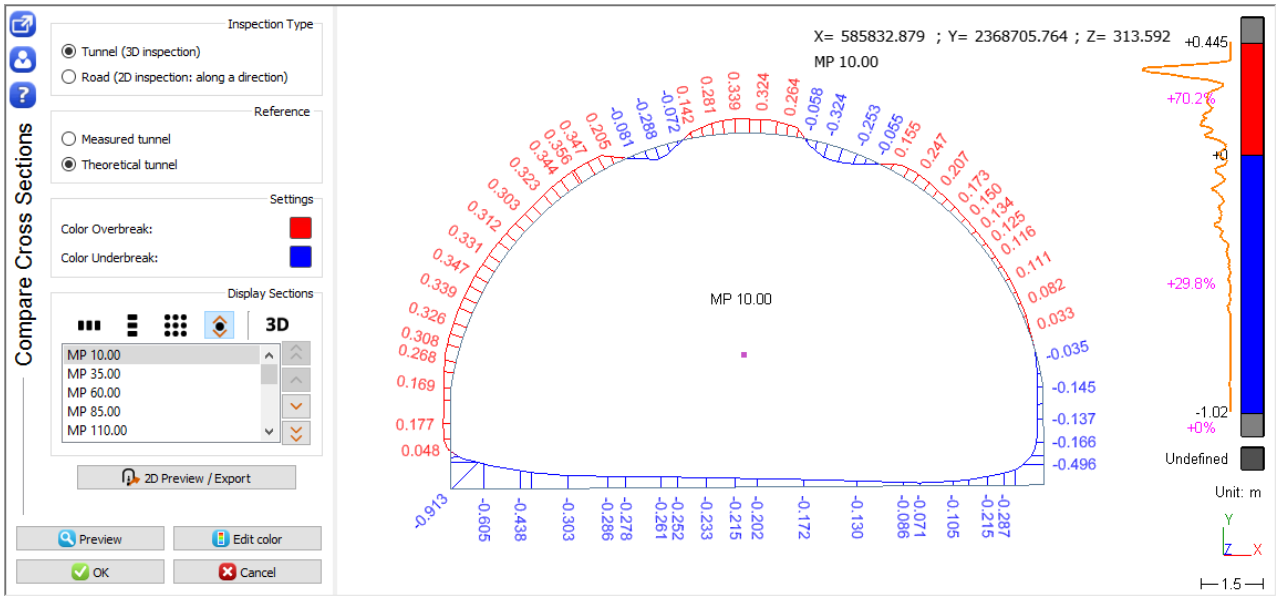


Figure 4: Comparing cross sections (example for one couple of sections).

5 Computing volumes of overbreaks and underbreaks

Thanks to the cross sections that we created, we will now compute, cut and fill volumes of the measured tunnel. The cross sections will delimit on which parts of the tunnel the volumes are going to be computed.

- Select cross sections folder and both meshes of theoretical and measured tunnel, and launch the command Surveying \ Volumes Over/Under.
- The only thing to set is which tunnel is the reference for the computation, so select the theoretical tunnel.
- Click on **Preview**.
- Colors are put on the tunnel to show zones of overbreak in red, and underbreak in blue. And one label is associated to each part of the tunnel, showing computed volumes. The total volumes (sum of all parts) are displayed in the dialog box.
- Click on **OK**.

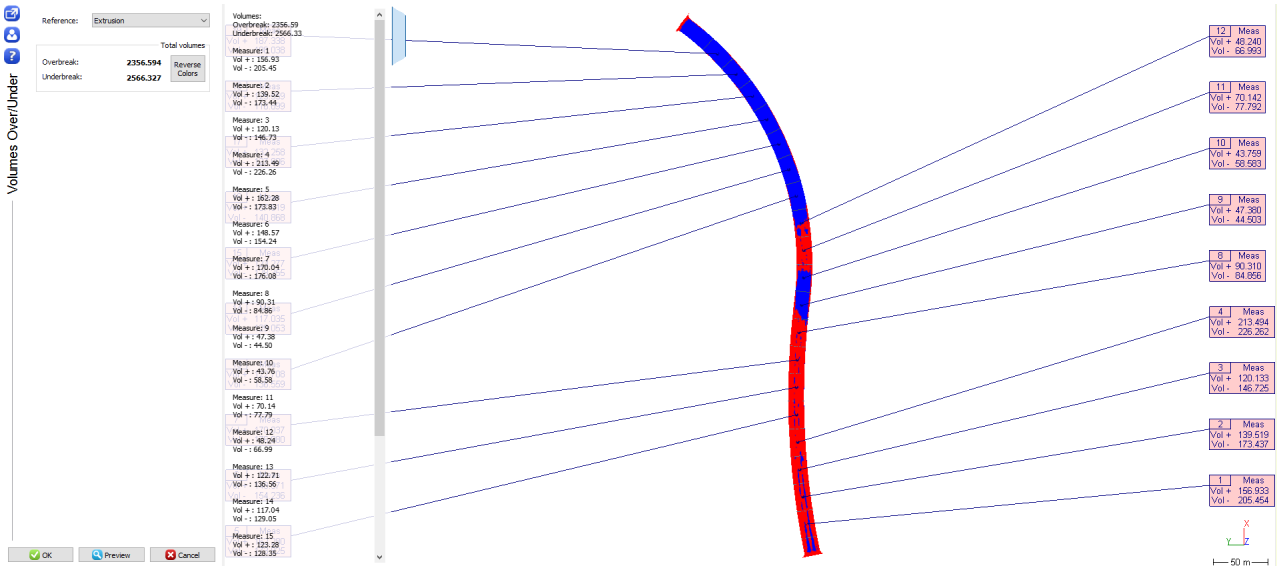


Figure 5: Computing volumes of overbreak and underbreak on parts of a tunnel.

6 Creating a 2D inspection map

A new colored mesh has been created with this volume computation. We are going to unroll it to create a 2D inspection map of the overbreaks and underbreaks.

- Select the colored mesh (**Compare Theoretical tunnel / Measured tunnel** in the **Measure Group**) and select the neutral axis.
- Launch the command Surveying \ Unroll.
- Choose the option **2D Inspection map**.
- You will be able to display a grid over the map. So you can set its parameters as in the picture.
- Click on **Preview** to see the result.
- You can export a picture of the scene by clicking on the **Export a picture** button.
- If you click on **OK** you will create this 2D map and the grid in the scene.

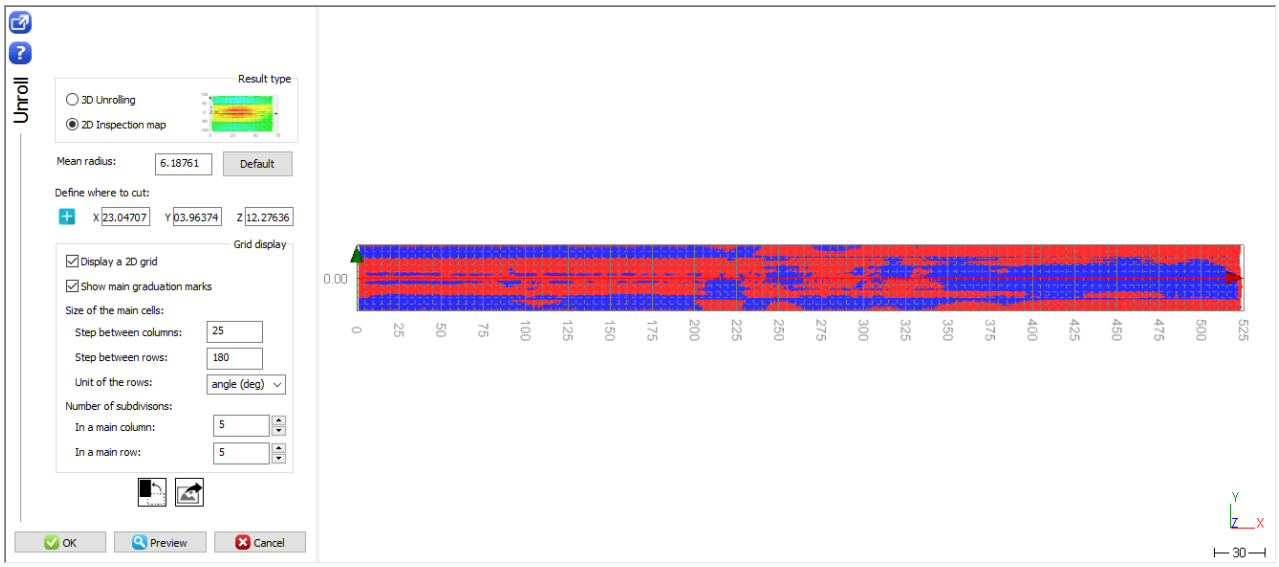


Figure 6: Unroll the mesh of the tunnel to create a 2D inspection map.

7 Printing the results

Now, two report data objects have been added to the 3DReshaper project: one corresponding to the cross sections and one to the unroll. Launch the command File \ Report Editor. Three chapters have been added to the report: a cover page and one chapter per report data object. These chapters are generated thanks to templates assigned to the report data categories. You may want to customize them:

- First, define the global layout. Layout settings are common to all chapters. Choose an **A4 Portrait** layout with headers and footers **Not on first chapter**. Reduce also the **number of decimals**.
- Select the cover page and add a title. Use the text toolbar to write it in an appropriate style. You can move the title to the middle of the page by adding somes lines. Drag and drop an automatic field (for instance, the date) from the data panel.
- Move the unroll chapter before the cross sections chapter if necessary (do a drag and drop).
- Select the unroll chapter:
    - In the header, add a text area containing the chapter title (use the automatic field because the header is common to all chapters).
    - In the footer, add the page number and the page count.
    - In the body, select the scene to increase the **ratio** and to modify the **scale**. Remove the empty item.
- Select the cross sections chapter. Align center the table.
- Finally, press **To PDF** to generate the report in .pdf.

Figure 7: Report example.

8 Making a video of a virtual visit

We will now create a virtual visit inside the tunnel:

- Switch to **perspective** view (if not already the case)
- Show only the neutral axis and all the groups of your cross sections.
- Select the neutral axis and launch the command Image \ Camera path.
- Press **X** or **Y** and click on **Use Current** to set the Z axis as the camera up vector.
- Try to play the video.
- Place the video cursor at about 12 seconds and press **Add / Edit** to place a target on a point of a section.
- Replay the video from the start.
- Record the video as an .avi file and choose for example the **Microsoft Video 1** encoder. Some video encoders may give a more efficient compression; however, it depends on which encoder was previously installed on your computer.

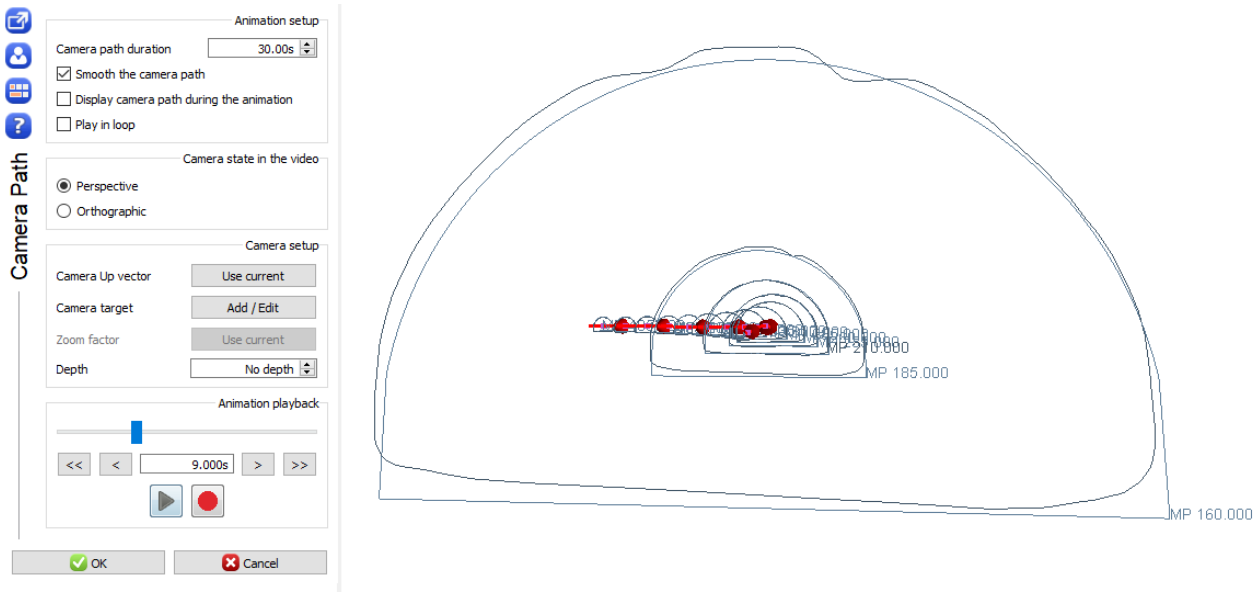


Figure 8: Video of virtual visit