Veesus Arena4D

Data Studio
Packages

User Guide
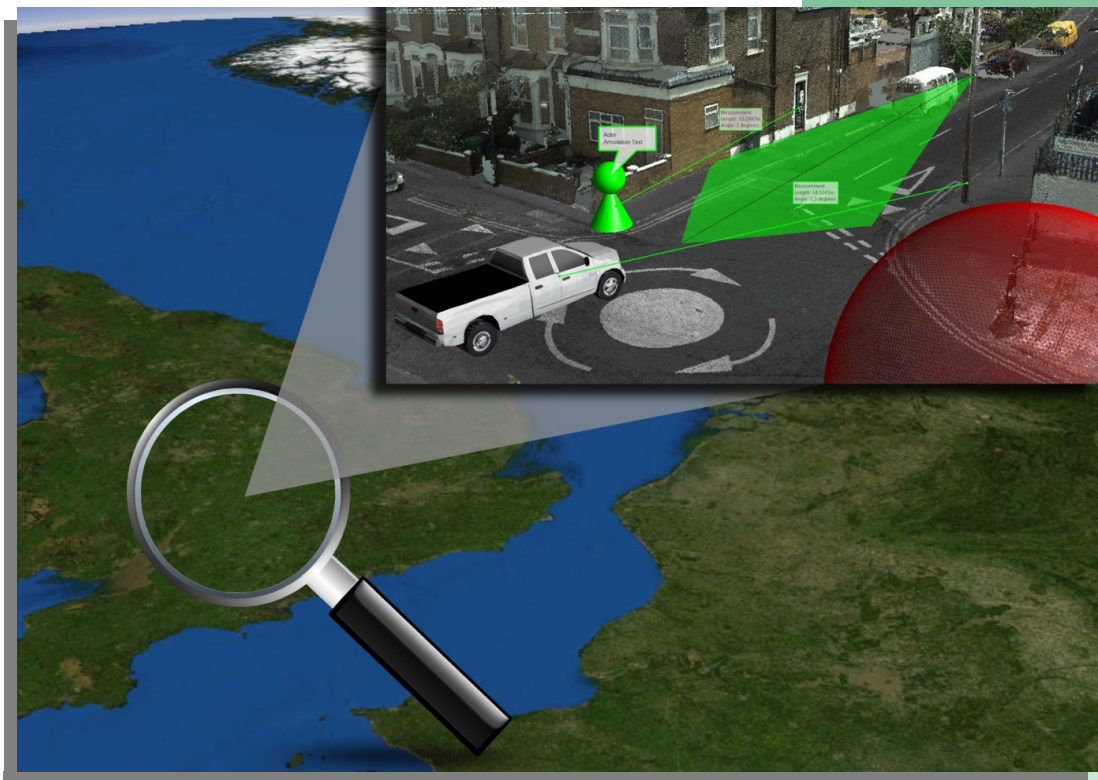
Software Version 3.1

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1   Introduction

1.1   *About*

Welcome to the User Guide for the Packages version of the Veesus Ltd Arena4D Geographic Information System (GIS) 3D visualisation tool.

Background: Arena4D is a true 3D GIS tool, that incorporates a point rendering engine at its core, that allows the rapid loading and visualisation of massive point cloud data sets. It is multi-platform and has been designed to be as simple and intuitive. The core premise behind Arena4D was to take Light Intensity Direction And Ranging (LIDAR) data, make it easy to use and accessible to non-expert users (and on commodity grade PC's).

The Packages version of Data Studio is a license free cut down version of the installed software. It allows projects that have been created to be viewed without the need to install any software and still allow the user to view all the data types created within the project and perform mensuration both on point clouds and NCTech iSTAR panoramas.

1.2   *Installation*

No installation is required, simply run the Launch file provided with the project. **Note:** The launch file "*Launch*" and directory "*Arena4D*" need to be in the same directory.

2   Getting Started

2.1   *Screen Layout*

The Arena4D application uses a docking framework allowing you to arrange windows as you please. The default layout features five main windows. The **Project Window** (on the Left), **View Window** (in the middle), **Tool Window** (on the right), **Status Window** (on the bottom left) and the **Output, Animator** or **Status Window** (on the bottom middle).
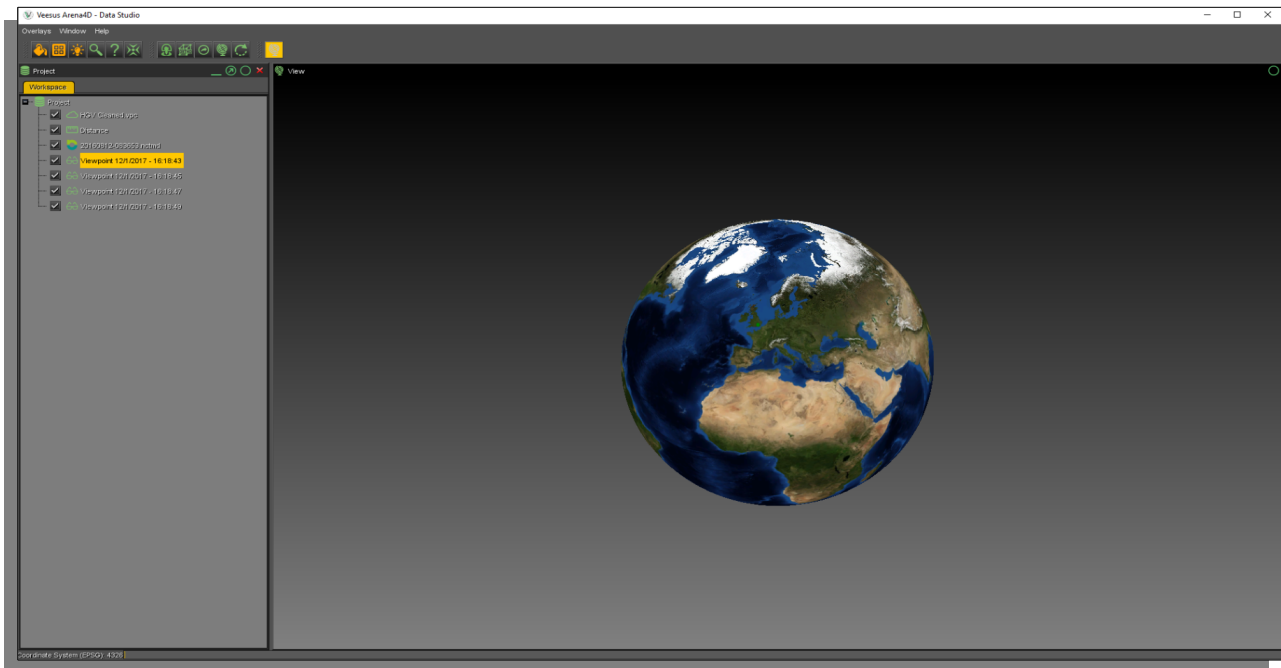
All windows can be resized, stacked or reordered by simply dragging them around. The window toolbars allow you to minimize, restore, maximize, externalize or remove windows. Minimized windows appear to the left of the application.

All Windows can be quickly reset back to default position clicking the restore windows icon.
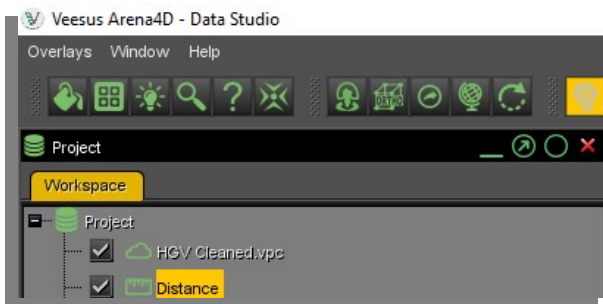
2.1.1   Workspace Tree

The Workspace Tree shows any data that is loaded in an Explorer tree like structure, any description that has been saved with the current Project and the properties of any selected object within the tree.

Double clicking any item in the Workspace Tree will "zoom" the view to that data object.

2.1.2   Status Window
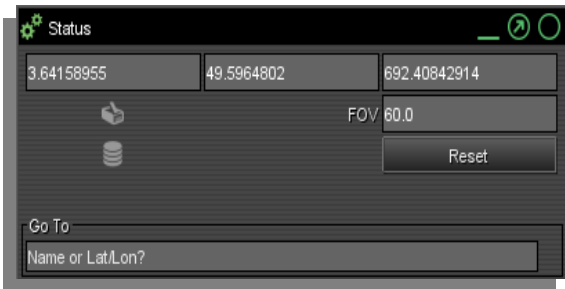
The **Status Window** shows X,Y,Z coordinates for the eye position.

Disk drive activity is happening.

Network activity is happening.

Reset button resets the FOV value to 60.0 if changed. Go To is the gazetteer function allowing you to zoom into an address or location. This tool is only active when there is an Internet connection.

2.1.3   Output Window

The **Output Window** shows the progress of any long running tasks.

2.1.4   Animator Window

The **Animator Window** is used to view generated animations and produce videos.

2.1.5   View Window

The **View Window** features the globe visualisation window with an image of the earth and the local viewer. This is the 3D viewing area where your data will be visualised.

Above the 3D viewing area is the application **Tool Bar** that features all the menu options available in Arena4D.

The **Tool Bar** has three distinct sections:

Point Cloud: specific Point Cloud tools such as Colouring, Filling, Lighting, Magnify, Point Cloud ID and Snap to Point.

Navigation: control and view related options such as, First Person, Orthogonal, Reorientate, Reset, Rotate.
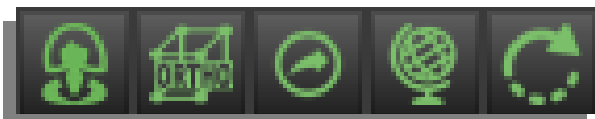
GIS: enable disable GIS mode.

2.2 *Viewer*

The standard viewer is provided to assist working with data that is not georeferenced. Arena4D was originally a GIS solution which worked best with data georeferenced on the globe.

To view georeferenced data in the standard viewer, simply double click it in the **Workspace Tree** chapter **2.1.1**

2.3 *Overlays*

The Overlays menu provides numerous different visual options for the 3D viewing area. The on/off state of each of the visual options is remembered by Arena4D each time you close it; therefore restarting in the state which you left it.

2.3.1 Animator

Shows the position and orientation of Key Frames.

2.3.2 Anti-Aliasing

Smooths jagged edges of screen graphics.

2.3.3 Compass

An animated on screen compass showing current heading and tilt.

2.3.4 Cross hairs

Places a set of cross hairs in the centre of the screen.

2.3.5 Cursor Location

Displays the current location in the 3D world of the cursor. Also displays the distance from the current eye view to the cursor location. This provides a simple distance measuring tool.

2.3.6 EGM96 Offsets

Similar to Cursor Location but instead displays the current eye view position.

2.3.7 Eye Location

Similar to Cursor Location but instead displays the current eye view position.

2.3.8 Globe

Enables and disables the globe.

2.3.9 Globe Transparency

Makes the globe partially see through.

2.3.10 Messages

Shows the onscreen Head Up Display (HUD). This shows the current view mode as well as network activity, disk activity and whether edit mode is active.
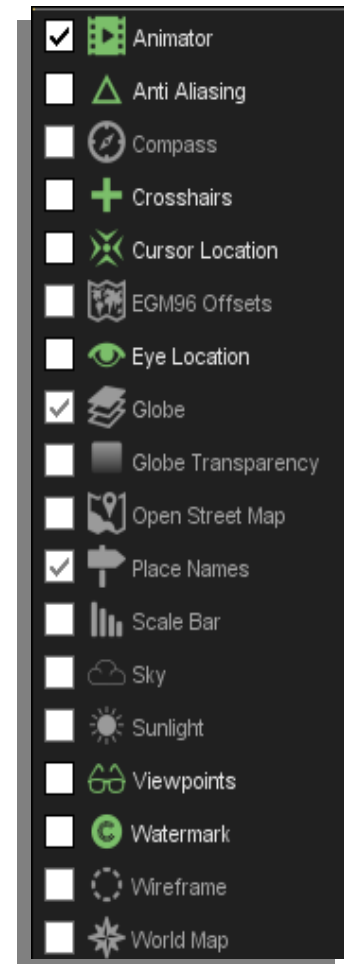
2.3.11   Open Street Map

Street level mapping. *(Internet connection required.)*

2.3.12   Place Names

Town and City names. *(Internet connection required.)*

2.3.13   Scale Bar

Simple scale bar that dynamically changes on zoom.

2.3.14   Sky

Provides realistic looking sky and horizon.

2.3.15   Sunlight

Provides real time lighting.

2.3.16   Viewpoints

Shows the position and orientation of viewpoint objects.

2.3.17   Watermark

Overlays a semi transparent image on the bottom left of the screen. This is useful for incorporating branding into generating screenshots and videos.

2.3.18   Wireframe

Draws the globe as a simple wireframe. Only visible when **Globe** overlay is **OFF**.

2.3.19   World Map

A small map indicating where the eye view position is over the globe.

3   Navigation

3.1   *Navigation & Controls*

Arena4D provides two different navigation modes for the GIS or Viewer: *Orbit and First Person.* These are switchable from the **Navigation tool bar** icon

Orbit controls:

- The left mouse button is used for editing/selection actions.

- Dragging the mouse with the middle button (wheel) will cause the view to pan and tilt.

- Dragging the mouse with the right mouse button will translate the view horizontally and vertically.

- GIS mode dragging the mouse with the right mouse button will translate the view horizontally in all directions. Vertical movement press both the left and right buttons together.

- Scrolling the wheel will cause the view to zoom in and out. In GIS mode pressing the "**C**" key at the same time will zoom in and out at the cursor position.

- Default short cut key **"X"** will centre view on your cursor as does double clicking the **left mouse** button.

First Person controls:

Places you in a typical game like control and view mode:

- "**W**,**S**,**A**,**D**" keys are used to walk forwards, backwards and strafe left and right.

- Dragging with the middle mouse (wheel) button will allow you to freely look around.

- Scrolling the wheel will cause you to go up and down in altitude.

- Holding the "**Shift"** key whilst moving will increase movement speed.

- Default short cut key **"Space"** will toggle view modes Orbit/First Person.

- Default short cut key **"X"** will centre view on your cursor as does double clicking the **left mouse** button..

The view can also be centred by right clicking on the GIS/Viewer and choosing Centre View.

3.1.1   Orthogonal View

Orthogonal view on the navigation tool bar removes all perspective from the main viewing window and is useful for doing line drawings. However it can be disorientating when moving around. If in doubt check that this is disabled when moving.

3.1.2   Reorientate

Used when you have got lost in your data. It will raise you up slightly, place your view at the ground and return you to Orbit view mode.

3.1.3   Reset

Returns you to a standard globe view.

3.1.4   Rotate

Places you in Orbit mode and automatically orbits around the object in the centre of the screen.

4   Data Objects

Data Objects are items that have be placed in the 3D world of your Arena. All Data Objects within the package software have been added/placed by the originator of the project and can not be edited or moved although some can be interacted with. The only Data Object that can be added with in the package software are measurements and NCTech Panorama measurements of which neither can be saved.

4.1   *Adding Measurement Data*

Measurement data can be added in two ways.

1. Right clicking on the GIS/Viewer and choose measurement.

2. Pressing the appropriate keyboard shortcut see section 7.4 Shortcut Keys (Default).
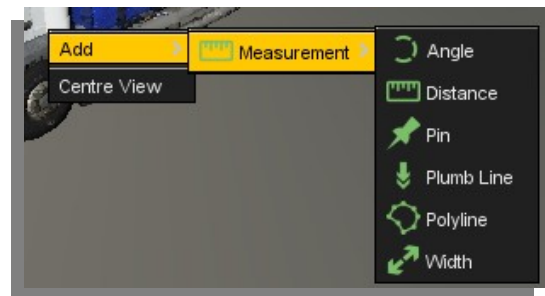
4.1.1   Actor

A generic 3D person on the globe.

Double clicking the Actor places you at their eye view position.

Pressing **Escape** exits from the Actor view.

4.1.2   Audio Dictation

Audio Dictation is a recorded sound file represented as an icon on the globe.

Double clicking the icon on the globe will play back the sound file.

4.1.3   Bullet Trajectory

The trajectory of a bullet with automatic angles and distances using compass point and origin.

4.1.3.1   *Compass*

Set a heading from a single point.

4.1.3.2   *Origin*

Can be used to reference a witness or any required reference position.

4.1.4   CAD

The CAD data type supports **DXF** CAD files in either 2D or 3D format.

4.1.5   Clip Box

Clipped the visible data down to a smaller size. For example if the roof of a house needs to be removed a Clip Box may have be drawn around just the lower parts of the house.

4.1.6   Environmental Audio

Whenever the user's viewpoint enters that area the audio clip will start to play back. Adds extra atmospherics to a scene.

4.1.7   Event

Displays a flashing event icon. Used mainly in conjunction with Arena4D time capabilities and maintenance records.

4.1.8   Field of View (FOV)

The FOV data type shows the field of view of an item, such as a camera, in 3D. If there is a network **MJPEG** feed of the camera available, it will also display that camera feed.

Click on the FOV to toggle drawing of the available camera feed. *Double Clicking* the FOV will place you in **First Person View** mode in the Field of View object location.

4.1.9   Flood

Renders a flood plain that interacts with the terrain to simulate the impact of high waters in an area.

4.1.10   GPS

Displays **GPX** (GPS eXchange format) files as a path on the globe.

4.1.11   Hyperlink

Hyperlink lists are used for data types not natively supported by Arena4D, or those that don't translate well to 3D. For example Word documents and PDF files. These files are shown as a list of hyperlinks which can be clicked in the 3D view.

When clicked, the files are loaded by the operating system into the tool best suited for visualising the selected file type.

4.1.12   Image

Images are represented by an icon on the globe. When your mouse cursor is placed over the icon a thumbnail of the image is displayed.

Double clicking the icon will open the image up full size in a separate window.

All typical image formats are supported.

4.1.13   Map

Map Files update the mapping or aerial imagery with higher fidelity data. Arena4D supports **GeoTiff** mapping data.

4.1.14   Measurement

Contains a selection of measuring Data Types

4.1.14.1   *Angle*

Angles allow you to draw two lines from clicking 3 points and will measure the angle between the two lines.

4.1.14.2   *Distance*

Distance allows you to measure between any two points in the **Presentation Screen**. The cursor will change to a cross hairs when measurement is active. Simply click on the two points you wish to measure between.

4.1.14.3   *Pin*

A single point measurement.

4.1.14.4   *Plumb Line*

 Vertical distance measurement data type.

4.1.14.5   *Polyline*

Draw a simple multi point poly line within the 3D data.

4.1.14.6 *Width*

Width objects allow you to measure accurately between two points, ensuring the measurement is parallel to a described line. The width object requires you to click three times on the screen. The first two mouse presses select the line to which you will measure at a tangent (e.g. the curb line). The third press will select the other side of the gap you width to measure (e.g. curb on other side of road).

4.1.15   NCTech Panorama

NCTech files **nctmd** and **nctrm** supporting iSTAR Measurement.

To enter the Panorama hover the mouse cursor over the Green sphere until it turns orange, then click the left mouse button twice. **Use the centre mouse button to rotate around inside the sphere and the mouse wheel to zoom in and out**.

Note: Make sure the movement "**Position**" tool is not enabled (no movement arrows).

Measurement icon can be used to make multiple measurements within the NCTech Panorama. Select he measure icon and click the first measurement point, now perform another click on the second measurement point. The right hand split window will now become available and perform the same measurement operation here followed by "Enter" key. A line and annotation will be presented representing the measurement.

Measurements can be cleared using the "Clear Measurements" option with in the properties for the NCTech data object.

Exit the Panorama sphere by pressing "**Esc**" on the keyboard.

4.1.16   Panorama

Panoramas support the same image formats as Image data types. However, the panoramas are shown as wire spheres rather than icons.

To enter the Panorama hover the mouse cursor over the Green sphere until it turns orange, then click the left mouse button twice. **Use the centre mouse button to rotate around inside the sphere and the mouse wheel to zoom in and out**.

Exit the Panorama sphere by pressing "**Esc**" on the keyboard.

4.1.17   Path

Paths are like multipoint measurements. Instead of measuring between two points you can measure the length of several connected points.

Paths also give you the ability to "walk" the path by playing back a trajectory along the path you have created.

4.1.18   Shape File

Standard ESRI Shape File. Drawn as line drawing overlay on the globe.

4.1.19   Terrain File

Terrain Files update the elevation model of Arena4D with higher fidelity data. Arena4D supports **GeoTiff** terrain data.

4.1.20   Threat Dome

Renders a sphere representing a threatened area; for example from an explosive device.

4.1.21   Trajectory

Trajectory visualises the extra data captures from mobile *LiDAR* capture vehicles.

The navigation data and imagery collected during a capture is overlaid on the globe in 3D.

4.1.22   TruView

Leica TruView data sets are supported in Arena4D.

Double clicking the TruView boxes will place you in the view of the panoramic images created by TruView data sets.

Press **Escape** or *Double Click* the TruView imagery to exit the panoramic view mode.

4.1.23   Viewpoint

A viewpoint is a snapshot of the current location and viewing angle when created.

4.1.24   Viewport

The Viewport data type shows the field of view projected through a defined four point area in 3D. Very useful for showing an area around a building window and showing the FOV through this selection.

4.1.25   WMS

Link to an OGC compliant Web Mapping Server (WMS).

5   Additional Supported Peripherals

5.1   Joypad Controller Support

Full support for USB joypad controllers using the buttons and analogue sticks to take control of movement through point clouds and associated Data Objects.

Note: Always make sure the joypad is connected before loading Data Studio or else the controller will not function correctly. Also ensure "Analog" mode if available is turned on (normally LED on).

The left joy stick moves the view forwards, backwards, strafe left and right.

The right joy stick changes tilt up, down, rotate left and right.

Any of the four button on the right side of the controller can be used to increase movement speed. Which of the four buttons can vary from controller to controller.

5.2   3D Space Mouse Controller Support

Full support for 3D Space Mouse to take control of movement through point clouds and associated Data Objects. Consult www.veesus.com FAQ's if the driver for the particular device is not working. New drivers can install an emulator overriding the normal 3D Space Mouse connection. Disabling the HID-compliant game controller solves the issue when the 3D Space Mouse is not connected.

6   Animator Tool

The animator allows multiple animations to be played and the ability to output the results into a standalone video/pictures.
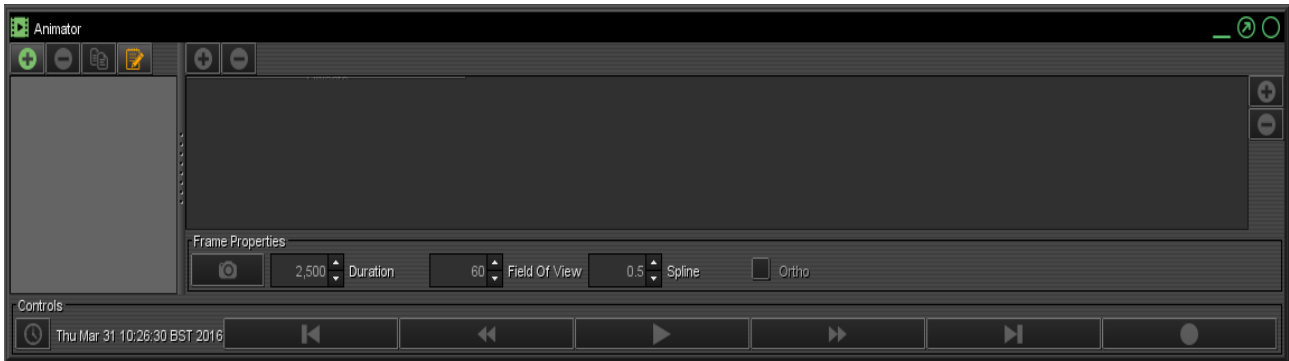
6.1   Key Frame Selection

Select Key Frames clicking (left mouse button) directly with the mouse cursor position or move between Key Frames by clicking on each of the animation tool buttons:

Skip to first Key Frame.

Skip to previous Key Frame.

Play animation from Key Frame selected.

Skip to next Key Frame.

Skip to last Key Frame.

Record animation to a standalone video file.

6.2   Creating a Standalone Video/Picture Animation

A video or collection of pictures can be generated for viewing within a standalone picture or video viewer.

Select the Record animation icon

When generating a movie file or multiple picture files you can select a number of options to produce the best output for your requirements.

Note: Which ever Key Frame is selected before pressing the Record icon will be first frame in the recording whether it is a Video or Picture(s). Multiple Key Frames can be also be selected using the "Shift key" to avoid unnecessary Pictures or Video lengths therefore creating a Partial Animation.

Format – Video/Picture format output.

Resolution – number of horizontal and vertical pixels to use per frame. The higher the pixel count the better the quality of video, but the more time taken to process. The default setting is standard High Definition television quality.

Width – number of horizontal pixels to use per frame. Overrides the setting under Resolution.

Height – number of vertical pixels to use per frame. Overrides the setting under Resolution.

Frame Rate – the number of images per second of animation. The higher the number the smoother the video. The default setting is the standard UK television rate of 25 frames per second.

Super Sampling – higher resolution sampling is used to source each frame and then downscaled to produce a better quality of video, but the more time taken to process.

Stereo – generates a *side by side* 3D stereoscopic video file.

Eye Separation – amount of separation when producing 3D stereoscopic video file.

There are also a number of "Override" settings which allow you to tune the viewpoint parameters used in creating the movie.

**Duration** – forces the video length to a set duration, therefore increasing or decreasing viewpoint durations as required to match the requested overall duration.

Speed – sets a constant fly through path speed. This will ignore all other duration settings.

Heading – offsets the viewpoint heading by a set amount.

Pitch – offsets the viewpoint pitch by a set amount.

Field Of View – sets the camera field of view.
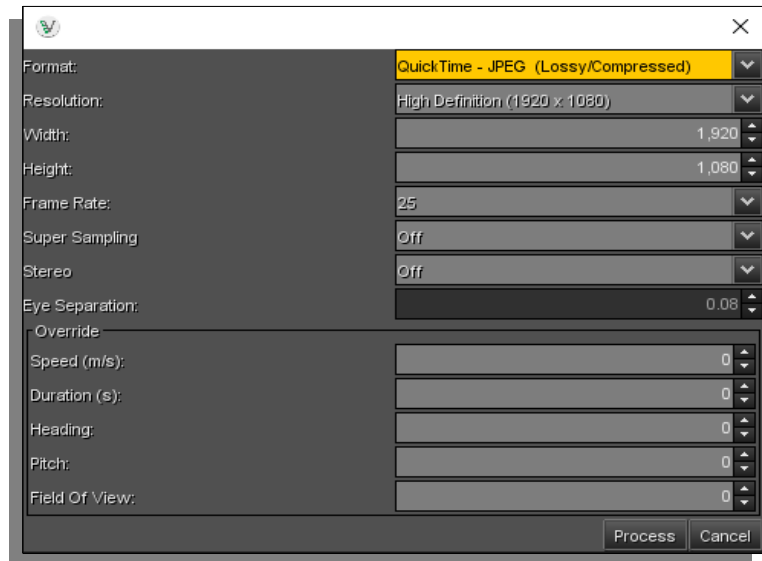
7   Controls Quick Reference

7.1   *Orbit GIS*

Left mouse drag	–	rotate.
Left mouse drag + SHIFT	–	pan/tilt.
Right mouse drag	–	translate.
Middle mouse drag	–	pan/tilt.
Mouse wheel	–	zoom.
X	–	centre view here.

7.2   *Orbit Viewer*

Left mouse drag	–	rotate around centre point.
Right mouse drag	–	translate.
Mouse wheel	–	zoom.
X	–	centre view here.

7.3   *First Person*

W	–	walk forwards.
S	–	walk backwards.
A	–	strafe left.
D	–	strafe right.
Q	–	rotate left (viewer mode).
E	–	rotate right (viewer mode).
SHIFT	–	run.
Left mouse drag	–	look around.

7.4   *Shortcut Keys (Default)*

SHIFT + ESC	**–**	**Escape Full Screen mode.**
R	**–**	**reorientate.**
F	**–**	**reset field of view.**
G	**–**	**reset view.**
X	**–**	**snap to cursor.**
T	**–**	**target view.**
SHIFT + R	**–**	**rotate.**

V	**–**	**create Viewpoint.**
M	**–**	**create Measurement.**
P	**–**	**create Plumb Line.**
L	**–**	**create Polyline.**
H	**–**	**create Pin.**
Arrow Keys	**–**	**rotate view 90 degrees.**
SHIFT + T	**–**	**top down view.**

8   Hints and Tips

Arena4D is a very versatile and powerful tool. To get the best experience of the software here are some useful suggestions when working with Arena4D.

8.1   *Combine Point Filling & Point Magnification*

Use a combination of Point **Filling** and Point Magnification when measuring to ensure you are clicking on the correct point. Point Clouds can be difficult to work with owing to the natural "gaps" in the data. These two modes can reduce the frustration when working with such data and combining them makes you almost forget you are using a Point Cloud at all.

8.2   *Use Point Lighting Mode 2*

Point Clouds are typically coloured using photographs taken at a time different from when the laser scan beam captured the original point. This can be anything from seconds in time to days/weeks/months. This can lead to the data "fooling" the human eye by presenting confusing colour that doesn't relate to the actual object that has been scanned.

By using Point Lighting Mode 2 all the colour is removed from the scene. However the intelligent lighting engine brings out the fine detail such as changes in surfaces, like ripples and cracks. These items normally go unseen in standard visualisation packages.

8.3   *Use Point Filtering*

Scan data often overlaps producing redundant data. Scans can be dramatically reduced in size by using point filtering. This can slow down the processing import stage, but creates a much smaller faster end product. Depending on scan acquisition type a range of between 2mm and 5mm is a good spacing to start experimenting with.
Using the Point Smoothing & Point Lighting function of Arena4D can easily overcome reduced point densities brought about by filtering, and in most cases actually improve the quality of the rendered data over raw unfiltered data.

8.4   *Filling Gaps*

If your point data has some noticeable gaps, try increasing the Point Render Threshold to a larger number in the System Settings. The higher the number, the more points that are loaded but the slower the rendering will become.

The other option is to adjust the Point Ratio values. When Point Filling is turned on it will apply a formula to the points to work out their size on the screen. This formula uses the distance, the point size and the point smoothing factor to calculate the correct size. By adjusting the point size and point smoothing figure in the Point Cloud properties you can adjust this gap filling effect.