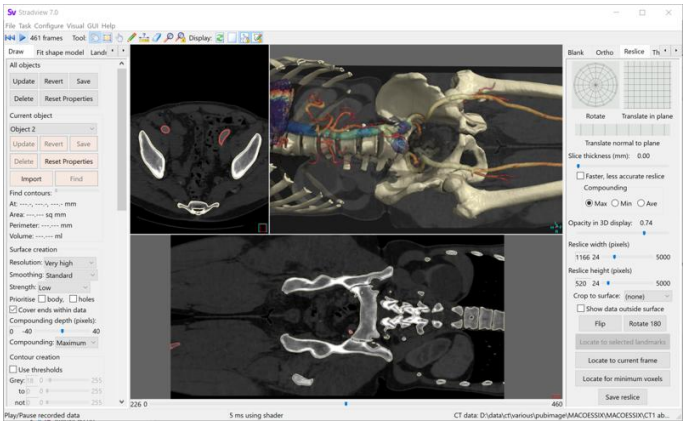
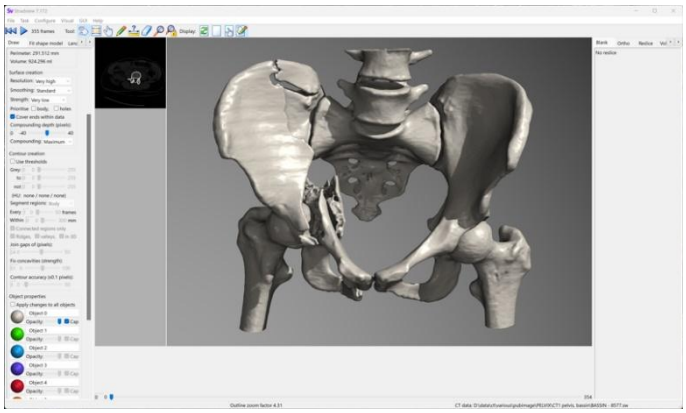
Stradview

Visualisation and analysis of 3D imaging data.
http://mi.eng.cam.ac.uk/Main/StradView



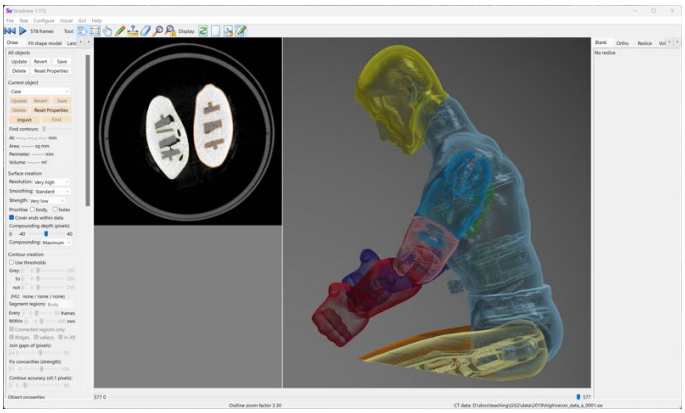
Concept

- **Practical**: makes very efficient use of memory and graphics power and is highly optimised. It can be used with large data sets (e.g. microCT) as well as small (e.g. medical) even on laptops.
- **Accurate**: sub-pixel and sub-voxel resolution is preserved throughout all of the analysis and visualisation.
- **Targeted**: for visualising and analysing individual 3D (cross-sectional) data sets. Doesn't do everything: but does what it does well.
- **Fine control**: the interface is carefully designed, but all useful options are exposed to the user.
- **Unique**: all features are designed and written in-house, not using third-party libraries.



Create surfaces from 3D data

- Surfaces always derived via contours in the original data which can be manually edited even if they were created automatically.
- Automated level-of-detail to ensure the minimum number of contour points for editing whilst maintaining accuracy. Deletion and selection of contours in 2D and 3D.
- Surfaces created from contours contain very regular triangles (*Regularised Marching Tetrahedra*), with triangle size independent of contours, and the capability to interpolate between very sparse contour sets.
- Automated extraction to multiple objects using data thresholds, but with tools to allow for sub-threshold thin features and gaps in 3D, and concavity detection and removal.
- Sub-pixel and sub-voxel accuracy throughout, in contrast to surfaces based on classifying voxels.
- Import objects from NIfTI and DICOM files, surfaces (including textures) from PLY and OBJ files, and export to PLY, OBJ, NIfTI and NRRD label data.
- Also includes features for segmenting surfaces using prior shape models and registering imported surfaces to data.
- Drawing directly on surfaces to extract patches / cut parts out for further analysis.

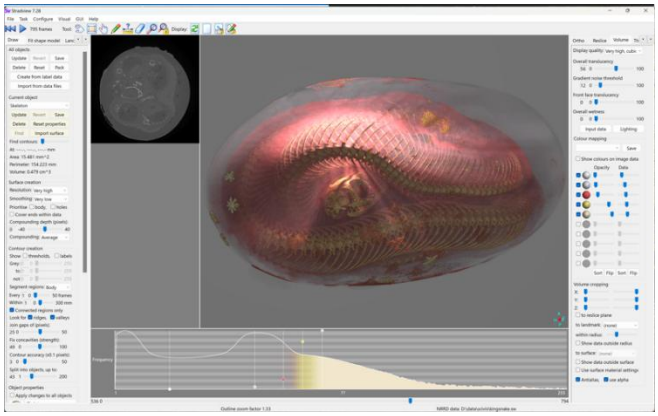


Visualise surfaces

- Includes advanced features such as ambient occlusion, soft and coloured translucent shadowing, and material anisotropy.
- A 'clear' visualisation which highlights internal features within complicated surfaces.
- Correct translucency even for complex surfaces and mixed with volume renderings.
- Dynamically updated intersections with all data reslices.

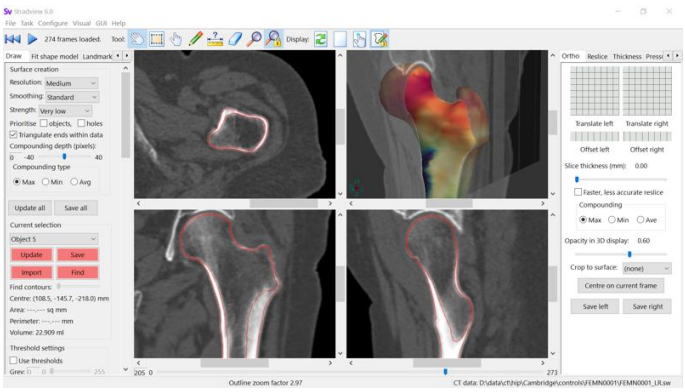
Volume rendering

- High quality realistic visualisations, better than normally available on basic hardware, including radiant and ambient shadowing, point lights and various material properties.
- Very accurate, using real time cubic interpolation of data.
- Fast and efficient, can run on a fairly minimal graphics card, reducing resolution automatically if the memory is limited.
- Volume rendering can be cropped to completely arbitrary surfaces, with sub-voxel accuracy.
- A 'clear' visualisation (as for surfaces) shows internal features very well.
- Mixed volume rendering / surface visualisations including lighting through translucent surfaces.



Analyse data over surfaces

- Including *Cortical Bone Mapping*, the only software which implements this technique.
- Advanced features for extracting very thin (sub-resolution) laminar surfaces from data.
- Can be used to create accurate geometry from thin surfaces.
- Can be used to map thin surface features (e.g. thickness / density) to the surface for visualisation or later statistical analysis.
- Can also directly map imaging data (min / max / average over a range) to the surface, which allows segmentation on surfaces.



Reslice imaging data

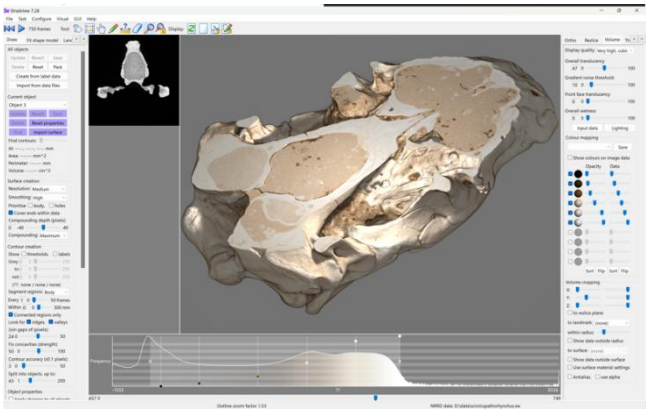
- Can generate accurate cross-sectional images (reslices) in any orientation.
- Thick slab reslices are also possible for e.g. maximum intensity projections.
- All reslices can be cropped to completely arbitrary surfaces.

Measurements

- Landmark placement on imaging data, reslices, surfaces or even volume visualisations.
- Allows measurement of location, distance and angles, and noting reference points.
- Export of this and summary surface information (volume, cross-sectional areas, centres, etc) to external files.

Data import and export

- Can read many different data formats, including DICOM, Mindways QCT, ITK, Analyze, NIfTI, NRRD, X-Tek CT and many 2D image formats.
- Can be used to take cross-sectional image sequences without any 3D locations and create 3D data from these, including when it is not on a regular grid, e.g. irregular spacing or fan-scans.
- Can export irregular 3D data to regular 3D resliced data, and regular data to NIfTI and NRRD formats, at reduced resolution if desired.
- Can convert 16-bit to (windowed) 8-bit data.
- Can export data to sequences of cross-sectional 2D images and visualisations to images.
- Many functions can be scripted (including live external control from another program), allowing automated processing and the creation of still image sequences for movies.



Data size and system requirements

- Design for minimal memory use allows loading and realistic processing of large data sets.
- Requires at most twice as much computer memory as (raw) data size:
    - 16-bit DICOM data of 512 x 512 x 400 would need only 200 MB.
    - 8-bit micro-CT data set of 1024 x 1024 x 1024 would need 2 GB.
    - 16-bit micro-CT data set of 2048 x 2048 x 2048 would need 32 GB.
- Visualisation only requires OpenGL 3.0 or above – available on nearly all graphics cards.
- Volume rendering limited by GPU memory and maximum 3D texture width. Often 2048 – in which case can render at full resolution up to 2048 x 2048 x 8192 by using multiple textures.
    - DICOM data of 512 x 512 x 3000 would need only 750 MB GPU memory.
    - Micro-CT data set of 1024 x 1024 x 4096 would need 4 GB GPU memory.
- Resolution automatically reduced if the GPU does not have enough memory.