Synapse 3D Overview

Synapse® 3D offers cardiology-focused application tools that follow the care pathway of the patient from diagnosis to treatment and then follow-up. By providing analytical virtual 3D models, cardiologists are able to read, report and plan in order to establish a more accurate diagnosis and more appropriate course of treatment.

Key benefits include:
- Clinically relevant application tools
- High image quality that improves clinical confidence
- Comprehensive analytical data
- Enterprise-wide solutions for easy access

The intended use of Synapse 3D tools are to provide trained clinical users comprehensive and powerful tools to aid in reading, reporting, and surgical treatment planning.

Note: This product is not intended for use with or for the primary diagnostic interpretation of Mammography images.

Synapse Cardiovascular Integration

Synapse 3D is a suite of application tools that integrates with Synapse Cardiovascular. This provides workflow and productivity enhancements such as:
- Secured authenticated access from any Synapse Cardiovascular terminal
- Automatic rules-based application tool launch
- Automatic structured report launch
- Synapse 3D data and images populate to a structured report using HL7

Cardiology Focus CT Tools

Coronary Analysis CT

Coronary Analysis CT is a useful tool for analyzing coronary arteries. The software extracts the path of the target blood vessels and provides comprehensive evaluation of the coronary arteries.

Main functions include:
- Display of axial, sagittal, and coronal images
- Automatic extraction of the heart
- Automatic extraction of coronary arteries
- Color-coded display of plaque (hard plaque and soft plaque)
- Measure coronary artery stenosis ratios
- Virtual stent graft
- Display coronary artery CPR images
- Save coronary artery CPR and orthogonal plane images
- Modify coronary artery paths and heart region
- Various types of 3D displays for observation of coronary arteries
- Simultaneous display of CT images in direct comparison to related XA images

Cardiac Function CT

Cardiac Function CT is a useful tool for analysing cardiac function by obtaining the contour of ventricle and myocardium from CT images constructed by the multiple time phases. Cardiac Function CT calculates ejection fraction, end-diastolic volume, end-systolic volume, stroke volume etc.

Main Functions include:
- Automatic extraction of the heart
- Automatic extraction of the contours of ventricle and myocardium which are required cardiac function analysis
- Display the long axis and short axis images of the heart
- 3D mapping display of analysis results
- Volume measurement and display of the bull’s eye for ventricle and myocardium
- Measuring of various cardiac function evaluations including end-diastolic volume, end-systolic volume, end-diastolic ventricular index, end-systolic ventricular index, stroke volume, cardiac output, peak filling rate, time to peak filling, cardiac index, ejection fraction, body surface area, heart rate, and myocardial mass
- Output cine movies
4-Chamber Analysis

4-Chamber Analysis is a useful tool for analyzing the function of cardiac ventricles and atria. The software extracts left and right ventricles, atria, and myocardium region from CT images consisting of the multiple time phases, calculates cardiac function parameters such as ventricular ejection fraction, and enables observation of transitions in ventricle and atrial volume.

Main functions include:
- Automatic extraction of the heart
- Automatic extraction of ventricular, atrial, and myocardial regions
- 3D surface rendering of ventricular, atrial, and myocardial regions
- Automatic extraction of the contours of ventricle and myocardium which are required cardiac function analysis
- Display the long axis and short axis images of the heart
- 3D mapping display of analysis results
- Volume measurement and bull’s eye display of ventricle, atrium, and myocardium
- Measuring of various cardiac function evaluations including end-diastolic volume, end-systolic volume, end-diastolic ventricular index, end-systolic ventricular index, stroke volume, cardiac output, peak filling rate, time to peak filling, cardiac index, ejection fraction, body surface area, heart rate, and myocardial mass
- Output cine movies
- Non-rigid phase registration

Calcium Scoring

Calcium Scoring is a useful tool for displaying the plaque area of the coronary artery by color and calculates the quantitative value of plaque by using the Agatston score method.

Main functions include:
- Automatic extraction of the heart
- Calculation of the Agatston score based on the Agatston score method
- Threshold value setting for scoring
- Specification for the plaque area in 2D and 3D images

Cardiac Ablation Analysis

Cardiac Ablation Analysis is a useful tool for cardiologists and electrophysiologists. The software extracts left and right ventricles, atria, and myocardium regions from CT images consisting of the multiple time phases. The software also extracts the pulmonary vein based on the left atrium region, in pre-operation simulation for ablation, and in post-operation observation.

Main functions include:
- Automatic extraction of the heart
- Automatic extraction of ventricular, atrial, and myocardial regions
- Extraction of the pulmonary vein based on the left atrium region
- ROI-based extraction of the gullet region
- 3D view inside the pulmonary vein
- Virtual endoscopic view of inside the pulmonary vein
Cardiac Fusion

Vessel Extraction is a useful tool viewing fusion of cardiac anatomy and functional analysis.

Main functions include:
- Display the axial, sagittal, and coronal plane images
- Overlay display of a functional image and a structural image
- Automatic and manual registration of images

Aortic Valve Analysis

Aortic Valve Analysis is useful for cardiologists in preparation for Transcatheter Aortic Valve Replacement (TAVR) planning. The software measures various aspects of the vicinity of the aortic valve by extracting the heart and aorta regions from the input CT images. Aortic Valve Analysis also allows the confirmation of the size of the aorta and the performance and calcification of the aortic valve to support an aortic valve replacement.

Main functions include:
- Automatic extraction of the heart and aorta regions
- Automatic detection of the contour of the aorta
- Measurement of the vicinity of the aortic valve
- Measurement of the calcification area in the aorta
- Transapical measurements
- Output cine movies

Cardiology Focus MR Tools

Coronary Analysis MR

Coronary Analysis MR is a useful tool for analyzing coronary arteries. The software uses MR images to extract the path of the target blood vessels and performs evaluation of the coronary arteries.

Main functions include:
- Display axial, sagittal, and coronal images
- Automatic extraction of coronary arteries
- Color mapping analysis
- Measure coronary artery stenosis ratios
- Virtual stent graft
- Display coronary artery CPR images
- Save coronary artery CPR and orthogonal plane images
- Modify coronary artery paths and heart region
- Various types of 3D displays for observation of coronary arteries

MR Flow Analysis

MR Flow analysis is a useful tool analyzing blood flow volume and the flow velocity per heart rate velocity.

Main functions include:
- Display analysis table (flow volume analysis and flow velocity analysis)
- Display blood flow velocity image
- Display original image, phase image, or absolute value image
- Display original image, phase image, or absolute value image, overlapped with the blood flow velocity image
- Display the result of the flow volume analysis and the flow velocity analysis by the time intensity curve
- Comparison with past analysis results and report output
Cardiac Function MR

Cardiac Function MR is a useful tool for evaluating cardiac function. The software obtains ventricle and myocardium boundaries from MR images consisting of multiple time phases and calculates ejection fraction, end-diastolic volume, end-systolic volume, stroke volume, and other related information.

The contour of ventricle and the contour of the cardiac wall can be set by automatic extraction based on the image information or by user input or modification. The calculated result can be displayed as a graph or bull’s-eye images, and it can be printed as a report.

Main Functions include:
- Semi-automatic extraction of the contours of right and left ventricle and myocardium which are required for cardiac function analysis
- Display the long axis and short axis images of the heart
- 3D mapping display of analysis results
- Volume measurement and display of the bull’s-eye for ventricle and myocardium
- Display of measurement results including end-diastolic volume, end-systolic volume, end-diastolic ventricular index, end-systolic ventricular index, stroke volume, cardiac output, peak filling rate, time to peak filling, cardiac index, ejection fraction, body surface area, heart rate, and myocardial mass
- Calculation of the ventricle capacity from a long axis image with the Area-Length method
- Output cine movies

Base Tools

Synapse®3D Base Tools include a comprehensive selection of imaging tools designed for general day to day 2D, 3D and 4D image visualization and processing. These base tools can be used alone or combine seamlessly with the cardiology tools for advanced clinical workflows.

3D Viewer

3D Viewer is a comprehensive tool that allows orthogonal and oblique analysis of CT, MR, NM and PT data. Main functions include:
- Macros – allows users to save and play workflows
- 2D and 3D display of cross sections
- Body part recognition, extraction or removal of anatomy
- Inserts image plane – inserts 2D cross section planes into 3D view and synchronizes with 2D cross section view
- Report – outputs observations and images to report
- Launches General CPR Tool for vessel analysis
- 3D Reformats including:
  - Volume rendering (VR)
  - Shaded surface rendering (SSD)
  - Maximum intensity projection (MIP)
  - Minimum intensity projection (MinIP)
  - Ray summation (Raysum)
- VR Color template
- Mask editing
- Object extraction and removal using erosion, dilation, threshold, etc.
- Multi-mask up to 12 layers
  - Ability to reverse mask
  - ADD, SUB, AND, XOR operations
- ROI editing
2D Viewer

The 2D viewer is a useful tool for anyone wishing to view multimodality images in a single application for simple viewing. This software is also embedded as the simple CD/DVD viewer. Main functions include:

- Cine playback
- Synchronization of density adjustment, panning, and zooming among multiple images
- Synchronization of coordinate positions among multiple images
- Change (reconstruction) the displayed plane
- Display of the average image
- Batch capture of images in a series
- Display of the following DICOM-compliant SOP classes:
  - CR Image Storage
  - CT Image Storage
  - MR Image Storage
  - PET Image Storage
  - NM Image Storage
  -XA Image Storage
  - US Image Storage
  - US Multi-frame Image Storage
  - SC Image Storage
  - Enhanced CT Image Storage
  - Enhanced MR Image Storage

Dynamic Data

Dynamic Data is a useful tool for clinical assessment of images over time including breast or prostate MRI or dynamic PET analysis as examples. The software displays individual parameter images or time-intensity/time-activity curves of slices of multi-phase data. Main functions include:

- Loads single or multiple slice cine images
- Displays time-intensity curves
- Displays time-activity curves (for NM or PET data)
- Displays parameter images (difference, time to peak, max-min, area underneath curve)
- Measurement or circular, rectangular, and freehand ROI’s. Output of measurement results in .csv format
- Displays and edits time

4D Viewer

Synapse 3D 4D Viewer is useful for viewing CT and MRI multi-phasic data in cine mode. Examples include cardiac CT or MRI or Cine play with synchronization between 2D cross sections and 3D images. Main functions include:

- Ability to specify display time for each phase in milliseconds or percentage (%) of the total play time.
- Creates movies of all images or only 3D images

Fusion Viewer

Fusion Viewer is a useful tool to analyze anatomical and physiological data between two 3D intra/intermodality images. Clinical applications include, but are not limited to, PET-MR, SPECT-CT and multi-phasic MRI. Main functions include:

- Comparison reading of current to 9 priors
- Reference reading
- MPR reading
- Overlay or blending is configurable
- Automatic rigid registration
- Manual rigid registration by translation and rotation
- Composites two images using rigid and/or flexible body registration and supports the following post-processing reconstructions for 3D viewing: subtraction value, absolute subtraction value, addition value, average value, maximum value, minimum value. In case of different modalities, WL conversion can be specified for reconstruction
- SUV evaluation for PT data
2D Fusion
2D Fusion is useful for users wishing to fuse multi-modality, multi-dimensional data for purposes such as ultrasound and CT. Viewer superimposes two 2D or 3D images of same or different modality. Main functions include:
- Fuse 2D or 3D images
- Save created fusion images as DICOM file

General CPR
General CPR is an application tool designed to visualize curved planar reconstructions (CPR), useful for clinical analysis of blood vessels (aorta, carotid, etc.) and other tubular structures. Main functions include:
- Display of axial, sagittal, and coronal images
- CPR path creation
- Modification of CPR center line and contour
- CPR image display
- Display of vessels started from a different application
- Measurement of stenosis ratios and plaque analysis
- Virtual stent graft
- Virtual stent templates for AAA, TAVR and custom
- Panorama display
- Saving CPR and orthogonal plane images

3D Comparison
3D Comparison is a tool that allows direct side-by-side comparison and synchronization of multiple 3D data. Main functions include:
- Simultaneous display of images in multiple series
- Synchronization of the current position of multiple images using image position
- Synchronization of various operations between images including measurements and annotations
- Display of the average image
- Histogram measurement at the same position between images

MPR Reformat
MPR Reformat allows users to create a plane along a straight line or in the shape of a fan on 2D images, allowing the user to print or save the plane as a new image. The user is able to link directly to 3D Viewer for additional analysis.

Combination
Combination is an application tool designed to combine multiple series to a single series, especially useful for visualizing multiple spine or vessel series as a single image. Images do not need to overlap, but should be captured at continuing positions. Main functions include:
- Display of orthogonal sections of MIP that are created by combining different series
- Save DICOM images after combining

Common Features
These features are common across all Synapse 3D application tools where applicable:
- 2D cross section display
- Changing window width and level
- Movie Creation and Saving
- Gamma and image edge/smoothing filters
- Measurement and Analysis
  - Measures lines, polygonal lines, angles, intensity values, rectangles, ellipses, polygons, freehand, boxes, spheres.
  - Calculates volume of mask region, and average/max/min/standard deviation of intensity values in 3D images
  - Calculates volume of mask region, and average/max/min/standard deviation of intensity values in 2D images
  - Displays profile curve or histogram of each measurement
  - Semi-automatic measurement of half-width
  - Stores measurement results and graph in text file (.csv, .txt) or in captured image
  - Ability to create ROI along the contour of an image by detecting contours during freehand measurement.
- Annotation
- Clipping
- User-customizable settings
- Reformat
- Report to DICOM and PDF
- Snapshot Save

For more information, or to schedule a demonstration, please contact your Fujifilm Representative by calling 1-866-879-0006.