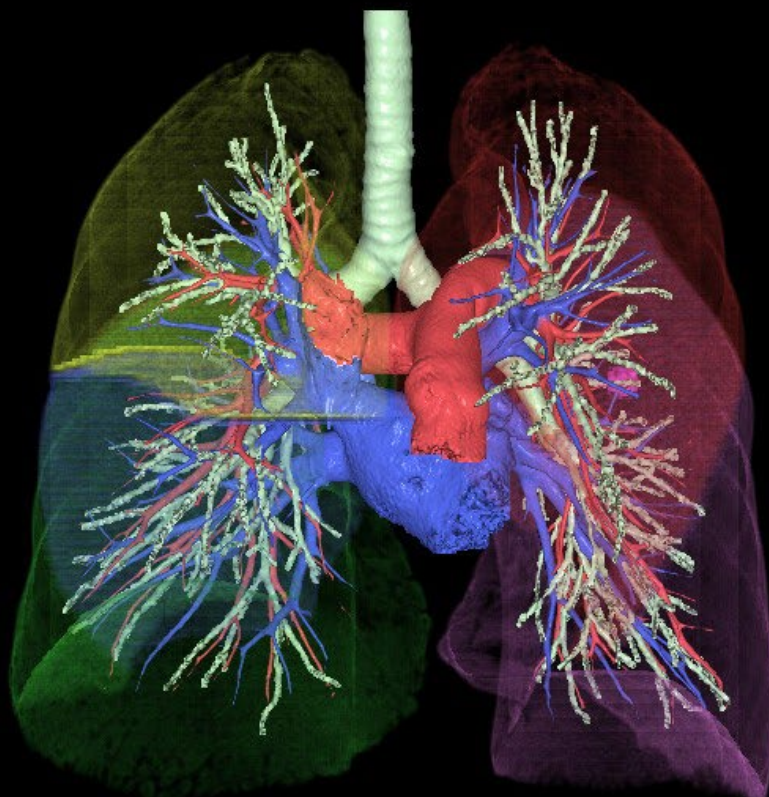


## Applications for advanced image visualization and analysis

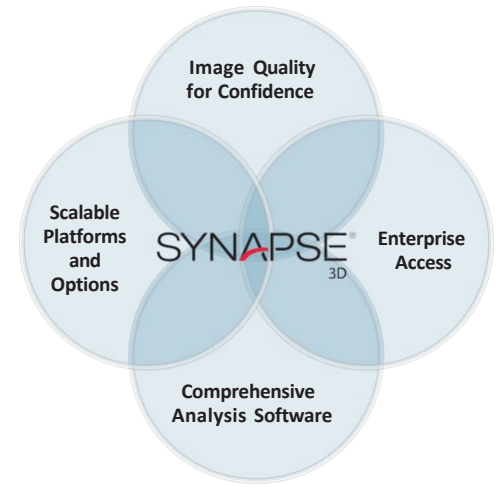


- High image quality
- Comprehensive and clinically relevant analysis software
- Enterprise-wide access
- Scalable platform
- Customized application packages

## OVERVIEW

Synapse<sup>®</sup> 3D provides clinical professionals with a comprehensive collection of applications for advanced image visualization and analysis. Its general tools provide day-to-day 2D, 3D, and 4D image analyses, while its comprehensive, clinically specific tools aid trained clinical users in interpreting, reporting, and providing treatment planning. Most tools can be used alone or combined seamlessly with other tools for additional advanced clinical workflows.

Note: Synapse 3D is not intended for primary diagnostic interpretation of mammography images.



## Clinical Tools

**PULMONOLOGY** p. 18

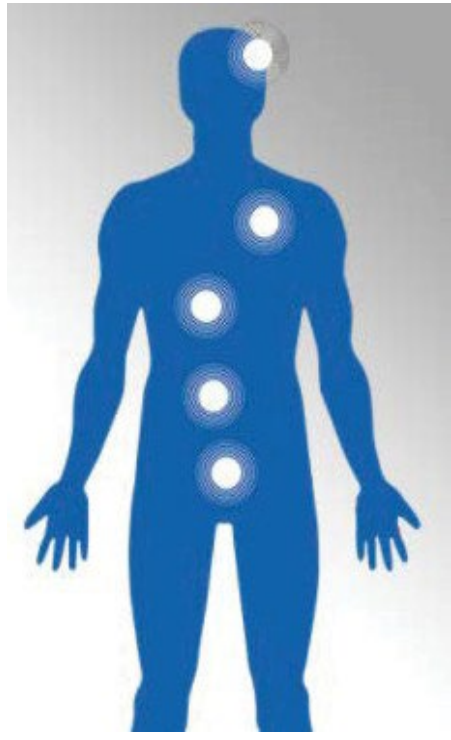
- Lung Analysis/Airway
- Lung Analysis Resection
- Lung Analysis Scope

**GASTROENTEROLOGY** p. 13

- Colon Analysis
- Endoscope Simulator
- IVIM MR
- Liver Analysis CT/MR
- Liver Analysis MR
- Rectal Analysis
- Pancreas Analysis

**NEUROLOGY** p. 15

- 4D Perfusion CT
- Brain Perfusion CT
- Brain Perfusion MR
- Craniotomy/Tensor Analysis
- Vessel Extraction



**UROLOGY** p. 19

- Kidney Analysis
- Kidney Volumetry

**CARDIOLOGY** p. 9

- 4-Chamber Analysis
- Aortic Valve Analysis (TAVR)
- Calcium Scoring
- Cardiac Ablation Analysis
- Cardiac Function CT
- Cardiac Function MR
- Cardiac Fusion
- Cardiac Perfusion CT
- Cardiac Tx Map
- Coronary Analysis CT
- Coronary Analysis MR
- Delayed Enhancement MR
- Flow Analysis MR
- Mitral Valve Analysis

**BASE TOOLS** p. 3

2D Fusion	ADC Viewer	IVR Simulator
2D Viewer	Combination	Knee Joint Analysis
3D Comparison	Dental MPR	MPR Reformat
3D Compositor	Dual Energy	Rib Viewer
3D Viewer	Dynamic Data	Sector MPR
3D Viewer with VE	Fat Analysis 2D & 3D	Slicer
4D Flow	Fusion Viewer	Surface Viewer
4D Viewer	General CPR	Tx Map

**ONCOLOGY** p. 16

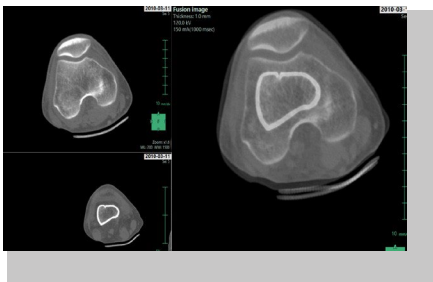
- Abdominal Perfusion CT
- Breast Analysis MR
- Nuclear Medicine Viewer
- Oncology Viewer
- Prostate Viewer MR

## BASE TOOLS

### 2D Fusion

Fuses multimodality and multidimensional data for purposes such as breast or prostate MR or police science applications. It superimposes two 2D/3D images of same/different modality. Main functions include:

- Fusing of 2D or 3D images
- Ability to save created fusion images as DICOM file
- Measurements of tibial tuberosity (TT) and trochlear groove (TG)

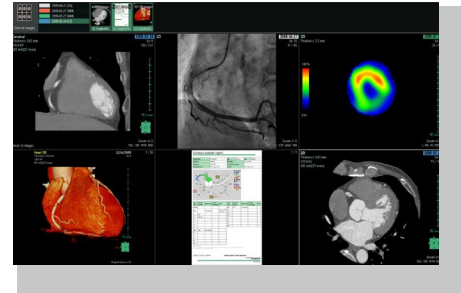


### 2D Viewer

Provides simple viewing of multimodality images in a single application. It 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) of 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
  - PT Image Storage
  - NM Image Storage
  - XA Image Storage
  - US Image Storage

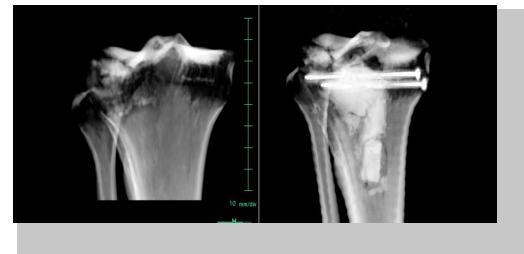
- US Multi-frame Image Storage
- SC Image Storage
- Enhanced CT Image Storage
- Enhanced MR Image Storage



### 3D Comparison

Enables side-by-side comparison and synchronization of multiple 3D data. Main functions include:

- Simultaneous display of images in multiple series
- Synchronization using “Image Intelligence”
- Synchronization of various operations between images, including measurements, annotations, and histograms
- Display of the average image

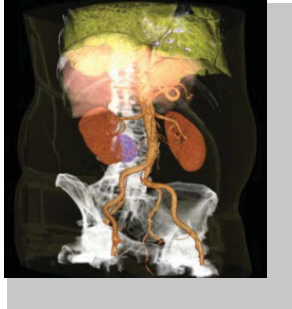


### 3D Compositor

Helps with complex surgical interventions. It enables fusion of up to five series in the same space and displays the volume rendering of combined images. Applications include display of CT images of the liver exposed at multiple time phases, CT



images of bone fused with MR images of soft tissue, and MRA images of artery with phase contrast of vein.

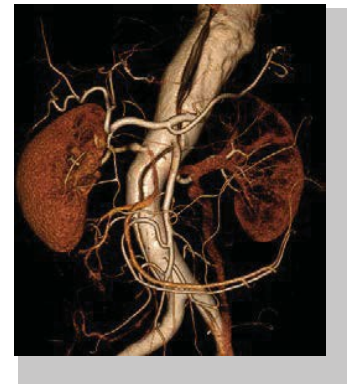


### 3D Viewer

Allows orthogonal, oblique, and endoscopic analysis of CT, MR, NM, and PT data. Main functions include:

- Photorealistic rendering (cinematic rendering)
- Macros: Save and play workflows
- 2D and 3D display of cross-sections
- Body part recognition, extraction, and removal, including:
  - Bone extraction or removal (CT)
  - Bed removal (automatic)
  - Brain extraction (CT or MR)
  - Heart extraction (CT)
  - Colon extraction (CT)
  - Lung and bronchus extractions (CT)
  - Liver extraction (CT)
  - Tumor extraction (CT)
  - Vessel extraction (CT)
  - Hip extraction (CT)
  - Spine extraction (CT)
  - Bone separation (CT)
  - Tube extraction (CT)
  - Cerebral vessels (CT)
  - Small bone extractor (CT)
  - Pulmonary artery and pulmonary vein extraction (CT)
  - Spinal cord extraction (CT)
- Insertion of image planes: Inserts 2D cross-section planes into 3D view and synchronizes with 2D cross-section view
- Outputs observations and images to a report

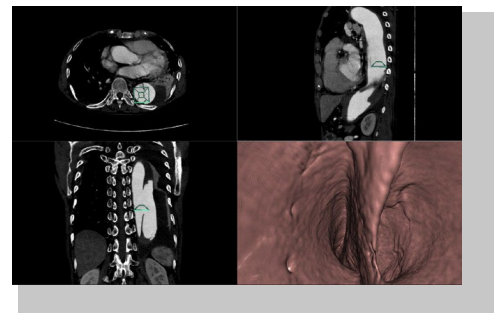
- Launch of General CPR tool for vessel analysis
- 3D reformats, including
  - Volume rendering (VR)
  - Shaded surface rendering (SSD)
  - Maximum intensity projection (MIP)
  - Minimum intensity projection (MinIP)
  - Ray summation (RaySum)
- VR color template
- Mask editing
- Object extraction and removal using erosion, dilation, threshold, etc.
- Multi-masking of up to 12 layers
  - Reverse, ADD, SUB, AND, XOR operations



### 3D Viewer with VE

Allows a fly-through with contrast-enhanced vessels or hollow structures. Main features include:

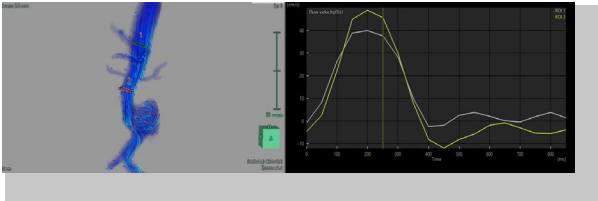
- Observation of the internal wall of hollow organs
- Ability to move automatically without hitting the walls of the lumen
- Automatic recording of the path of the endoscope camera



## 4D Flow

Calculates the blood flow volume, velocity, and vector of a designated ROI and overlays the results onto the extracted region. Main functions include:

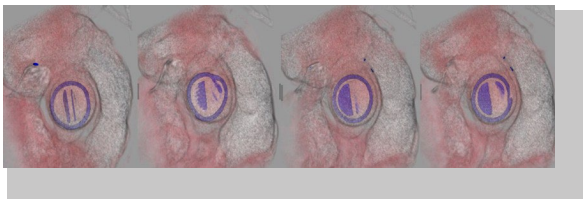
- The parameters of an arranged ROI can be shown in a graph and a summary table
- Display of axial, sagittal, and coronal images overlaid with maximum velocity vector
- Overlay of flow velocity vectors, streamlines, and pathlines on an extracted region
- Display 4D cine of flow velocity vectors, streamlines, and pathlines on an extracted region



## 4D Viewer

Enables CT and MR multiphase data to be viewed in cine mode. It is useful for viewing cardiac CT/MR. In cine play, 2D cross-sections and 3D images are synchronized. Main functions include:

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



## ADC Viewer

Calculates and visualizes apparent diffusion coefficients from information about signal values of diffusion-weighted images collected with MR. Main functions include:

- Observation stage for diffusion-weighted whole-body imaging with background

suppression (DWIBS).

- Display of ADC map and EADC map images
- Measurement of ADC values in ROIs
- Pseudo-color display of ADC map images
- Blending display of ADC map images and background images
- Automatic/manual registration of ADC map images and background images
- Ability to adjust b-value dynamically for computed DWI



## Combination

Combines multiple series into 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 created by combining different series
- Ability to save DICOM images after combining



## Dental MPR

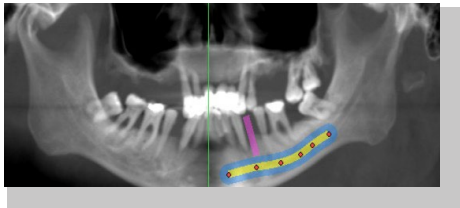
Creates and displays panoramic images of teeth and alveolar bones, useful for implant planning.

Main functions include:

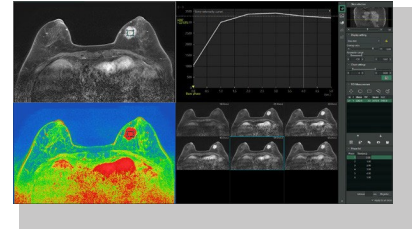
- Display of cross-sectional images of alveolar bones



- Display of panoramic images along row of teeth
- Virtual implant operations
- Ability to output to DICOM or Windows printer



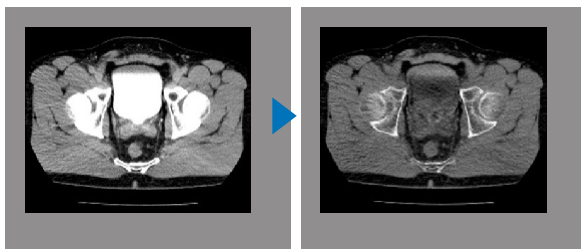
- Display of parameter images (difference, time to peak, max-min, area underneath curve)
- Measurement of circular, rectangular, and freehand ROIs. Output of measurement results in .csv format
- Display and editing of time



## Dual Energy

Creates a virtual mono image from two different kV CT series, two or three material decomposition images, or one virtual non-contrast image. Main functions include:

- Improves artifact visibility by comparing different contrast images
- Extraction or removal of any value within a scatter plot
- Decomposition of two materials from each CT value
- Creation of a virtual non-contrast image by changing the contrast rate from a CT scan with contrast
- Display of contrast rate in a pseudo-color map to enhance contrast effect



## Dynamic Data

Enables clinical assessment of images over time, including breast and prostate MR and dynamic PT analysis. It displays individual parameter images or time-intensity/time-activity curves of slices of multiphase data. Main functions include:

- Loading of single or multiple slice cine images
- Display of time-intensity curves
- Display of time-activity curves (for NM or PT data)

## Fat Analysis 2D and 3D

Calculates the area of subcutaneous fat and visceral fat, and psoas muscle volume. It is useful for monitoring sarcopenia, cachexia, and response to chemotherapy. Main functions include:

- Three-dimensional analysis and display of subcutaneous and visceral fat, current and prior
- Calculation of the area of subcutaneous fat and visceral fat for each slice
- Extraction of psoas muscle with volume calculation
- Calculation of circumference of the body surface, fat ratio, BMI



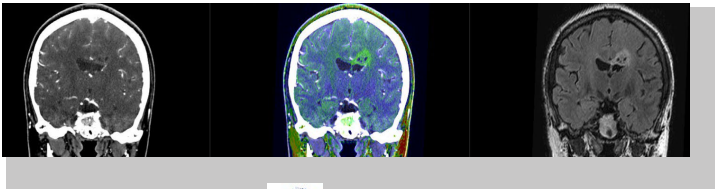
## Fusion Viewer

Enables the display of images fused from two different modalities (CT/PT, CT/MR, CT/SPECT, etc) or images of the same modality with different exposure methods, exposure times, etc.

Main functions include:

- Configurable overlay and blending

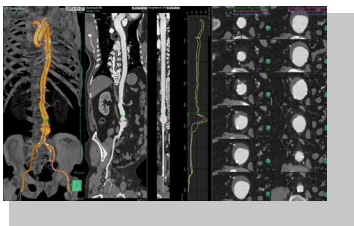
- Automatic rigid registration
- Manual rigid registration by translation and rotation
- Composites of two images using rigid support for the following post-processing reconstructions for 3D viewing: subtraction value, absolute subtraction value, addition value, average value, maximum value, minimum value. In case of different modalities, WL conversion can be specified for reconstruction.
- SUV evaluation for PET data
- Layout options optimal for PET and SPECT-CT viewing
- Measurement of SUV
- Comparison with past analysis results and report output



### General CPR

Visualizes curved planar reconstruction (CPR), useful for clinical analysis of blood vessels (aorta, carotid, etc.) and other tubular structures. Main functions include:

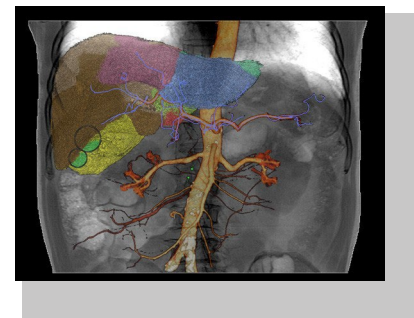
- Automatic or manual creation of CPR path
- Modification of CPR center line and contour
- CPR image display
- Extension of the common carotid to the aortic arch
- Capture of multiple vessel paths with a single button
- Measurement of stenosis ratios
- Color-coded display from color mapping analysis
- Virtual stent graft with TAA, AAA, and TAVR templates



### Interventional Radiology (IVR) Simulator

Provides specialized tools to guide preoperative IVR planning and offers preliminary simulation by extracting regions and paths to the target. Main functions include:

- Automatic or manual path extraction
- Automatic or manual extraction of the abdominal arteries, portal veins, pulmonary arteries, and pulmonary veins
- Setting single or multiple targets (e.g., extravasation area, tumor)
- Searching for and using the best path candidate to the target
- Segmentation of the liver into eight sections (Couinaud segments)
- Display of the size and direction of the vascular branch point by circle and color (referencing a branch and depth map)
- Options to show or hide objects such as targets, paths, or arteries
- A path list that shows the distance from start and distance to target for each target point
- Calculation of the working angle
- Automatic extraction of the liver and spleen
- Volume calculation and territory percentage as derived from vessel selection



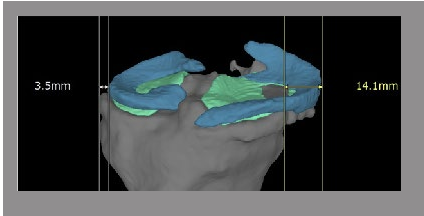
### Knee Joint Analysis

Performs automatic segmentation of bones, meniscus, and cartilage of the knee joint for various analyses. Main functions include:

- Measurement of cartilage loss and thickness
- Quantification of cartilage
- Quantification of meniscus shape



- Measurement of distance from meniscus to tibia
- Display of meniscus signal analysis

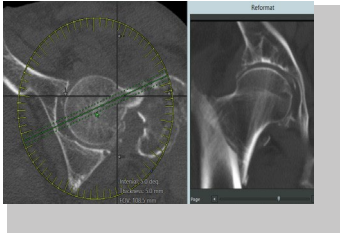


- Cine playback of multiphasic MPR images
- Display of pseudo light-decay shading for realistic visualization
- Measurements on sector MPR images for centesis planning



## MPR Reformat

Creates a plane along a straight line or in the shape of a fan on 2D images and prints or saves the plane as a new image. It links directly to the 3D Viewer for additional analysis.



## Slicer

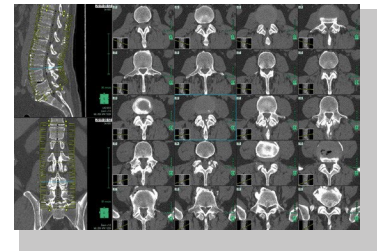
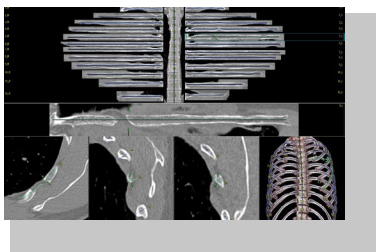
Reconstructs slice data through various translations. It is especially helpful for complex spinal analysis such as scoliosis treatment planning. Main functions include:

- Display of slice images
- Reformatting and reconstruction options
- Specialized layouts for slice visualization
- Spine detection with spine labeling
- Ability to output slice images to DICOM or Windows printers

## Rib Viewer

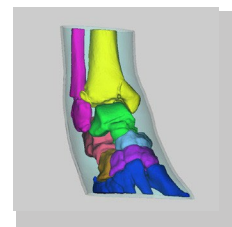
Automatically extracts and labels the spine and ribs. Results are displayed in 3D volume and curved planar reformat (CPR) images. Main functions include:

- Edit of centerlines and labels
- Addition or deletion of vertebrae
- Extraction of the scapula, sternum, clavicle, and spine
- 3D volume views for general pathology assessment



## Surface Viewer

Creates and displays a polygon mesh from the bounding surface determined by threshold processing of volume data using the marching cubes algorithm. It enables the generation of multiple polygon meshes that can be edited and saved as external files.



## Sector MPR

Simulates ultrasound examinations. It is particularly good for aspiration and biopsy planning. It enables the display of single or multiphasic studies to visualize probe and centesis placement. Main functions include:

- Display of sector MPR images

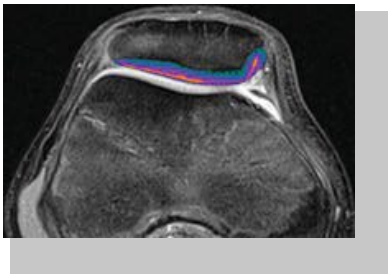




## TX Map

Calculates MR signal values. It enables T2\* assessment, which has clinical utility of cartilage and collagen analysis. T2\* is useful to determine iron deposits and distribution. Main functions include:

- Display of the T2\* map
- Measurement of T2\* values in ROIs
- Monitoring of the T2\* map time-intensity curve
- Pseudo-color display of T2\* map images



## CARDIOLOGY

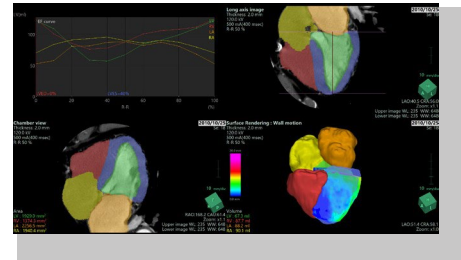
### 4-Chamber Analysis

Extracts left and right ventricles, atria, and myocardium region from CT images consisting of multiple time phases. It calculates cardiac function parameters such as ventricular ejection fraction and enables observation of transitions in ventricle and atrial volume. Main functions include:

- Pre-rendering with 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 for cardiac function analysis
- Display of long- 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
- Measurement 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

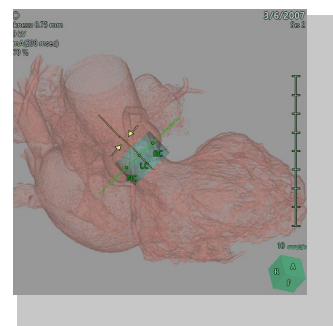
- Ability to output cine movies
- Non-rigid phase registration



### Aortic Valve Analysis (TAVR)

Useful for transcatheter aortic valve replacement (TAVR) planning. It measures various aspects of the vicinity of the aortic valve by extracting the heart and aorta regions from the input CT images. It enables confirmation of the size of the aorta and the performance and calcification of the aortic valve to support aortic valve replacement. Main functions include:

- Pre-rendering with automatic extraction of the heart and aorta regions
- Ability to read single or multiphase data
- Automatic detection of the aortic contours
- Measurement of circumference, area, major and minor axis, average diameter and area, distance to right and left coronary artery, and plaque volumes
- Transapical approach displays and measurements
- Coronary cusp labeling
- Virtual valves with presets
- Ability to output cine movies and data to report summary



## Calcium Scoring

Displays the plaque area of the coronary artery by color and calculates the quantitative value of plaque using the Agatston scoring method. Main functions include:

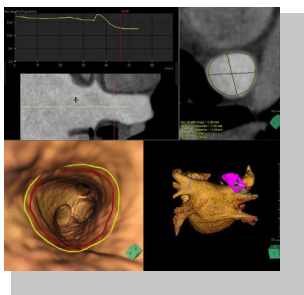
- Automatic extraction of the heart
- Calculation based on the Agatston scoring method
- Threshold value setting for scoring
- Specification for the plaque area in 2D and 3D images

Artery list			
Artery name	# plaques	Volume(mm <sup>3</sup> )	Agatston score
LM	1	53.9	71.8
LCX	3	31.5	33.3
LAD	7	268.1	340.8
RCA	0	0.0	0.0
Total	11	353.5	445.9

## Cardiac Ablation Analysis

Extracts left and right ventricles, atria, and myocardium regions from CT images consisting of the multiple time phases. It also extracts the pulmonary vein based on the left atrial region, for pre-operative simulation for ablation, and for post-operative observation. Main functions include:

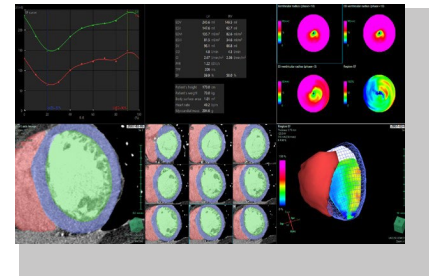
- Automatic extraction of the heart
- Automatic extraction of ventricular, atrial, and myocardial regions
- Automatic extraction of the pulmonary vein
- Extraction and visualization of esophagus for positioning
- 3D view of the pulmonary vein
- Virtual endoscopic view inside the pulmonary vein



## Cardiac Function CT

Evaluates cardiac function by obtaining the contour of the ventricle and myocardium from CT images constructed by multiple time phases. It 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 the left and right ventricles and myocardium
- Display of the long- and short-axis images of the heart
- 3D mapping display of analysis results
- Volume measurement and display of the bull's-eye for the ventricle and myocardium
- Measurement of various cardiac functions 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
- Ability to output cine movies



## Cardiac Function MR

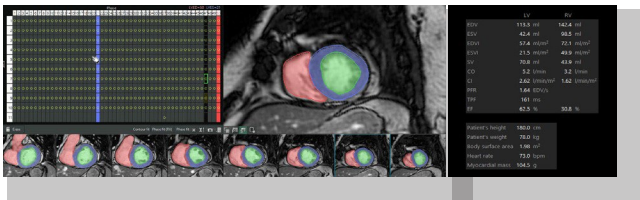
Evaluates cardiac function by obtaining ventricle and myocardium boundaries from MR images consisting of multiple time phases and calculates ejection fraction, end-diastolic volume, end-systolic volume, stroke volume, and other related information.

The contours of the ventricle and 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 printed as a report. Main functions include:

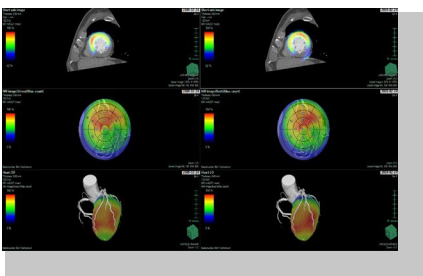
- Automatic left ventricular and myocardial contour extraction
- Manual right ventricular and myocardial contour extraction
- Display of long- and short-axis images of the heart
- 3D mapping display of analysis results
- Volume measurement and display of the bull's-eye for the ventricle and myocardium
- 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 using the Area-Length method
- Ability to output cine movies



## Cardiac Fusion

Enables generation of functional and structural images. Main functions include:

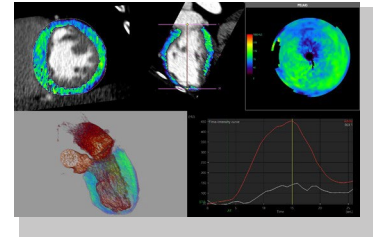
- Display of axial, sagittal, and coronal plane images
- Overlay display of functional and structural images
- Automatic and manual registration of images



## Cardiac Perfusion CT

Analyzes myocardial blood flow using multiphase 3D heart images. Myocardial blood volume (MBV), myocardial blood flow (MBF), time to peak (TTP), peak enhancement (PE), and peak enhancement ratio (PER) are calculated as analysis results. Main functions include:

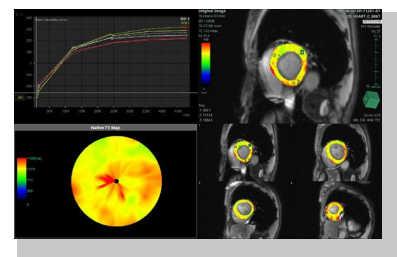
- Position detection and correction of arteries
- Visualization of intensity changes in each phase
- Calculation of MBV, MBF, TTP, PE, and PER
- Myocardial territory extraction



## Cardiac Tx Map

Performs calculations from signal value information collected from MR images and presents the information visually. It also supports qualitative evaluation of the myocardial region based on native T1 mapping and post-contrast T1 mapping from inversion recovery sequences. Main functions include:

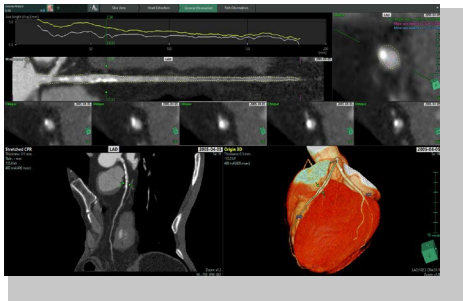
- Tx map display (native T1, contrast T1, extracellular volume [ECV])
- Tx measurement in ROIs
- Tx map time-intensity curve display
- Tx map pseudo-color display
- Tx map bull's-eye display
- A comparison viewer of T1 mapping (native and contrast), subtracted T1 mapping, and delayed enhancement that facilitates evaluation of an area of interest



## Coronary Analysis CT

Enables evaluation of coronary arteries by extracting and segmenting all paths. 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)
- Measurement of coronary artery stenosis ratios
- Virtual stent graft
- Display of coronary artery CPR images
- Ability to save coronary artery CPR and orthogonal plane images
- Ability to 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

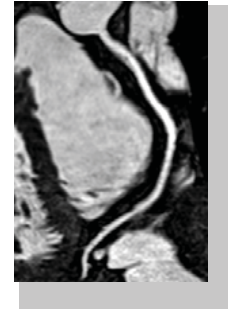


## Coronary Analysis MR

Enables evaluation of coronary arteries by extracting and segmenting all paths. Main functions include:

- Display of axial, sagittal, and coronal images
- Automatic extraction of coronary arteries
- Color mapping analysis
- Measurement of coronary artery stenosis ratios
- Virtual stent graft
- Display of coronary artery CPR images
- Ability to save coronary artery CPR and orthogonal plane images

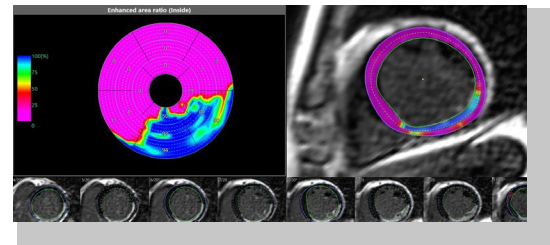
- Ability to modify coronary artery paths and heart region
- Various types of 3D displays for observation of coronary arteries



## Delayed Enhancement MR

Analyzes myocardial viability and calculates the volume and area of myocardial infarction.

It displays the enhanced area overlaid in the bull's-eye map. Enhanced area, mean intensity, and ratio of inner and outer wall can be viewed in short-axis display.



## Flow Analysis MR

Enables calculation of the blood flow volume and the flow velocity per heart rate velocity of an arranged ROI. Main functions include:

- Display of analysis table (flow volume analysis and flow velocity analysis)
- Display of blood flow velocity image
- Display of original image, phase image, or absolute value image
- Display of original image, phase image, or absolute value image overlapped with the blood flow velocity image
- Display results of the flow volume analysis and the flow velocity analysis by the time-intensity curve



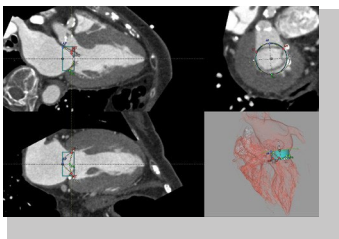
- Comparison with past analysis results and report output

Heart rate	50.0	bpm
R-R interval	1200.0	ms
ROI No.	1	
Area [cm <sup>2</sup> ]	3.40	3.3
Mean flux [ml/s]	2.2	4
Forward flow volume [ml]	3.2	2
Backward flow volume [ml]	5.5	7
Regurgitant fract. [%]	63.2	75
Abs. stroke volume [ml]	8.7	10
Stroke volume [ml]	2.6	5

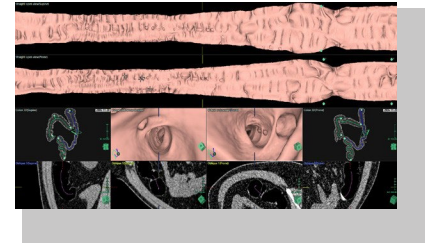
## Mitral Valve Analysis

Facilitates essential mitral valve measurements and generates results used to guide transcatheter mitral valve replacement (TMVR) planning using CT images. It also calculates volume of calcium and shows the location of the virtual valve. Main functions include:

- Measurement of the mitral valve annulus including distance, perimeter, and area
- Measurement of the volume of Hounsfield unit (HU) classification in the virtual valve area
- Virtual mitral valve with presets
- Automatic measurements that can be exported to the report
- Three view types: long-axis, saddle view, and d-shape
- Transapical view approach with adjustable catheter diameter
- Evaluation of aorta and iliac vessels with path planning

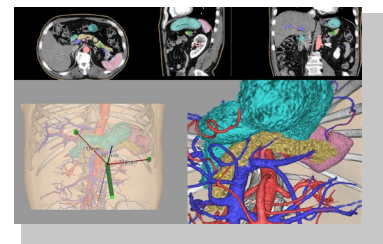


- Automatic extraction of the intestinal tract
- Automatic centerline tracking of intestinal tract
- Observation options for entire colon and lumen
- Comparative observation using any dual combination of the following: supine, prone, or decubitus
- Lesion observation and analysis tools
- Special displays such as colon unfolded cube view display, straight open display, straight cross-section display, etc.
- Digital cleansing
- Observation of lesions and colon in 2D and/or 3D
- Simultaneous display of colon and surrounding organs for treatment planning



## Endoscope Simulator

Useful for laparoscopic surgery simulation. It segments vessels, skin, bone, pancreas, spleen, and tumors. It also simulates inflation of the abdomen, port placement, and positioning. It can perform virtual resection of organs with pertinent volumes.



## GASTROENTEROLOGY

### Colon Analysis

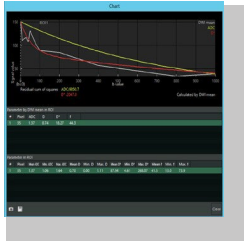
Enables viewing of the colon for the detection of polyps, masses, cancers, and other lesions. It can be used for reading, interpreting, reporting, and screening. Main functions include:

## Intravoxel Incoherent Motion (IVIM) MR

Uses diffusion-weighted images to provide quantitative data from tissue microcapillary perfusion. It automatically displays an ADC map, eADC map, D map, D\* map, and f map. The



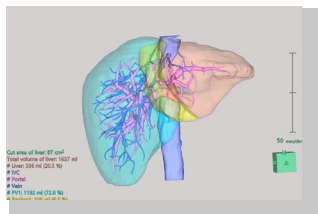
selected ROI can be set on areas of disease to generate analysis results.



## Liver Analysis CT/MR

Useful for liver tumor analysis and resection planning. It enables extraction of the liver and nearby vessel regions from contrast-enhanced CT and MR images and displays the results as 3D-mapped images. In addition, the dominant region of the extracted liver region, portal vein, and veins can be extracted and divided into areas. Hepatectomy simulation can be performed. Main functions include:

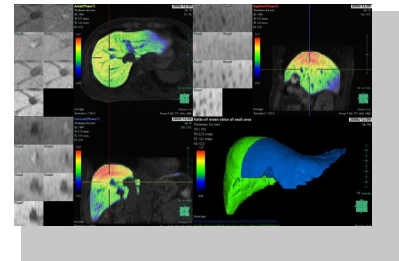
- Display of axial, sagittal, and coronal images
- Automatic extraction of the liver region
- Automatic extraction of hepatic artery, hepatic vein, portal vein, and bile duct
- Simultaneous display of liver, blood vessels, bile duct, tumors, gallbladder, body surface, bones, and other regions
- Volume calculations of liver, tumors, gallbladder, and other regions
- Extraction of resection areas by portal vein or hepatic vein territory, scoop or manual selections
- Segmentation of the liver into eight sections (Couinaud segments)
- Manual modification of any extractions
- Observation and measurements through sector MPR of the liver region
- Fusion of NM or MR data
- Ability to capture and save the tumor list
- Automatic extraction of the inferior vena cava (CT only)



## Liver Analysis MR

Displays MR multiphase contrast-enhanced images and reference images. It enables the generation and viewing of calculated results for liver and spleen regions. Main functions include:

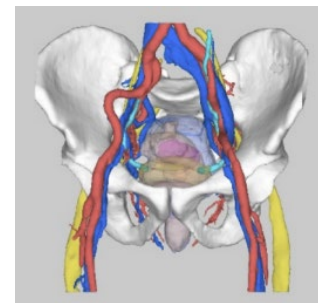
- Display of multiphase contrast-enhanced images and reference images
- Extraction of the liver and spleen regions
- Visualization of calculation results
- Manual modification of extractions



## Rectal Analysis

Automatically segment pelvic-region organs, vessels, and nerves from MRI images for preoperative planning. Virtual Endoscope mode can also be used for preoperative simulation. Main functions include:

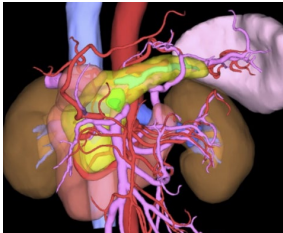
- Automatic extraction of pelvis, rectal, mesorectum, arteries, veins, rectal ROI region, and nerves.
- Display of distance between ROI region and mesorectum in color map.
- Highlight if distance between ROI region in rectal and mesorectum is less than 1 mm.
- Virtual endoscopic view for preoperative planning.



## Pancreas Analysis

Automatically segment and extract the pancreas and nearby vessels and regions from contrast-enhanced CT images to display results in 3D for preoperative planning. The remnant pancreas volume and resection plane area can also be observed. Main functions include:

- Display of pancreas' peripheral region.
- Automatic extraction of pancreas, pancreatic duct, portal veins, arteries, spleen, kidney/renal vein and stomach/duodenum.
- Measurement of resection plane area and pancreatic duct diameter.
- Calculation of remnant pancreas volume.

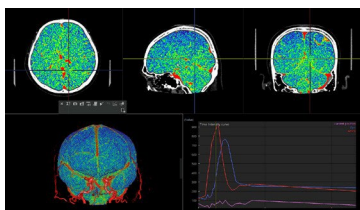


## NEUROLOGY

### 4D Perfusion CT

Uses 4D perfusion data to analyze the changes in cerebral blood flow from the dynamic scan images of CT and calculates cerebral blood volume (CBV), cerebral blood flow (CBF), mean transient time (MTT), and time to peak (TTP). Main functions include:

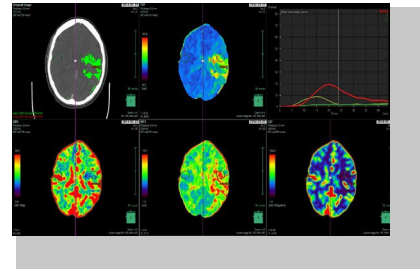
- Color maps for CBV, CBF, MTT, TTP, and Tmax
- Automatic brain, vessels, and skull extraction
- Calculation of mismatch volume and ratio
- All color maps displayed for comparison
- A symmetric ROI and quantitative results
- Display of the image as vessel, vessel MIP, parameter image, fusion image, or multi 3D
- 4D movie creation



## Brain Perfusion CT

Enables analysis of the changes in cerebral blood flow from the dynamic scan images of CT for the same slice. It also calculates cerebral blood volume (CBV), cerebral blood flow (CBF), mean transient time (MTT), and time to peak (TTP) from the analysis results. Main functions include:

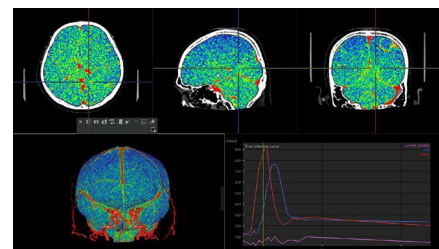
- Analysis of 3D or 4D brain perfusion CT data
- Automatic registration
- Position detection and correction of arteries and veins
- Calculation of CBV, CBF, MTT, and TTP
- Display of the analysis result list
- Specification of threshold-based color overlays



## Brain Perfusion MR

Enables analysis of changes in cerebral blood flow from the dynamic scan images of MR for the same slice and calculation of cerebral blood volume (CBV), cerebral blood flow (CBF), mean transient time (MTT), and time to peak (TTP) from the analysis results. Main functions include:

- Automatic registration
- Position detection and correction of arteries and veins
- Calculation of CBV, CBF, MTT, and TTP
- Display of the analysis result list
- Ability to blend with the ADC map

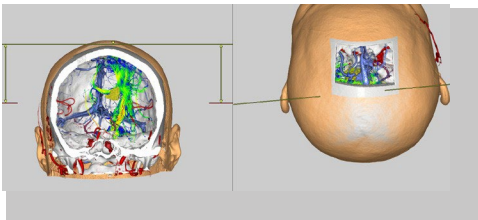


## Craniotomy/Tensor Analysis

Enables tensor analysis from diffusion-weighted MR images, tractography-based extraction, and observation of white matter tractography pathways. It can load additional images (mainly CT images) and extract skin, bone, brain parenchyma, tumor, and cerebral vessels in craniotomy simulations.

Main functions include:

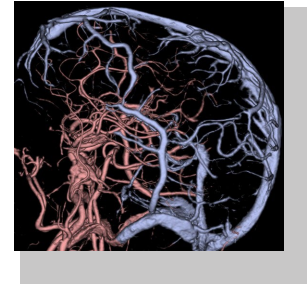
- Display of fractional anisotropy (FA) and diffusion color map images
- Ability to extract and observe white matter tractography
- Ability to calculate FA value, number of fibers, area, and volume in the specified ROI
- Simultaneous display of white matter tractography, skin, bone, brain parenchyma, tumor, artery, vein, and other regions
- Craniotomy simulations involving cutting of skin and bone regions, brain surface clipping by depth, and tumor plane clipping
- Automatic and manual data registration options



## Vessel Extraction

Semi-automatically extracts the blood vessel region from the post-contrast image by removing the bone region using the pre-contrast image. Main functions include:

- Display of three planes (axial, sagittal, and coronal) and respective 3D images
- Display of artery, vein, and calcium
- Automatic or manual registration of images
- Displays of the brain vessel extraction result as 3D, MIP, or fusion
- Stereoscopic display using two 3D images with differing angles



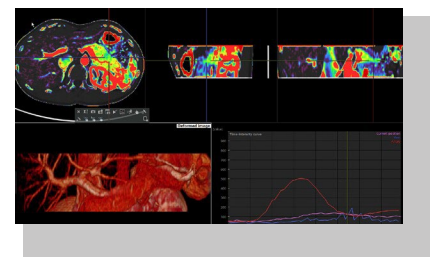
## ONCOLOGY

### Abdominal Perfusion CT

Enables analysis of the blood flow of abdominal organs over time (in 4D) using multiphase 3D abdomen images. It calculates tissue blood volume (TBV), tissue blood flow (TBF), mean transient time (MTT), and time to peak (TTP) as analysis results.

Main functions include:

- Position detection and correction of arteries and veins
- Calculation of TBV, TBF, MTT, and TTP
- Display of analysis result list

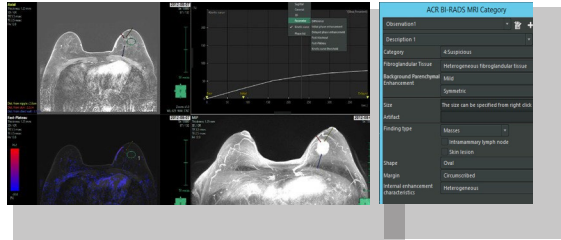


### Breast Analysis MR

Enables the analysis of tumors in the breast and generates a BI-RADS<sup>®</sup> report. Tools in this application include kinetic curves for wash-in and washout and subtraction of pre- and post-contrast. Measurements include distance from the nipple, distance from the skin, distance from the chest wall, and tumor volume. Color overlays can be used to display the differences respectively between the different phases such as initial phase and delayed phase, initial phase enhancement, delayed phase enhancement with washout, and kinetic curve threshold.







## RECIST (Oncology Viewer)

Enables the determination of temporal changes in tumors using RECIST, WHO, mRECIST, or Choi evaluation criteria. Main functions include:

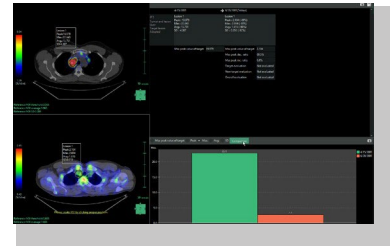
- Lung RADS<sup>®</sup> reporting
- Lesion measurement and display
- Background and lesion measurement
- Long-axis diameter and perimeter measurements of tumors and nodules
- Evaluation according to tumor assessment criteria (WHO, RECIST 1.0 and 1.1, mRECIST, Choi criteria, irRC and Cheson criteria)
- Automatic or manual registration of PT/CT
- Comparison and synchronization with up to nine prior studies
- Display of evaluation data with exportable trend graphs and data tables



## PERCIST (Oncology Viewer)

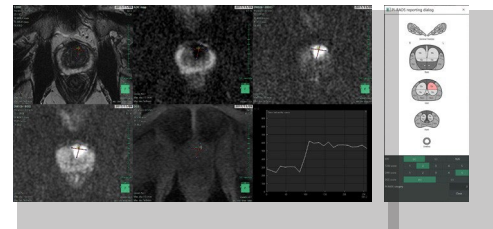
Enables the determination of temporal changes in solid tumors using PERCIST 1.0 evaluation criteria. Main functions include:

- Automatic or manual registration of PT/CT images
- Measurement of background and lesions
- Evaluation by PERCIST 1.0
- Comparison and synchronization with up to nine prior studies
- Output of status of approval, determination, and overall determination of studies
- Display of evaluation data with exportable trend graphs and data tables
- Management of user authority



## Prostate Viewer MR

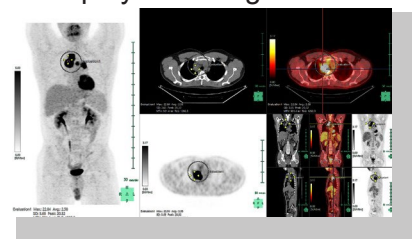
Enables the analysis of prostate gland tumors. It facilitates diameter and volume measurements of the prostate gland and its lesions. Viewing tools include comparative observation of multiple series, T2, ADC, DWI, DCE, and time-intensity curves. Observation and acquired measurements can be used to generate a PI-RADS<sup>™</sup> report.



## Nuclear Medicine Viewer

Enables the combination of multiple series into a single series. It fuses and displays CT or MR and nuclear medicine (SPECT or PET) images to visualize anatomical and physiological data together. Main functions include:

- Fusion of structural images captured by CT and functional images using rigid or non-rigid registration
- Manual or automatic registration
- Fusion display of orthogonal or oblique planes



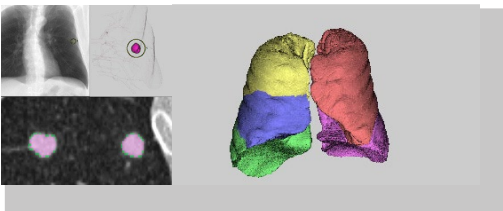
## PULMONOLOGY

### Lung Analysis/Airway



Enables analysis of lung nodules, bronchi, and low-attenuation areas of the lungs. It is useful for assessing nodules, airway obstructions, and lung data over time. Main functions include:

- Automatic and semi-automatic extraction of the lung field and lung lobes
- Extraction of the contact area between the lung field and diaphragm
- Semi-automatic extraction and volume calculation for nodules in lung field
- Extraction of bronchus regions and measurement of diameter of bronchi
- Signal values, Goddard score, and low-attenuation cluster analysis for lung field region
- Comparison of nodules, attenuation, and airway between current and prior studies



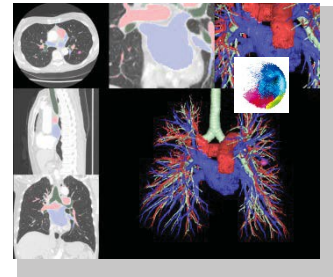
### Lung Analysis Resection



Enables the extraction of lung regions, pulmonary artery, pulmonary vein, bronchus, and other regions for 3D visualization of the lungs. It simulates lung resection by extracting and segmenting the territories of pulmonary vessels and bronchi, which is useful for preoperative planning. Main functions include:

- Automatic and semi-automatic extraction of the lung field and lung lobes
- Extraction and display of diaphragm region
- Extraction of tumors and volume calculation
- Automatic extraction of the pulmonary artery, pulmonary vein, and bronchus
- Surface display and output as an STL file for 3D printing

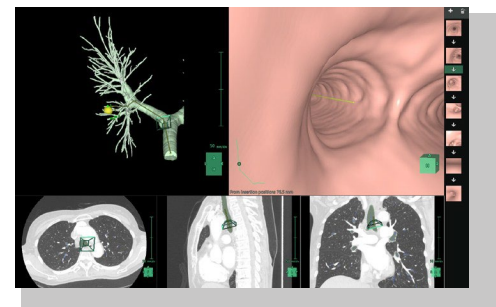
- Calculation of the territories of pulmonary vessels and bronchi of the lung field region
- Long-axis diameter and perimeter measurements of tumors or nodules
- Display of oblique fissures of the lung(s)



### Lung Analysis Scope

Helps pulmonologists to plan endoscopy procedures. It searches for optimal bronchus pathways toward a lung lesion. It performs a bronchoscope simulation along the path, which is useful for visualizing difficult procedures prior to invasive examinations. Main functions include:

- Automatic extraction of the lung field and bronchus
- Semi-automatic extraction of lung nodule, setting of lymph node
- Automatic search for optimum bronchus path to access the lung nodule
- Bronchus display in realistic patient procedure orientation
- Virtual endoscopic image display along the bronchus path

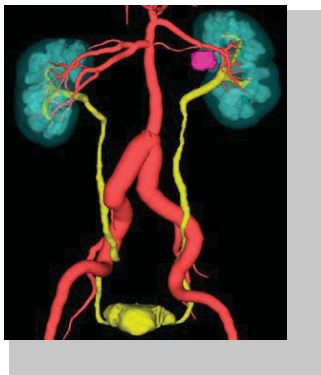


## UROLOGY

### Kidney Analysis

Useful for kidney tumor analysis and nephrectomy planning. It extracts the kidney, renal cortex, renal sinus fat, and regions including various surrounding organs from contrast-enhanced CT images and displays results as 3D images. In addition, further extraction of the extracted kidney region and arterial territory region are possible. Regions can be divided, and nephrectomy simulations can be performed. Main functions include:

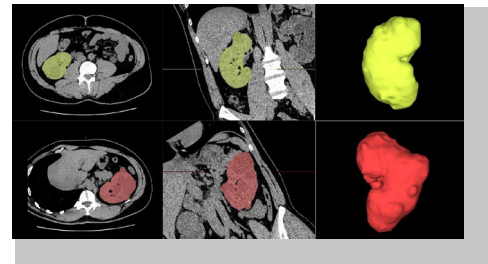
- Display of axial, sagittal, and coronal images
- Automatic extraction of the kidney region
- Automatic vessel extraction
- Automatic renal sinus fat extraction
- Simultaneous display of kidney, blood vessels, tumors, renal calculus, ureters and bladder, body surface, bones, and other regions
- Volume calculations for kidneys, tumors, renal cortex, and renal medulla
- Extraction of the vascular territories in the kidney
- Extraction through tumor scooping in the kidney region
- Manual segmentation of the kidney region
- Observation and measurement through sector MPR of the kidney region



### Kidney Volumetry

Conducts volume analysis of the kidneys on non-contrast CT or MR scans. The result of the analysis can be compared to past results to observe changes in volume over time. Main functions include:

- Semi-automatic extraction and editing of the kidney region
- Measurement in the kidney region
- Observation of the kidney region over time



## COMMON FEATURES

These features are common across all Synapse 3D application tools, where applicable:

- Photorealistic rendering (cinematic rendering)
- 2D cross-section display
- Changing window width and level
- Rendering options include MIP, MinIP, volume rendering (VR), RaySum, and surface
- 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, and spheres
  - Calculates volume of mask region and average/max/min/standard deviation of intensity values in 3D images



## COMMON FEATURES cont.

- 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
- 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
- Annotations
- Clipping
- User-customizable settings
- Reformation by straight line, fan shape, or circular to preset thicknesses and degrees
- Report to DICOM or PDF
- Ability to save workflow snapshots for viewing on PACS or tablet



\*This icon means that **Deep Learning** is used.

To learn more, contact your local sales entity, or visit [3DEnterprisemaging.com](http://3DEnterprisemaging.com). Please note: The content of the URL is for the US region. The actual solution may be different in your region.