Atlas-Based Autosegmentation

DICOM Conformance Statement
DICOM 3.0

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Revision History

Revision	Date	Changes
ABAS_DCS_100_A	04/2008	First version.
ABAS_DCS_B	04/2009	Update tags for DICOM 3.0; update logos

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ABAS DICOM Conformance Statement

1   Intro

1.1 Conformance Statement Overview

Atlas-based autosegmentation computes estimates of anatomic boundaries (contours) in a patient CT image series by deformably registering a previously contoured CT image--the atlas--to the patient image. Transforming the deformed atlas contours onto the patient image produces the desired segmentation.

ABAS requires DICOM format CT Image and RT Structure Set files to represent the anatomy, but does not use DICOM services for image and structure set import or export, relying instead on an user interaction to define where the atlas and patient are located in the computer file system. Navigation of the file system to locate the data is done using the tools of the host operating system.

The RT Structure Set file produced by ABAS contains the data objects needed for DICOM PS 3.3 compliance.

ABAS does not use DICOM network query-retrieve, storage, or media services.

2   Networking

ABAS is a single object oriented program with a simple user interface to locate the atlases and patients and to place the output RT Structure Set files. It only uses the file location methods of the local computer operating system.

The program uses the patient and atlas DICOM header information to define the output RT Structure Set objects.

3   Media Interchange

ABAS provides user interaction only with the disk resources of the local host computer. Any transfer of data to media other than the local disks would require the read/write resources of the local host.

ABAS uses no DICOM media servers or resources.

4   Support of Character Sets

ABAS does not support extended character sets.

5   Security

No specific DICOM security features are applied within ABAS.

Annex A. IOD Contents

A.1 Created SOP Instances.

The following tables use a number of abbreviations. They are as follows:

Value Representations (VR)

VR Entry	Definition
CS	Code String
DA	Date
DS	Decimal String
IS	Integer String
LO	Long String
OB	Other Byte String
PN	Person Name
SH	Short String
SQ	Sequence of Items
TM	Time
UI	Unique Identifier
US	Unsigned Short

Presence Of

Presence Entry	Definition
VNAP	Value Not Always Present (attribute sent zero length if no value is present)
ANAP	Attribute Not Always Present
ALWAYS	Always Present
EMPTY	Attribute is sent without a value

Source

Source Entry	Definition
USER	the attribute value source is from User input
AUTO	the attribute value is generated automatically
CONFIG	the attribute value source is a configurable parameter

NOTE: All dates and times are encoded in the local configured calendar and time.

A.1.2 RT Structure Set IOD

The following tables list the output from the Atlas-Based Autosegmentation product. The RT Structure Set is the only output DICOM information. The output data is located on

the hard drive of the system and contains the meta-header information for storage on media.

IE	Module	Reference	Usage
Patient	Patient	Table A.1.3-1	ALWAYS
Study	General Study	Table A.1.3-2	ALWAYS
Series	RT Series	Table A.1.4-1	ALWAYS
Equipment	General Equipment	Table A.1.3-3	ALWAYS
Structure Set	Structure Set	Table A.1.4-2	ALWAYS
	ROI Contour	Table A.1.4-3	ALWAYS
	RT ROI Observations	Table A.1.4-4	ALWAYS
	Approval	Table A.1.4-5	ALWAYS
	SOP Common	Table A.1.3-4	ALWAYS

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A.1.3 Common Modules

Patient (Table A.1.3-1)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Patient Name	(0010, 0010)	PN	Set to the same value as in the input image set	ALWAYS	AUTO
Patient ID	(0010, 0020)	CS	Set to the same value as in the input image set	ALWAYS	AUTO
Patient's Birth Date	(0010, 0030)	DA	Set to the same value as in the input image set	ALWAYS	AUTO
Patient's Sex	(0010, 0040)	CS	Set to the same value as in the input image set	ALWAYS	AUTO

General Study Module (Table A.1.3-2)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Study Instance UID	(0020, 000D)	UI	Set to the same value as in the input image set	ALWAYS	AUTO
Study Date	(0008, 0020)	DA	Set to the same value as in the input image set	ALWAYS	AUTO
Study Time	(0008, 0030)	TM	Set to the same value as in the input image set	ALWAYS	AUTO
Referring Physician's Name	(0008, 0090)	PN	Set to the same value as in the input image set	ALWAYS	AUTO
Study ID	(0020, 0010)	SH	Set to the same value as in the input image set	ALWAYS	AUTO
Accession Number	(0008, 0050)	SH	Set to the same value as in the input image set	ALWAYS	AUTO

General Equipment Module (Table A.1.3-3)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Manufacturer	(0008,0070)	LO	"CMS, Inc."	ALWAYS	AUTO
Institution Name	(0008,0080)	LO	NULL	EMPTY	AUTO

Manufacturer's Model Name	(0008, 1090)	LO	"Atlas-Based Autosegmentation"	ALWAYS	AUTO
Software Version(s)	(0018, 1020)	LO	Current release number	ALWAYS	AUTO

SOP Common Module (Table A.1.3-4)

Attribute Name	Tag	VR	Value	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	"1.2.840.10008.5.1.4.1.1.481.3"	ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI	Automatically Generated	ALWAYS	AUTO

A.1.4 Series Module

RT Series Module (Table A.1.4-1)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Modality	(0008, 0060)	CS	"RTSTRUCT"	ALWAYS	AUTO
Series Instance UID	(0020, 000E)	UI	Automatically Generated	ALWAYS	AUTO
Series Number	(0020, 0011)	IS	NULL	EMPTY	AUTO

A.1.4 RT Structure Set Modules

Structure Set Module (Table A.1.4-2)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Structure Set Label	(3006, 0002)	CS	Automatically Generated of the form xxxxx_yyy_RTS_z where xxxxx = first 5 characters of the atlas yyy = first 3 characters of the patient name z = optional sequential number for multiple files of the same name	ALWAYS	AUTO
Structure Set Date	(3006, 0008)	DA		ALWAYS	AUTO

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Structure Set Time	(3006, 0009)	TM		ALWAYS	AUTO
Referenced Frame of Reference Sequence	(3006, 0010)	SQ		ALWAYS	AUTO
>Frame of Reference UID	(0020, 0052)	UI	Set to the value of the image data	ALWAYS	AUTO
>RT Referenced Study Sequence	(3006, 0012)	SQ		ALWAYS	AUTO
>>Referenced SOP Class	(0008, 1150)	UI	"1.2.840.10008.5.1.4.1.1.2"	ALWAYS	AUTO
>>Referenced SOP Instance UID	(0008, 1155)	UI	Set to the value of the image data	ALWAYS	AUTO
>>RT Referenced Series Sequence	(3006, 0014)	SQ		ALWAYS	AUTO
>>>Series Instance UID	(0020, 000E)	UI	Set to the value of the image data	ALWAYS	AUTO
>>>Contour Image Sequence	(3006, 0016)	SQ		ALWAYS	AUTO
Structure Set ROI Sequence	(3006, 0020)	SQ		ALWAYS	AUTO
>ROI Number	(3006, 0022)		Set to the same value for this structure as in the atlas structure set.	ALWAYS	AUTO
>Referenced Frame of Reference	(3006, 0024)	SQ		ALWAYS	AUTO
>ROI Name	(3006, 0026)	LO	Set to the same value for this structure as in the atlas structure set.	ALWAYS	AUTO
>ROI Generation Algorithm	(3006, 0036)	CS	"AUTOMATIC"	ALWAYS	AUTO

ROI Contour Module (Table A.1.4-3)

Attribute Name	Tag	VR	Value	Presence of Value	Source
ROI Contour Sequence	(3006, 0039)	SQ		ALWAYS	AUTO
>Referenced ROI Number	(3006, 0084)	IS		ALWAYS	AUTO
>ROI Display Color	(3006, 002A)	IS	Set to the same value for this structure as in the atlas structure set.	ALWAYS	AUTO
>Contour Sequence	(3006, 0040)	SQ		ALWAYS	AUTO
>>Contour Geometric	(3006, 0042)	CS	"CLOSED_PLANA	ALWAYS	AUTO

Attribute Name	Tag	VR	Value	Presence of Value	Source
Type			R" or "POINT".		
>>Number of Contour Points	(3006, 0046)	IS		ALWAYS	AUTO
>>Contour Data	(3006, 0050)	DS		ALWAYS	AUTO

RT ROI Observations Module (Table A.1.4-4)

Attribute Name	Tag	VR	Value	Presence of Value	Source
RT ROI Observations	(3006, 0080)	SQ	One or more items. One item for each ROI in the structure set.	ALWAYS	AUTO
>Observation Number	(3006, 0082)	SQ	Unique for each observation	ALWAYS	AUTO
>Referenced ROI Number	(3006, 0084)	IS	Set to one of the ROI Number (3006, 0022) values specified in the Structure Set ROI Sequence (3006, 0020).	ALWAYS	AUTO
>RT ROI Interpreted Type	(3006,00A4)	CS	NULL	EMPTY	AUTO
>ROI Interpreter	(3006,00A6)	PN	NULL	EMPTY	AUTO

Approval Module (Table A.1.4-5)

Attribute Name	Tag	VR	Value	Presence of Value	Source
Approval Status	(300E, 0002)	CS	"UNAPPROVED"	ALWAYS	AUTO

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A.2 Usage of Attributes from Received IODs

A.2.1 Image Data

The receipt of image data into the ABAS application is dependent on several DICOM tags. The specific requirements are covered in the following table.

Module	Attribute Name	Tag	VR	Value
Frame of Reference	Frame of Reference UID	(0020, 0052)	UI	Must be the same for all images.
Image Plane	Image Position (Patient)	(0020,0032)	US	Must define a transverse set of images by having two of the coordinates be the same for all images (e.g. x and y).
SOP Common	SOP Class UID	(0008,0016)	UI	Must be "1.2.840.10008.5.1.4.1.1.2"

A.2.2 RT Structure Set

The receipt of a RT Structure Set for use as an Atlas is dependent on the image data as well as the RT Structure Set. The following information must be present in the RT Structure Set beyond the standard DICOM requirements.

Module	Attribute Name	Tag	VR	Value
Structure Set	Referenced Frame of Reference Sequence	(3006, 0010)	SQ	Must be present.
	>Frame of Reference UID	(0020,0052)	UI	Must match the value in the referenced image set.
ROI Contour	>>Contour Geometric Type	(3006, 0042)	CS	Must be either "CLOSED_PLANAR" or "INTERPOLATED_PLANAR".