Velocity Python API

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Command Prompt and Python Interpreter Basics

- Using Command Prompt vs Python Interpreter
    - >
        - Indicates that the following should be typed into the command prompt
    - >>>
        - Indicates that the following should be typed into the python interpreter
- Command Prompt Commands
    - > cd
        - Allows the user to change their working directory
        - Absolute Path
            - A path that starts from the root directory
            - This path must be used if your working directory is not part of the path to get to the desired directory
            - Example
                - > cd C:\absolute\path\to\directory
        - Relative Path
            - A path that starts from the working directory
            - This path can be used if your working directory is part of the path to get to the desired directory
            - Example
                - > cd \relative\path\to\directory
    - > python
        - Allows the user to open the python interpreter
        - If the following command is followed by a .py file, the file will be executed (otherwise, it will just open the python interpreter)
            - Example
                - > python my_code.py
    - Arrow Keys
        - The up and down arrow keys can be used to navigate through previously entered commands
- Python Interpreter Commands
    - >>> quit()
        - Allows you to exit the python interpreter and return to the command prompt

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Set-up Needed to Access Scripts

- Setting up python
    - Download latest version of Python 2.7 (currently 2.7.15)
        - https://www.python.org/downloads/windows/
        - Windows x86-64 MSI installer
- Setting up pip
    - Pip should already be downloaded with python
        - To check if pip is already downloaded
            - > pip --version
    - If pip is not already download
        - https://pip.pypa.io/en/stable/installing/
- Setting up virtualenv
    - To download virtualenv
        - > pip install virtualenv
    - To create a virtualenv (named “velocity-env”)
        - > virtualenv velocity-env
    - To activate the virtualenv
        - > velocity-env\Scripts\activate
- Downloading velocity
    - Place the following file in the directory C:\Users\your_user_directory
        - Velocity-4.0.0.794-cp27-cp27m-win_amd64.whl
    - Make sure that your working directory is the directory that you just put the file in
    - To install velocity
        - > pip install velocity-4.0.0.794-cp27-cp27m-win_amd64.whl

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Using Scripts

- Editing scripts to run
  - Open the script you want to change in emacs
    - > emacs script_name.py
  - Find the variable DB_NAME and change it to the database name
    - Example
      DB_NAME = 'VMS_GRID'
  - Find the DB_USER and DB_PASS and change it to your username and password
    - Example
      DB_USER = 'script'
      DB_PASS = 'script'
  - The DB_IP and DB_PORT should already be correct
    - DB_IP = '127.0.0.1'
    - DB_PORT = 57000
  - Save the file by pressing the save button at the top or using the shortcut C-x s
    - C-x s means that you should hold down the control key, press x and then press s
- Compile the script
  - Switch to the python interpreter
  - Type the following into the interpreter
    - >>> import py_compile
    - >>> py_compile.compile("file_name.py")
  - This will compile the code so that the changes made to the code will be updated
- Run the script
  - Type the following into the command prompt
    - > python file_name.py
  - This will allow the program to run
- Fixing errors
  - RuntimeError: Non-script users may not log in from scripts
    - Log into velocity and go to settings
    - Click on the users tab and create a new user
    - After creating the new user, change the user type to Script
    - Use the username and password created for this user for DB_USER and DB_PASS
  - RuntimeError: Could not connect to active database at : *DB_IP* (*DB_PORT*). DbName=*DB_NAME*
    - This means that the DB_NAME is incorrect
  - RuntimeError: No response from Grid database (*DB_IP*:*DB_PORT*/*DB_NAME*): Resource temporarily unavailable

        - This means that the DB_IP is incorrect or the DB_PORT is incorrect
    - RuntimeError: Could not find patient with id: *patientId*
        - The specific patient that the script is written for needs to be imported to velocity in order to get the script to run
        - The patientId specifies which patient the script is written for

Example Scripts

- BED.py
    - Running the script
        - Runs Biological Effective Dose (BED) calculation
- Liver_import.py
    - Running the script
        - Tests to see if a file can be imported properly
- Pet_ct_registrations.py
    - Running the script
        - Tests running a manual registration, rigid registration, and performing a deformable registration
- Print_patient.py
    - Running the script
        - Prints out all information and data on the patient
- Structure_metrics.py
    - Running the script
        - Copies structures using a deformable.
        - Calculates minimum, median, mean, and standard deviation values, comparing them across the deformable or with the proceeding rigid.

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Writing Scripts

- Required components for writing velocity scripts
    - Import statements
        - import velocity
            - This statement will import all velocity classes
        - import atexit
            - This statement will import the atexit module, which assists with properly closing the program after the script has finished running
    - Attributes
        - DB_NAME
            - This attribute can be named whatever you choose, but it will represent the name of the database that is used to login to the velocity grid
            - This attribute should be a constant
                - Although it is not necessary put the name in all capitalization, it is suggested to use capitalization to signify that the attribute is a constant
            - Example
                - DB_NAME = r‘VMS_GRID’
                    - The r is used in order to ensure that if there any escape characters, (a backslash) these characters will be registered as is, rather than as an escape character
        - DB_USER
            - This attribute can be named whatever you choose, but it will represent the username that is used to log into the velocity grid
            - The username should not be the generic username used to login to velocity, but should be the username that was created when you created a Script user for velocity
            - This attribute should be a constant
            - Example
                - DB_USER = ‘script’
        - DB_PASS
            - This attribute can be named whatever you choose, but it will represent the password that is used to log into the velocity grid
            - The password should not be the generic password used to login to velocity, but should be the password that was created when you created a Script user for velocity
            - This attribute should be a constant

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- Example
  - DB_PASS = ‘script’

■ DB_IP
- This attribute can be named whatever you choose, but it will represent the IP address for the velocity grid
- Example
  - DB_IP = ‘127.0.0.1’

■ DB_PORT
- This attribute can be named whatever you choose, but it will represent the port number for the velocity grid
- Example
  - DB_PORT = 57000

■ PATIENT_ID
- This attribute can be named whatever you chose, but it will represent the id of the patient that is being used to run the script
- Example
  - PATIENT_ID = ‘AW3Y6TA684’

○ Creating the velocity engine

■ e = velocity.VelocityEngine()
def orThrow(c, e=e):
    if not c or (hasattr(c, ‘isValid’) and not c.isValid()):
        raise RuntimeError(e.getErrorMessage())
- This block of code is used to create the velocity engine and checks any errors that occur when creating the engine
- Determines if the attempt to create the engine is valid using the isValid() method from the PatientDataItem class
- Uses the getErrorMessage() method from the VelocityEngine class if an error occurs when trying to create the engine

○ Logging in to and out of the velocity grid

■ orThrow(e.loginToGrid(DB_USER, DB_PASS, DB_IP, DB_PORT, DB_NAME))
atexit.register(e.logout)
- Logs into your velocity grid using the loginToGrid() method from the VelocityEngine class and using your username, password, ip address, port number, and grid database
  - The username, password, etc. must be in the exact same order as listed above in order to successfully login
- Logs out of the velocity grid after the script has finished running using the register() method from the atexit module

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- Other components for writing velocity scripts
    - Based on what you want your script to test, you will most likely need to include other attributes, methods, and print statements
    - Most of the additional methods you will need to use will be from the VelocityEngine class; however, other methods may be needed
    - Additional attributes will need to be created in order to fill the parameters of the methods that you are testing
    - Scripts can be used to test a singular method to make sure it works properly, or used to test the interaction between multiple methods
    - Examine other scripts in order to get an idea of what is needed to write additional scripts
    - An example script with comments is provided for you on the next page to help visualize how to write your own scripts
        - This script can be copied and pasted into emacs as a .py file, compiled, and then run in order to see what it does
        - A "#" is used to denote that the following information is a comment, not an actual part of the code

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```
# The following script is used an an example script to show how to write a script.
# In order to create the script, you will need to create a .py file. You can name
# the .py file whatever you want. I have chosen to name my .py file MyScript.py.
# To create the .py file, go to the command prompt and navigate to the directory
# that you wish to place your script in. I am placing my script in the
# velocity-examples directory (C:\Users\fgm3919\velocity-env\velocity-examples)
# where the other example scripts are. Once your are in the desired directory,
# type the following:
#         emacs MyScript.py
# This will open an empty file in emacs where you can copy and paste this script.
# After you have copied and pasted the script, compile the script and run it.
#
# The following script uses a patient that has already been imported, loads the
# patient, and then prints out the patient's full name and date of birth. The
# script tests the loadPatient() and patientDataOps() methods from the
# VelocityEngine class, the getPatientByPatientId() method from the
# PatientDataOperations class, and the getFirstName() and getLastName() methods
# from the Patient class.

import velocity
import atexit

# Attributes
DB_NAME = r'VMS_GRID'
DB_USER = 'script'
DB_PASS = 'script'
DB_IP = '127.0.0.1'
DB_PORT = 57000

# O'Reilly, Bobby'O must be loaded for the script to work
PATIENT_ID = "O'ReillyID"

# Creates the velocity engine
e = velocity.VelocityEngine()
def orThrow(c, e=e):
        if not c or (hasattr(c, 'isValid') and not c.isValid()):
                raise RuntimeError(e.getErrorMessage())

# Login to velocity grid
```

```
orThrow(e.loginToGrid(DB_USER, DB_PASS, DB_IP, DB_PORT, DB_NAME))
# Logout of velocity grid when script is done running
atexit.register(e.logout)

# Loads the patient given the patient ID
orThrow(e.loadPatient(PATIENT_ID))
print('Loaded patient: {}'.format(PATIENT_ID))

# Allows the script to use the patient data operations
patientDataOps = e.getPatientDataOperations()
# Assigns the patient to a variable called patient
patient = patientDataOps.getPatientByPatientId(PATIENT_ID)
# Determines the patient's full name
patientFullName = patient.getFirstName() + " " + patient.getLastName()
print('Patient {} is named {}.'.format(PATIENT_ID, patientFullName))
# Determines the patient's date of birth
patientDOB = patient.getDateOfBirth()
print('Patient {} was born {}.'.format(PATIENT_ID, patientDOB))
```

Viewing Documentation

- Entire Velocity Documentation
    - >>> import velocity
    - >>> help(velocity)
- Specific Class Documentation
    - >>> import velocity
    - >>>help(velocity.Class_Name)

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__builtin__.SwigPyObject

- SwigPyObject is an implementation detail. All Velocity classes inherit SwigPyObject but scripting API users **should not use** SwigPyObject methods. These methods are:
    - acquire()
    - append()
    - disown()
    - next()
    - own()

Velocity Classes

- List of all classes
    - BaseRegistrationSettingsStructure
        - BaseImageBasedRegistrationSettingsStructure
            - BSplineDeformableRegistrationSettingsStructure
            - RigidRegistrationSettingsStructure
        - ManualRegistrationSettingsStructure
    - BoolList
    - CharList
    - CropSettings
    - DoubleList
    - ExportOperations
    - FloatList
    - Image2DList
    - ImportOperations
    - IntList
    - MarginSettings
    - MatrixR22d
    - MatrixR22i
    - MatrixR33d
    - MatrixR33f
    - MatrixR44d
    - MatrixR44f
    - PatientDataItem
        - Image2D
        - Patient
        - Plan
        - Registration
        - RegistrationCommissioningMarkerList
        - Structure
        - StructureSet
        - Volume
    - PatientDataOperations
    - PatientList
    - PlanList
    - RegistrationCommissioningMarkerLists
    - RegistrationList
    - RegistrationMarker
    - RegistrationMarkerList

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BaseRegistrationSettingsStructure

- Defined built-in methods
    - Built-in: Set 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

BaseImageBasedRegistrationSettingsStructure

- Attributes and data descriptors
  - preprocessingMethods
    - Attribute type
      - PreprocessingFilterMethod object
    - Description
      - A image pre-processing filter
  - primaryEndLevel
    - Attribute type
      - Double
  - primaryStartLevel
    - Attribute type
      - Double
  - roiEnd
    - Attribute type
      - VectorR3d object
    - Description
      - Used to represent the ending point for the region of interest
  - roiStart
    - Attribute type
      - VectorR3d object
    - Description
      - Used to represent the starting point for the region of interest
  - secondaryEndLevel
    - Attribute type
      - Double
  - secondaryStartLevel
    - Attribute type
      - Double
- Defined built-in methods
  - Built-in: Set 1
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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BSplineDeformableRegistrationSettingsStructure

- Attributes and data descriptors
    - applyBoundaryContinuityConstrains
        - Type
            - vector < bool >
    - applyTopologicalRegularizer
        - Type
            - vector < bool >
    - gradientMagnitudeTolerance
        - Attribute type
            - vector < double >
    - gridCellSize
        - Attribute type
            - vector < VectorR3d >
    - gridCellSizeType
        - Attribute type
            - vector < char >
    - maximumNumberOfConsecutiveOptimizerAttempts
        - Attribute type
            - vector < int >
    - maximumNumberOfIterations
        - Attribute type
            - vector < int >
    - maximumStepLength
        - Attribute type
            - vector < double >
    - metricValuePercentageDifferent
        - Attribute type
            - vector < double >
    - minimumStepLength
        - Attribute type
            - vector < double >
    - numberOfHistogramBins
        - Attribute type
            - vector < int >
    - numberOfMultiResolutionLevels
        - Attribute type
            - Integer
        - Description

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                - Represents the number of resolution levels
        - relaxationFactor
            - Attribute type
                - vector < double >
        - samplesDenominator
            - Attribute type
                - vector < int >
        - topologicalRegularizerDistanceLimitingCoefficient
            - Attribute type
                - vector < VectorR3d >
- Inherited data descriptors
    - From BaseImageBaswedRegistrationSettingsStructure
        - preprocessingMethod
        - primaryEndLevel
        - primaryStartLevel
        - roiEnd
        - roiStart
        - secondaryEndLevel
        - secondaryStartLevel
- Defined built-in methods
    - Built-in: Set 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

RigidRegistrationSettingsStructure

- Attributes and data descriptors
    - disableRotationsX
        - Attribute type
            - Boolean
    - disableRotationsY
        - Attribute type
            - Boolean
    - disableRotationsZ
        - Attribute type
            - Boolean
    - disableTranslationsX
        - Attribute type
            - Boolean
    - disableTranslationsY
        - Attribute type
            - Boolean
    - disableTranslationsZ
        - Attribute type
            - Boolean
    - maximumNumberOfIterations
        - Attribute type
            - Integer
    - maximumStepLength
        - Attribute type
            - Double
    - minimumStepLength
        - Attribute type
            - Double
    - numberOfHistogramBins
        - Attribute type
            - Integer
    - performInitialAutoAlignment
        - Attribute type
            - Boolean
    - samplesDenominator
        - Attribute type
            - Integer
- Inherited data descriptors

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    - From BaseImageBaswedRegistrationSettingsStructure
        - preprocessingMethod
        - primaryEndLevel
        - primaryStartLevel
        - roiEnd
        - roiStart
        - secondaryEndLevel
        - secondaryStartLevel
- Defined built-in methods
    - Built-in: Set 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

ManualRegistrationSettingsStructure

- Attributes and data descriptors
    - registrationMatrix
        - Attribute type
            - MatrixR44d object
        - Description
            - Represents the rigid transformation matrix of the registration
- Defined built-in methods
    - Built-in: Set 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

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BoolList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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CharList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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CropSettings

- Data descriptors
  - margin
  - marginDirection
  - operation
- Defined built-in methods
  - Built-in: Set 1
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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DoubleList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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ExportOperations

- Attributes
    - DICOM_REG
        - Value
            - 2
    - DICOM_RTPLAN
        - Value
            - 1
    - DICOM_RTSTRUCT
        - Value
            - 3
    - DICOM_VOLUME
        - Value
            - 0
- Defined built-in methods
    - Built-in: Set 1
- Other defined methods
    - documentNameStrFilenameFormatted(reportRecordId)
        - Return type
            - String
        - Description
            - Returns the name of the specified document as a formatted string
            - Calls getErrorMessage() method and returns an empty string if there is an error
    - exportDicomObject(objectType, objectUID, folderPath, overrideWithInfoFromDB = false, encodingType = ORIGINAL_ENCODING)
        - Return type
            - Boolean
        - Description
            - Exports a dicom object to the specified folder path
    - exportReportDocument(reportRecordId, baseFilenameExport, baseFolderPathExport)
        - Return type
            - Boolean
        - Description
            - Exports the report to the specified folder path
            - Returns false if there is an error
    - getErrorMessage()
        - Return type

                - String
            - Description
                - Returns a string displaying an error message
        - getLocalizedErrorMessage()
            - Return type
                - String
            - Description
                - Returns a string displaying an error message
        - patientIdStrFilenameFormatted()
            - Return type
                - String
            - Description
                - Returns the patient id as a formatted string
                - Calls the getErrorMessage() method and returns an empty string if an error occurs
        - registrationNameStrFilenameFormatted()
            - Return type
                - String
            - Description
                - Returns the name of the current registration object as a formatted string
                - Calls the getErrorMessage() method and returns an empty string if an error occurs
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

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FloatList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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Image2DList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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ImportOperations

- Defined built-in methods
    - Built-in: Set 1
- Other defined methods
    - getErrorMessage()
        - Return type
            - String
        - Description
            - Returns a string displaying an error message
    - getLocalizedErrorMessage
        - Return type
            - String
        - Description
            - Returns a string displaying an error message
    - importDirectory(path, recursive)
        - Return type
            - Boolean
        - Description
            - Imports DICOM files
    - importEclipseTrePointSet(fileLocation, registrationCommissioningName)
        - Return type
            - Integer
        - Description
            - Imports the TRE Point Set from the Eclipse database and returns the record id
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

IntList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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MarginSettings

- Data descriptors
  - marginDirection
  - marginType
  - marginValue
  - marginValueNegX
  - marginValueNegY
  - marginValueNegZ
  - marginValueX
  - marginValueY
  - marginValueZ
- Defined built-in methods
  - Built-in: Set 1
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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MatrixR22d

- Attributes
  - num_cols
    - Attribute type
      - Integer
      - Constant
    - Value
      - 2
  - num_rows
    - Attribute type
      - Integer
      - Constant
    - Value
      - 2
- Defined built in methods
  - Built-in: Set 1
  - Built-int: Set 3
- Other defined methods
  - elements()
    - Return Type
      - E
    - Description
      - Returns a pointer to an array with the elements in the matrix
  - extractScale(scale)
    - Description
      - Extracts the scale from the matrix
  - extractTranslation(translation)
    - Description
      - Extracts the translation from the matrix
  - get()
  - identity()
    - Description
      - Sets the matrix back to identity
  - invert()
    - Description
      - Changes the matrix to its inverse
  - isRigid()
    - Return type
      - Boolean

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        - Description
            - Determines if a matrix is a pure Rigid
    - set()
    - setElements(elementArray)
        - Description
            - Copies the elements from an array into the matrix
    - transpose(m)
        - Description
            - Returns the transpose of the matrix
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

MatrixR22i

- Attributes
    - num_cols
        - Attribute type
            - Integer
            - Constant
        - Value
            - 2
    - num_rows
        - Attribute type
            - Integer
            - Constant
        - Value
            - 2
- Defined built in methods
    - Built-in: Set 1
    - Built-int: Set 3
- Other defined methods
    - elements()
        - Return Type
            - E
        - Description
            - Returns a pointer to an array with the elements in the matrix
    - extractScale(scale)
        - Description
            - Extracts the scale from the matrix
    - extractTranslation(translation)
        - Description
            - Extracts the translation from the matrix
    - get()
    - identity()
        - Description
            - Sets the matrix back to identity
    - invert()
        - Description
            - Changes the matrix to its inverse
    - isRigid()
        - Return type
            - Boolean

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        - Description
            - Determines if a matrix is a pure Rigid
    - set()
    - setElements(elementArray)
        - Description
            - Copies the elements from an array into the matrix
    - transpose(m)
        - Description
            - Returns the transpose of the matrix
- Inherited methods
    - From __builtin__.SwigPyObject)
        - All __builtin__.SwigPyObject methods

MatrixR33d

- Attributes
    - num_cols
        - Attribute type
            - Integer
            - Constant
        - Value
            - 3
    - num_rows
        - Attribute type
            - Integer
            - Constant
        - Value
            - 3
- Defined built in methods
    - Built-in: Set 1
    - Built-int: Set 3
- Other defined methods
    - elements()
        - Return Type
            - E
        - Description
            - Returns a pointer to an array with the elements in the matrix
    - extractScale(scale)
        - Description
            - Extracts the scale from the matrix
    - extractTranslation(translation)
        - Description
            - Extracts the translation from the matrix
    - get()
    - identity()
        - Description
            - Sets the matrix back to identity
    - invert()
        - Description
            - Changes the matrix to its inverse
    - isRigid()
        - Return type
            - Boolean

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        - Description
            - Determines if a matrix is a pure Rigid
    - set()
    - setElements(elementArray)
        - Description
            - Copies the elements from an array into the matrix
    - transpose(m)
        - Description
            - Returns the transpose of the matrix
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

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MatrixR33f

- Attributes
    - num_cols
        - Attribute type
            - Integer
            - Constant
        - Value
            - 3
    - num_rows
        - Attribute type
            - Integer
            - Constant
        - Value
            - 3
- Defined built in methods
    - Built-in: Set 1
    - Built-int: Set 3
- Other defined methods
    - elements()
        - Return Type
            - E
        - Description
            - Returns a pointer to an array with the elements in the matrix
    - extractScale(scale)
        - Description
            - Extracts the scale from the matrix
    - extractTranslation(translation)
        - Description
            - Extracts the translation from the matrix
    - get()
    - identity()
        - Description
            - Sets the matrix back to identity
    - invert()
        - Description
            - Changes the matrix to its inverse
    - isRigid()
        - Return type
            - Boolean

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        - Description
            - Determines if a matrix is a pure Rigid
    - set()
    - setElements(elementArray)
        - Description
            - Copies the elements from an array into the matrix
    - transpose(m)
        - Description
            - Returns the transpose of the matrix
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

MatrixR44d

- Attributes
    - num_cols
        - Attribute type
            - Integer
            - Constant
        - Value
            - 4
    - num_rows
        - Attribute type
            - Integer
            - Constant
        - Value
            - 4
- Defined built in methods
    - Built-in: Set 1
    - Built-int: Set 3
- Other defined methods
    - elements()
        - Return Type
            - E
        - Description
            - Returns a pointer to an array with the elements in the matrix
    - extractScale(scale)
        - Description
            - Extracts the scale from the matrix
    - extractTranslation(translation)
        - Description
            - Extracts the translation from the matrix
    - get()
    - identity()
        - Description
            - Sets the matrix back to identity
    - invert()
        - Description
            - Changes the matrix to its inverse
    - isRigid()
        - Return type
            - Boolean

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        - Description
            - Determines if a matrix is a pure Rigid
    - set()
    - setElements(elementArray)
        - Description
            - Copies the elements from an array into the matrix
    - transpose(m)
        - Description
            - Returns the transpose of the matrix
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

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MatrixR44f

- Attributes
    - num_cols
        - Attribute type
            - Integer
            - Constant
        - Value
            - 4
    - num_rows
        - Attribute type
            - Integer
            - Constant
        - Value
            - 4
- Defined built in methods
    - Built-in: Set 1
    - Built-int: Set 3
- Other defined methods
    - elements()
        - Return Type
            - E
        - Description
            - Returns a pointer to an array with the elements in the matrix
    - extractScale(scale)
        - Description
            - Extracts the scale from the matrix
    - extractTranslation(translation)
        - Description
            - Extracts the translation from the matrix
    - get()
    - identity()
        - Description
            - Sets the matrix back to identity
    - invert()
        - Description
            - Changes the matrix to its inverse
    - isRigid()
        - Return type
            - Boolean

Return to Table of Contents

        - Description
            - Determines if a matrix is a pure Rigid
    - set()
    - setElements(elementArray)
        - Description
            - Copies the elements from an array into the matrix
    - transpose(m)
        - Description
            - Returns the transpose of the matrix
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

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PatientDataItem

- Defined built in methods
    - Built-in: Set 1
- Other defined methods
    - getVelocityId()
        - Return Type
            - Integer
        - Description
            - Returns the velocity id value of the object
    - isValid()
        - Return Type
            - Boolean
        - Description
            - Determines if the object is a valid object
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

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Image2D

- Defined built in methods
    - Built-in: Set 1
- Other defined methods
    - getCreateDate()
        - Return type
            - String
        - Description
            - Returns the date that the image was created
            - Formats the date in ISO format
    - getEditDate()
        - Return type
            - String
        - Description
            - Returns the date that the image was edited
            - Formats the date in ISO format
    - getInstanceUID()
        - Return type
            - String
    - getModality()
        - Return type
            - String
    - getName()
        - Return type
            - String
        - Description
            - Returns the name
    - getPatient()
        - Return type
            - Patient object
        - Description
            - Returns the patient object
    - getSeriesUID()
        - Return type
            - String
    - getStudyDate()
        - Return type
            - String
        - Description

Return to Table of Contents

                - Returns the date of the study
                - Formats the date in ISO format
        - getStudyUID()
            - Return type
                - String
        - getType()
            - Return type
                - String
        - isLocked()
            - Return type
                - Boolean
            - Description
                - Determines if the object is locked
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods
    - From PatientDataItem
        - getVelocityId()
            - Return Type
                - Integer
            - Description
                - Returns the velocity id value of the object
        - isValid()
            - Return Type
                - Boolean
            - Description
                - Determines if the object is a valid object

Patient

- Defined built in methods
    - Built-in: Set 1
- Other defined methods
    - getCreateDate()
        - Return type
            - String
        - Description
            - Returns the date that the record was created
            - Formats the date in ISO format
    - getDateOfBirth()
        - Return type
            - String
        - Description
            - Returns the patient's date of birth
            - Formats the date in ISO format
    - getEditDate()
        - Return type
            - String
        - Description
            - Returns the date that the record was edited
            - Formats the date in ISO format
    - getFirstName()
        - Return type
            - String
        - Description
            - Returns the patient's first name
    - getLastName()
        - Return type
            - String
        - Description
            - Returns the patient's last name
    - getPatientId()
        - Return type
            - String
        - Description
            - Returns the patient's id
    - getPlans()
        - Return type

                - vector < Plan >
        - getSex()
            - Return type
                - String
            - Description
                - Returns the patient's sex
        - getVolumes()
            - Return type
                - vector < Volume >
            - Parameters
                - modalityToGet
        - isLocked()
            - Return type
                - Boolean
            - Description
                - Determines if the object is locked
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods
    - From PatientDataItem
        - getVelocityId()
            - Return Type
                - Integer
            - Description
                - Returns the velocity id value of the object
        - isValid()
            - Return Type
                - Boolean
            - Description
                - Determines if the object is a valid object

Plan

- Defined built in methods
    - Built-in: Set 1
- Other defined methods
    - getCreateDate()
        - Return type
            - String
        - Description
            - Returns the date the plan was created
            - Formats the date in ISO format
    - getDoseVolumeIds()
        - Return type
            - vector < int >
        - Description
            - Returns the id values of the dose volumes
    - getDoseVolumes()
        - Return type
            - vector < Volume >
        - Description
            - Returns the dose volumes
    - getEditDate()
        - Return type
            - String
        - Description
            - Returns the date that the plan was edited
            - Formats the date in ISO format
    - getInstanceUID()
        - Return type
            - String
        - Description
            - Returns the UID of the instance
    - getName()
        - Return type
            - String
        - Description
            - Returns the name of the plan
    - getSeriesUID()
        - Return type
            - String

        - Description
            - Returns the UID of the series
    - getStructureSet()
        - Return type
            - StructureSet object
        - Description
            - Returns the structure set
    - getStructureSetUID()
        - Return type
            - String
        - Description
            - Returns the UID of the structure sets
    - getStructureVelocityIds()
        - Return type
            - vector < int >
        - Description
            - Returns the velocity ids of the structures
    - getStructures()
        - Return type
            - vector < Structure >
        - Description
            - Returns the structures
    - getStudyDate()
        - Return type
            - String
        - Description
            - Returns the date the study was created
            - Formats the date in ISO format
    - getStudyUID()
        - Return type
            - String
        - Description
            - Returns the UID of the study
    - getVolume()
        - Return type
            - Volume object
        - Description
            - Returns the volume
    - getVolumeVelocityId()

        - Return type
            - Integer
        - Description
            - Returns the velocity id of the volume
    - isLocked()
        - Return type
            - Boolean
        - Description
            - Determines if the current plan is locked
- Inherited methods
    - From __builtin__.SwigPyObject)
        - All __builtin__.SwigPyObject methods
    - From PatientDataItem
        - getVelocityId()
            - Return Type
                - Integer
            - Description
                - Returns the velocity id value of the object
        - isValid()
            - Return Type
                - Boolean
            - Description
                - Determines if the object is a valid object

Registration

- Defined built in methods
    - Built-in: Set 1
- Other defined methods
    - getCreateDate()
        - Return type
            - String
        - Description
            - Returns the date that the registration was created
            - Formats the date in ISO format
    - getDicomRegistrationUID()
        - Return type
            - String
        - Description
            - Returns the UID of the DICOM registration
    - getEditDate()
        - Return type
            - String
        - Description
            - Returns the date that the registration was edited
            - Formats the date in ISO format
    - getInstanceUID()
        - Return type
            - String
        - Description
            - Returns the UID of the instance
    - getName()
        - Return type
            - String
        - Description
            - Returns the name of the registration
    - getSourceVolume()
        - Return type
            - Volume object
        - Description
            - Returns the source volume
    - getTargetVolume()
        - Return type
            - Volume object

        - Description
            - Returns the target volume
    - getType()
        - Return type
            - String
        - Description
            - Returns the registration type
    - isLocked()
        - Return type
            - Boolean
        - Description
            - Determines if the registration is locked
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods
    - From PatientDataItem
        - getVelocityId()
            - Return Type
                - Integer
            - Description
                - Returns the velocity id value of the object
        - isValid()
            - Return Type
                - Boolean
            - Description
                - Determines if the object is a valid object

RegistrationCommissioningMarkerList

- Defined built in methods
    - Built-in: Set 1
- Other defined methods
    - getCreateDate()
        - Return type
            - String
        - Description
            - Returns the date that the registration commissioning marker was created
            - Formats the date in ISO format
    - getName()
        - Return type
            - String
        - Description
            - Returns the name of the registration commissioning marker
    - getPrimaryVolume()
        - Return type
            - Volume object
        - Description
            - Returns the primary volume
    - getRegistrationMarkerList()
        - Return type
            - vector < RegistrationMarker >
        - Description
            - Returns the list of registration markers
    - getSecondaryVolume()
        - Return type
            - Volume object
        - Description
            - Returns the secondary volume
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods
    - From PatientDataItem
        - getVelocityId()
            - Return Type
                - Integer
            - Description

        - Returns the velocity id value of the object
- isValid()
    - Return Type
        - Boolean
    - Description
        - Determines if the object is a valid object

Structure

- Defined built in methods
    - Built-in: Set 1
- Other defined methods
    - getCreateDate()
        - Return type
            - String
        - Description
            - Returns the date that the structure was created
            - Formats the date in ISO format
    - getEditDate()
        - Return type
            - String
        - Description
            - Returns the date that the structure was edited
            - Formats the date in ISO format
    - getFrameOfReferenceUID()
        - Return type
            - String
        - Description
            - Returns the UID of the frame of reference
    - getInstanceUID()
        - Return type
            - String
        - Description
            - Returns the UID of the instance
    - getName()
        - Return type
            - String
        - Description
            - Returns the name of the structure
    - getROINumber()
        - Return type
            - String
        - Description
            - Returns the ROI number of the structure
    - getStructureSet()
        - Return type
            - StructureSet object

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        - Description
            - Returns the structure set
    - getType()
        - Return type
            - String
        - Description
            - Returns the type of the structure
    - getVolume()
        - Return type
            - Volume object
        - Description
            - Returns the volume of the structure
    - getVolumeId()
        - Return type
            - Integer
        - Description
            - Returns the id of the volume of the structure
    - getVolumetricSize()
        - Return type
            - Double
        - Description
            - Returns the size of the volume of the structure
    - isEditable()
        - Return type
            - Boolean
        - Description
            - Returns if the structure can be edited
    - isLocked()
        - Return type
            - Boolean
        - Description
            - Returns if the structure is locked
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods
    - From PatientDataItem
        - getVelocityId()
            - Return Type
                - Integer

        - Description
            - Returns the velocity id value of the object
- isValid()
    - Return Type
        - Boolean
    - Description
        - Determines if the object is a valid object

StructureSet

- Defined built in methods
    - Built-in: Set 1
- Other defined methods
    - getCreateDate()
        - Return type
            - String
        - Description
            - Returns the date that the structure set was created
            - Formats the date in ISO format
    - getEditDate()
        - Return type
            - String
        - Description
            - Returns the date that the structure set was edited
            - Formats the date in ISO format
    - getInstanceUID()
        - Return type
            - String
        - Description
            - Returns the UID of the instance
    - getName()
        - Return type
            - String
        - Description
            - Returns the name of the structure set
    - getSeriesDescription()
        - Return type
            - String
        - Description
            - Returns the description of the structure set series
    - getSeriesUID()
        - Return type
            - String
        - Description
            - Returns the UID of the series
    - getStructures()
        - Return type
            - vector < Structure >

        - Description
            - Returns the structures in the structure set
    - getStudyDate()
        - Return type
            - String
        - Description
            - Returns the date that the study was created
            - Formats the date in ISO format
    - getStudyUID()
        - Return type
            - String
        - Description
            - Returns UID of the study
    - getVolume()
        - Return type
            - Volume object
        - Description
            - Returns the volume of the structure set
    - getVolumeUID()
        - Return type
            - String
        - Description
            - Returns the UID of the volume
    - isLocked()
        - Return type
            - Boolean
        - Description
            - Returns if the structure set it locked
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods
    - From PatientDataItem
        - getVelocityId()
            - Return Type
                - Integer
            - Description
                - Returns the velocity id value of the object
        - isValid()
            - Return Type

    - Boolean
- Description
    - Determines if the object is a valid object

Volume

- Defined built in methods
    - Built-in: Set 1
- Other defined methods
    - getAccessionNumber()
        - Return type
            - String
        - Description
            - Returns the accession number of the volume
    - getAllStructures()
        - Return type
            - vector < Structure >
        - Description
            - Returns all of the structures
    - getCreateDate()
        - Return type
            - String
        - Description
            - Returns the date that the volume was created
            - Formats the date in ISO format
    - getDicomPatientDateOfBirth()
        - Return type
            - String
        - Description
            - Returns the date that the patient was born
            - Formats the date in ISO format
    - getDicomPatientId()
        - Return type
            - String
        - Description
            - Returns the patient id
    - getDicomPatientName()
        - Return type
            - String
        - Description
            - Returns the name of the patient
    - getDicomPatientSex()
        - Return type
            - String

        - Description
            - Returns the sex of the patient
    - getDicomReferringPysicianName()
        - Return type
            - String
        - Description
            - Returns the name of the patient's physician
    - getEditDate()
        - Return type
            - String
        - Description
            - Returns the date that the volume was edited
            - Formats the date in ISO format
    - getFrameOfReferenceUID()
        - Return type
            - String
        - Description
            - Returns the UID of the frame of reference
    - getLinkedPlans()
        - Return type
            - vector < Plan >
        - Description
            - Returns the plans linked to the volume
    - getLinkedRegistrations()
        - Return type
            - vector < Registration >
        - Description
            - Returns the registrations linked to the volume
    - getModality()
        - Return type
            - String
        - Description
            - Returns the modality
    - getName()
        - Return type
            - String
        - Description
            - Returns the name of the volume
    - getPatient()

        - Return type
            - Patient object
        - Description
            - Returns the patient
    - getPlanUID()
        - Return type
            - String
        - Description
            - Returns the plan UID of the dose volumes
    - getSeriesDate()
        - Return type
            - String
        - Description
            - Returns the date the series was created
            - Formats the date in ISO format
    - getSeriesNumber()
        - Return type
            - String
        - Description
            - Returns the number of the series
    - getSeriesTime()
        - Return type
            - String
        - Description
            - Returns the time the series was created
    - getSeriesType()
        - Return type
            - String
        - Description
            - Returns the type of the series
    - getSeriesUID()
        - Return type
            - String
        - Description
            - Returns the UID of the series
    - getSourceType()
        - Return type
            - String
        - Description

            - Returns the type of the source
    - getStructureSets()
        - Return type
            - vector < StructureSet >
        - Description
            - Return the structure sets of the volume
    - getStudyDate()
        - Return type
            - String
        - Description
            - Returns the date the study was created
            - Formats the date in ISO format
    - getStudyDescription()
        - Return type
            - String
        - Description
            - Returns the description of the study
    - getStudyId()
        - Return type
            - String
        - Description
            - Returns the id of the study
    - getStudyInstanceUID()
        - Return type
            - String
        - Description
            - Returns the UID of the study instance
    - getStudyTime()
        - Return type
            - String
        - Description
            - Returns the time the study was created
    - getVolumeUID
        - Return type
            - String
        - Description
            - Returns the UID of the volume
    - isLocked()
        - Return type

                - Boolean
            - Description
                - Returns if the volume is locked
    - registrationCommissioningMarkerLists()
        - Return type
            - vector < RegistrationCommissioningMarkerList >
        - Parameters
            - secondaryVolumeId
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods
    - From PatientDataItem
        - getVelocityId()
            - Return Type
                - Integer
            - Description
                - Returns the velocity id value of the object
        - isValid()
            - Return Type
                - Boolean
            - Description
                - Determines if the object is a valid object

PatientDataOperations

- Defined built in methods
    - Built-in: Set 1
- Other defined methods
    - getErrorMessage()
        - Return type
            - String
        - Description
            - Returns an error message based on the error that has occurred
    - getLocalizedErrorMessage()
        - Return type
            - String
        - Description
            - Returns a localized error message based on the error that has occurred
    - getPatient(vscId)
        - Return type
            - Patient object
        - Description
            - Returns the patient of a given vsc id
    - getPatientByPatientId(patientId)
        - Return type
            - Patient object
        - Description
            - Returns the patient of a given patient id
    - getPatients()
        - Return type
            - vector < patientdata::Patient >
        - Description
            - Returns the patients
    - getPlan(velocityId)
        - Return type
            - Plan object
        - Description
            - Returns the plan of a given velocity id
    - getRegistration(velocityId)
        - Return type
            - Registration object
        - Description

                - Returns the registration of a given velocity id
        - getRegistrationCommissioningMarkerList(velocityId)
            - Return type
                - RegistrationCommissioningMarkerList object
            - Description
                - Returns the registration commissioning marker list of a given velocity id
        - getStructure(velocityId)
            - Return type
                - Structure object
            - Description
                - Returns the structure of a given velocity id
        - getStructureSet(velocityId)
            - Return type
                - StructureSet object
            - Description
                - Returns the structure set of a given velocity id
        - getStructureSetByUID(uid)
            - Return type
                - StructureSet object
            - Description
                - Returns the structure set of a given UID
        - getVolume(velocityId)
            - Return type
                - Volume object
            - Description
                - Returns the volume of a given velocity id
        - getVolumeByUID(uid)
            - Return type
                - Volume object
            - Description
                - Returns the volume of a given UID
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

PatientList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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PlanList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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RegistrationCommissioningMarkerLists

- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 2
- Other defined methods
    - Undocumented: Set 1
    - Undocumented: Set 2
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

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RegistrationList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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RegistrationMarker

- Defined built in methods
    - Built-in: Set 1
- Other defined methods
    - getName()
        - Return type
            - String
        - Description
            - Returns the name of the registration marker
    - getPrimaryLocation()
        - Return type
            - VectorR3d object
        - Description
            - Returns the primary location of the registration marker
    - getSecondaryLocation()
        - Return type
            - VectorR3d object
        - Description
            - Returns the secondary location of the registration marker
    - isConfirmed()
        - Return type
            - Boolean
        - Returns if the registration marker has been confirmed
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

RegistrationMarkerList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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RegistrationOperations

- Defined built in methods
  - Built-in: Set 1
- Other defined methods
  - computeJacobian()
    - Return type
      - ScaledVolumeData object
    - Description
      - Calculates the Jacobian from loaded volumes and registrations
      - Will return an empty volume data if there is an error
  - createNewRegistration(name, progress = nullptr)
    - Return type
      - Registration object
    - Description
      - Creates a new rigid registration with a given name
  - exportRegistration(registrationId, progress = nullptr)
    - Description
      - Creates a DICOM file of the current registration
  - getErrorMessage()
    - Return value
      - String
    - Description
      - Returns an error message based on the error that has occurred
  - getLocalizedErrorMessage()
    - Return value
      - String
    - Description
      - Returns a localized error message based on the error that has occurred
  - getTransformedRegistrationCommissioningMarkers(markerListId)
    - Return type
      - pair < bool, vector < TransformedRegistrationMarker > >
    - Description
      - Returns a list of registration commissioned markers
      - The registration commissioned markers will be converted to coordinate systems
  - performBsplineRegistration(settings)
    - Return type
      - Boolean

        - Description
            - Performs a BSpline deformable registration of two loaded volumes
            - Requires coordinate and image values to exist in Velocity's coordinate space and units
            - Returns true if the deformable registration occurs successfully
    - performBsplineRegistrationDICOM(settings)
        - Return type
            - Boolean
        - Description
            - Performs a BSpline deformable registration of two loaded volumes
            - Requires coordinate and image values to exist in DICOM coordinate space and units
            - Returns true if the deformable registration occurs successfully
    - performManualAlignment(settings)
        - Return type
            - Boolean
        - Description
            - Performs a manual alignment of two loaded volumes
            - Requires coordinate and image values to exist in Velocity's coordinate space and units
            - Returns true if the manual alignment occurs successfully
    - performManualAlignmentDICOM(settings)
        - Return type
            - Boolean
        - Description
            - Performs a manual alignment of two loaded volumes
            - Requires coordinate and image values to exist in DICOM coordinate space and units
            - Returns true if the manual alignment occurs successfully
    - performRigidRegistration(settings)
        - Return type
            - Boolean
        - Description
            - Performs a rigid registration of two loaded volumes
            - Requires coordinate and image values to exist in Velocity's coordinate space and units
            - Returns true if the rigid registration occurs successfully
    - performRigidRegistrationDICOM(settings)
        - Return type

                - Boolean
            - Description
                - Performs a rigid registration of two loaded volumes
                - Requires coordinate and image values to exist in DICOM coordinate space and units
                - Returns true if the rigid registration occurs successfully
    - saveRegistration(progress = nullptr)
        - Return type
            - Registration object
        - Description
            - Saves loaded registration to the database
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

ReportOperations

- Defined built in methods
    - Built-in: Set 1
- Other defined methods
    - appendToReport(htmlStreamDataToAppend, includePatientHeaderInformation = true)
        - Return type
            - Boolean
        - Description
            - Appends a specified html stream to the internal html report
            - Calls getErrorMessage() method and returns false if an error occurs
    - attachRegistrationCommissioningToReport(registrationCommissioningMarkerListRecord)
        - Return type
            - Boolean
        - Description
            - Attaches the specified registration commissioning marker to the internal report
            - Calls getErrorMessage() method and returns false if an error occurs
    - attachViewer3DToReport()
        - Return type
            - Boolean
        - Description
            - Attaches the viewer state to the internal report
    - clearReport()
        - Description
            - Clears the internal html report
    - getErrorMessage()
        - Return type
            - String
        - Description
            - Returns an error message based on the error that has occurred
    - getLocalizedErrorMessage()
        - Return type
            - String
        - Description

                - Returns a localized error message based on the error that has occurred
    - getReport()
        - Return type
            - String
        - Description
            - Returns the internal html report
    - loadPersistentCachedReport()
        - Return type
            - Boolean
        - Description
            - Loads persistent reports for the current patient from the database
    - loadReportFromDatabase(reportRecordId)
        - Return type
            - Boolean
        - Description
            - Loads the specified report from the database
    - persistCachedReport()
        - Return type
            - Boolean
        - Description
            - Puts the internal html report into a temporary file in the database
    - saveReportToDatabase(reportName)
        - Return type
            - Integer
        - Description
            - Saves the internal html report into the database under the specified name
            - Returns the id number of the report if the save is successful, otherwise -1 is returned
            - Clears the internal report if the save is successful
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

ScaledVolumeData

- Attributes and data descriptors
    - data
        - Attribute type
            - vector < double >
    - indexTranform
        - Attribute type
            - MatrixR44d object
    - size
        - Attribute type
            - VectorR3i object
    - volume
        - Attribute type
            - Volume object
- Defined built in methods
    - Built-in: Set 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

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StringList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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StructureGuidedRegistrationInformation

- Attributes and data descriptors
    - burnInStructureVolume
        - Attribute type
            - ImageR3us object
    - burnInVolumeMember
        - Attribute type
            - SelectedVolumeMember object
    - burnInVoxelValue
        - Attribute type
            - Short
    - euclideanDistanceMapModelTransform
        - Attribute type
            - AffineTransformR3d object
    - euclideanDistanceMapOfStructure
        - Attribute type
            - EuclideanDistanceTransformR3 object
    - handleObjectCleanup
        - Attribute type
            - Boolean
    - internalStructurePointsSCE
        - Attribute type
            - vector < VectorR3d >
    - neighboringPointIndices
        - Attribute type
            - vector < vector < int > >
    - primarySurfacePointsSCE
        - Attribute type
            - vector < VectorR3d >
    - secondarySurfacePointsSCE
        - Attribute type
            - vector < VectorR3d >
    - structureGuidedMethod
        - Attribute type
            - StructureGuidedMethod object
    - structureSurfacePointsSCE
        - Attribute type
            - vector < VectorR3d >
    - structureWeightCoefficient

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        - Attribute type
            - Double
    - surfacePointsWeightCoefficients
        - Attribute type
            - vector < double >
- Defined built in methods
    - Built-in: Set 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

StructureList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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StructureMap

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 2
  - Undocumented: Set 4
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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StructureOperations

- Defined built in methods
    - Built-in: Set 1
- Other defined methods
    - conformality(structureId1, structureId2, reporter = nullptr)
        - Return type
            - Double
        - Description
            - Calculates the conformality of two structures
    - copyStructuresToPrimary(secondaryStructureIds, structureSetId)
        - Return type
            - map < int, Structure >
        - Description
            - Copies the structures in the secondary volume to the primary volume
    - copyStructuresToSecondary(primaryStructureIds, structureSetId)
        - Return type
            - map < int, Structure >
        - Description
            - Copies the structures in the primary volume to the secondary volume
    - createStructure(structureSetId, name, type = “Organ”, color = nullptr)
        - Return type
            - Structure object
        - Description
            - Creates a new structure
            - Requires that the type parameter is a valid DICOM type
    - createStructureSet(name, onPrimary, studyUID = “”, studyDate = “”)
        - Return type
            - StructureSet object
        - Description
            - Creates a new structure set
    - crop(sourceStructureId, structureSetId, croppingStructureIds, cropSettings, targetName, targetColor = nullptr, reporter = nullptr)
        - Return type
            - Structure object
        - Description
            - Crops a structure
    - exportStructureSet(structureSetId, encodingType = “”, reporter = nullptr)

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        - Return type
            - Boolean
        - Description
            - Creates the structure set as a RTSTRUCT DICOM file on the disk
    - getErrorMessage()
        - Return type
            - String
        - Description
            - Returns an error message based on the error that has occurred
    - getLocalizedErrorMessage()
        - Return type
            - String
        - Description
            - Returns a localized error message based on the error that has occurred
    - getStructureDVH(structureId, bins)
        - Return type
            - pair < bool, vector < VectorR2d > >
        - Description
            - Calculates the dose volume histogram of a given structure
    - getVolumetricStructure(structureId)
        - Return type
            - ScaledVolumeData object
        - Description
            - Returns the volumetric structure data
            - Requires that the structureId parameter is either the primary or secondary volume
            - Will change the secondary volume to the primary volume if the secondary volume is used
    - intersectStructures(structureSetId, structureIds, targetName, targetColor = nullptr, reporter = nullptr)
        - Return type
            - Structure object
        - Description
            - Creates a structure based on the intersection of multiple structures
    - margin(structureSetId, sourceId, targetId, settings, reporter = nullptr)
        - Return type
            - Structure object
        - Description

                - Uses the margin operation on a structure
        - saveStructureSets(structureSetId, encodingType = “”)
            - Return type
                - StructureSet object
            - Description
                - Saves changes to a structure set
                - Must be called after finishing a set of modifications to a structure set
        - smooth(structureId, structureSetId, targetName, reporter = nullptr)
            - Return type
                - Structure object
            - Description
                - Creates a new structure after smoothing the current structure
        - surfaceDistanceMetrics(structureId1, structureId2)
            - Return type
                - SurfaceDistanceMetrics object
            - Description
                - Calculates the surface distance between two structures
        - unionStructures(structureSetId, structureIds, targetName, targetColor = nullptr, reporter = nullptr)
            - Return type
                - Structure object
            - Description
                - Used the union from multiple structures to create a new structure
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

StructureSetList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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SurfaceDistanceMetrics

- Attributes and data descriptors
    - hausdorffDistance
        - Attribute type
            - Double
    - isValid
        - Attribute type
            - Boolean
    - mean
        - Attribute type
            - Double
    - median
        - Attribute type
            - Double
    - min
        - Attribute type
            - Double
    - standardDeviation
        - Attribute type
            - Double
    - structureName1
        - Attribute type
            - String
    - structureName2
        - Attribute type
            - String
- Defined built in methods
    - Built-in: Set 1
    - Built-in: Set 2
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

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SwigPyIterator

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 4
  - Built-in: Set 5
  - __iter__()
- Other defined methods
  - Undocumented: Set 3
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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TransformedRegistrationMarker

- Attributes and data descriptors
    - deformedSecondaryInPrimaryDICOM
        - Attribute type
            - VectorR3d object
    - deformedSecondaryInScene
        - Attribute type
            - VectorR3d object
    - deformedSecondaryInSecondaryDICOM
        - Attribute type
            - VectorR3d object
    - isConfirmed
        - Attribute type
            - Boolean
    - name
        - Attribute type
            - String
    - primaryInIndex
        - Attribute type
            - VectorR3d object
    - primaryInPrimaryDICOM
        - Attribute type
            - VectorR3d object
    - primaryInScene
        - Attribute type
            - VectorR3d object
    - rigidSecondaryInPrimaryDICOM
        - Attribute type
            - VectorR3d object
    - rigidSecondaryInSecondaryDICOM
        - Attribute type
            - VectorR3d object
    - secondaryInIndex
        - Attribute type
            - VectorR3d object
- Defined built in methods
    - Built-in: Set 1
- Inherited methods
    - From __builtin__.SwigPyObject

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- All __builtin__.SwigPyObject methods

VectorR2b

- Attributes
  - SIZE
    - Attribute type
      - Integer
      - Constant
    - Value
      - 2
- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 5
  - __delitem__()
  - __getitem__()
  - __setitem__()
- Other defined methods
  - nonNegative()
    - Return type
      - Boolean
    - Description
      - Determines if every element in the vector is nonnegative
  - normalized(epsilon = vsc::VSC_EPSILON)
    - Return type
      - VectorR < N, E >
    - Description
      - Returns a normalized vector
  - positive()
    - Return type
      - Boolean
    - Description
      - Determines if every element in the vector is positive
  - set(element)
    - Description
      - Changes all elements in the vector to the specified element
  - setElements(elementArray)
    - Description
      - Sets the elements in the vector equal to the elements in the array
      - The vector and array need to have the same number of elements
  - size()
    - Description

Return to Table of Contents

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR2bList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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VectorR2d

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 2
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR2dList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR2f

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 2
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR2fList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR2i

- Attributes
  - SIZE
    - Attribute type
      - Integer
      - Constant
    - Value
      - 2
- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 5
  - __delitem__()
  - __getitem__()
  - __setitem__()
- Other defined methods
  - nonNegative()
    - Return type
      - Boolean
    - Description
      - Determines if every element in the vector is nonnegative
  - normalized(epsilon = vsc::VSC_EPSILON)
    - Return type
      - VectorR < N, E > object
    - Description
      - Returns a normalized vector
  - positive()
    - Return type
      - Boolean
    - Description
      - Determines if every element in the vector is positive
  - set(element)
    - Description
      - Changes all elements in the vector to the specified element
  - setElements(elementArray)
    - Description
      - Sets the elements in the vector equal to the elements in the array
      - The vector and array need to have the same number of elements
  - size()
    - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR2iList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR2s

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 2
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR2sList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR2ub

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 2
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR2ubList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR2ui

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 2
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

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VectorR2uiList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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VectorR2us

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 2
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR2usList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR3b

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 3
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR3bList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR3d

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 3
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR3dList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR3f

- Attributes
  - SIZE
    - Attribute type
      - Integer
      - Constant
    - Value
      - 3
- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 5
  - __delitem__()
  - __getitem__()
  - __setitem__()
- Other defined methods
  - nonNegative()
    - Return type
      - Boolean
    - Description
      - Determines if every element in the vector is nonnegative
  - normalized(epsilon = vsc::VSC_EPSILON)
    - Return type
      - VectorR < N, E > object
    - Description
      - Returns a normalized vector
  - positive()
    - Return type
      - Boolean
    - Description
      - Determines if every element in the vector is positive
  - set(element)
    - Description
      - Changes all elements in the vector to the specified element
  - setElements(elementArray)
    - Description
      - Sets the elements in the vector equal to the elements in the array
      - The vector and array need to have the same number of elements
  - size()
    - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR3fList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR3i

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 3
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR3iList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR3s

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 3
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR3sList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR3ub

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 3
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR3ubList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR3ui

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 3
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

Return to Table of Contents

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR3uiList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR3us

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 3
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR3usList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR4b

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 4
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR4bList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR4d

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 4
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR4dList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR4f

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 4
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR4fList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR4i

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 4
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR4iList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR4s

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 4
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR4sList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

Return to Table of Contents

VectorR4ub

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 4
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR4ubList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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VectorR4ui

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 4
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR4uiList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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VectorR4us

- Attributes
    - SIZE
        - Attribute type
            - Integer
            - Constant
        - Value
            - 4
- Defined built-in methods
    - Built-in: Set 1
    - Built-in: Set 5
    - __delitem__()
    - __getitem__()
    - __setitem__()
- Other defined methods
    - nonNegative()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is nonnegative
    - normalized(epsilon = vsc::VSC_EPSILON)
        - Return type
            - VectorR < N, E > object
        - Description
            - Returns a normalized vector
    - positive()
        - Return type
            - Boolean
        - Description
            - Determines if every element in the vector is positive
    - set(element)
        - Description
            - Changes all elements in the vector to the specified element
    - setElements(elementArray)
        - Description
            - Sets the elements in the vector equal to the elements in the array
            - The vector and array need to have the same number of elements
    - size()
        - Description

                - Determines the size of the vector
        - xy()
            - Return type
                - VectorR < 2, E >
            - Description
                - Returns the first two components of the vector
                - Sets undefined coordinates to 0
        - xyz()
            - Return type
                - VectorR < 3, E >
            - Description
                - Returns the first three components of the vector
                - Sets undefined coordinates to 0
        - xyzw()
            - Return type
                - VectorR < 4, E >
            - Description
                - Returns the first three components of the vector
                - If the w coordinate is undefined, it is set to 1
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VectorR4usList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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VelocityEngine

- Attributes
  - VSC_PRIMARY_VALUE
    - Value
      - 0
  - VSC_SECONDARY_VALUE
    - Value
      - 1
- Defined built-in methods
  - Built-in: Set 1
- Other defined methods
  - deletePatient(patientId, forceDelete)
    - Return type
      - Boolean
    - Description
      - Deletes the patient with the specified patient id
      - If there are multiple patients with the same id, forceDelete must be true in order to delete the patients
      - Returns true if the patient is successfully deleted
  - getCurrentPatient()
    - Return type
      - Patient object
    - Description
      - Returns the patient that is currently loaded
      - Will print an error message if there is no patient loaded
  - getErrorMessage()
    - Return type
      - String
    - Description
      - Returns an error message based on the error that has occurred
      - If there is not an error, an empty string is returned
  - getExportOperations()
    - Return type
      - ExportOperations object
    - Description
      - Returns the export operations for the engine
      - Will return a null pointer if the engine is not connected to the database
  - getImportOperations()

        - Return type
            - ImportOperations object
        - Description
            - Returns the import operations for the engine
            - Will return a null pointer if the engine is not connected to the database
    - getLocalizedErrorMessage()
        - Return type
            - String
        - Description
            - Returns a localized error message based on the error that has occurred
            - If there is not a localized error, and empty string is returned
    - getPatientDataOperations()
        - Return type
            - PatientDataOperations object
        - Description
            - Returns the patient data operations for the engine
            - Will return a null pointer if the engine is not connected to the database
    - getPatientVolumeUIDs(patientID, modality)
        - Return type
            - vector < string >
        - Description
            - Returns the volumeUIDs of a specified patient in the form of a vector
    - getPrimaryVolume()
        - Return type
            - Volume object
        - Description
            - Returns the primary volume of the current patient
    - getRegistrationOperations()
        - Return type
            - RegistrationOperations object
        - Description
            - Returns the registration operations for the engine
            - Will return a null pointer if the engine is not connected to the database
    - getReportOperations()

        - Return type
            - ReportOperations object
        - Description
            - Returns the report operations for the engine
            - Will return a null pointer if the engine is not connected to the database
    - getSecondaryVolume()
        - Return type
            - Volume object
        - Description
            - Returns the secondary volume of the current patient
    - getStructureOperations()
        - Return type
            - StructureOperations object
        - Description
            - Returns the structure operations for the engine
            - Will return a null pointer if the engine is not connected to the database
    - getValueAtStructureCenter(volume, linearInterp = true)
        - Return type
            - Double
        - Description
            - Returns the value at the structure center of the primary and secondary volumes
    - getVolumeOperations()
        - Return type
            - VolumeOperations object
        - Description
            - Returns the volume operations for the engine
            - Will return a null pointer if the engine is not connected to the database
    - isLoggedIn()
        - Return type
            - Boolean
        - Description
            - Determines if the engine is currently logged in
    - loadPatientByPatientId(patientId)
        - Return type
            - Patient object

        - Description
            - Loads a patient based on the specified patient id
            - Returns true if the patient is loaded successfully
    - loadPatient(patientId)
        - Return type
            - Boolean
        - Description
            - Load a patient based on the specified internal database id
            - Returns true if the patient is loaded successfully
    - loadPlan(velocityId)
        - Return type
            - Plan object
        - Description
            - Loads a plan based on the specified patient id
    - loadPlanByUID(uid)
        - Return type
            - Plan object
        - Descritpion
            - Loads a plan based on the specified UID
    - loadPrimaryVolumeByUID(volumeUID)
        - Return type
            - Boolean
        - Description
            - Loads a primary volume based on the specified volume UID
            - Returns true if the volume is loaded successfully
    - loadPrimaryVolume(databaseId)
        - Return type
            - Boolean
    - loadRegistration(registrationId)
        - Return type
            - Registration object
        - Description
            - Loads a registration based on the specified registration id
    - loadRegistrationByName(name)
        - Return type
            - Registration object
        - Description
            - Loads a registration based on the specified registration name
    - loadSecondaryVolumeByUID(volumeUID)

        - Return type
            - Boolean
        - Description
            - Loads a volume based on the specified volume UID
            - Returns true if the volume is loaded successfully
    - loadSecondaryVolume(databaseId)
        - Return type
            - Boolean
    - loadStructure(velocityId)
        - Return type
            - Structure object
        - Description
            - Loads a structure based on the specified velocity id
    - loadStructureByName(name, structureSetUID)
        - Return type
            - Structure object
        - Description
            - Loads a structure based on the specified structure name
            - The structure must have a unique name in the set in order to be loaded properly
    - loadStructureByUID(uid)
        - Return type
            - Structure object
        - Description
            - Loads a structure based on the specified structure UID
    - loginToGrid(username, password, ip, port, dbLabel)
        - Return type
            - Boolean
        - Description
            - Logs into the the specified Grid database
            - Returns true if the specified Grid database is successfully logged into
            - All parameters must be valid in order to successfully log in
    - loginToWorkstation(username, password, path, force = false)
        - Return type
            - Boolean
        - Description
            - Logs into the specified workstation database

                - Returns true if the specified workstation database is successfully logged into
                - All parameters must be valid in order to successfully log in
    - logout()
        - Return type
            - Boolean
        - Description
            - Logs out of the database
            - Logging out makes all Operations class instances invalid
    - unloadPatient()
        - Return type
            - Boolean
        - Description
            - Unloads the current patient
            - Will cause the primary and secondary volumes to also unload
    - unloadPrimaryVolume()
        - Return type
            - Boolean
        - Description
            - Unloads the current primary volume
            - Will cause the secondary volume to unload
    - unloadSecondaryVolume()
        - Return type
            - Boolean
        - Description
            - Unloades the current secondary volume
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods

VolumeList

- Defined built-in methods
  - Built-in: Set 1
  - Built-in: Set 2
- Other defined methods
  - Undocumented: Set 1
  - Undocumented: Set 2
- Inherited methods
  - From __builtin__.SwigPyObject
    - All __builtin__.SwigPyObject methods

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VolumeOperations

- Defined built-in methods
  - Built-in: Set 1
- Other defined methods
  - createBEDose(fractions, structureNames, structureIds, structRatioVal, progress = nullptr)
    - Return type
      - Integer
    - Description
      - Performs the BED scaling for the loaded secondary volume based on the loaded primary volume
      - Returns the volume id of the created volume, unless there is an error, in which -1 is returned
  - createBEDoseByStructureUIDs(fractions, stuctureNames, structureUIDs, structRatioVal, progress = nullptr)
    - Return type
      - Integer
    - Description
      - Performs the BED scaling for the loaded secondary volume based on the loaded primary volume
      - Returns the volume id of the created volume unless there is an error, in which -1 is returned
  - createResampledPrimaryVolume(elementOperation, name = “”, scalingCoefficient = 1.0, progress = nullptr)
    - Return type
      - Integer
    - Description
      - Performs the resampling of the specified element operation for the loaded primary volume
      - An error will occur if the specified element operation must be performed on multiple volumes
  - getErrorMessage()
    - Return type
      - String
    - Description
      - Returns an error message based on the error that has occurred
  - getLocalizedErrorMessage()
    - Return type
      - String

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        - Description
            - Returns a localized error message based on the error that has occurred
- Inherited methods
    - From __builtin__.SwigPyObject
        - All __builtin__.SwigPyObject methods