

VMATDocumentation

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Wed May 11 2016 16:40:24

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Chapter 1

Namespace Index

1.1 Packages

Here are the packages with brief descriptions (if available):

greedyVMATsampling	7
--	---

Chapter 2

Class Index

2.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

greedyVMATsampling.apertureList	
ApertureList is a class definition of locs and angles that is always sorted	15
greedyVMATsampling.region	17
greedyVMATsampling.vmat_class	
This defines the global VMAT class that contains most of the VMAT data to be used in the implementation Most of the values were defined as static attributes and only one instantiation at a time is possible	18

Chapter 3

File Index

3.1 File List

Here is a list of all files with brief descriptions:

greedyVMATsampling.py	25
---	----

Chapter 4

Namespace Documentation

4.1 greedyVMATsampling Namespace Reference

Classes

- class [region](#)
- class [apertureList](#)

[apertureList](#) is a class definition of locs and angles that is always sorted.

- class [vmat_class](#)

This defines the global VMAT class that contains most of the VMAT data to be used in the implementation Most of the values were defined as static attributes and only one instantiation at a time is possible.

Functions

- def [readctvoxelinfo](#)
- def [readDmatrix](#)
- def [calcObjGrad](#)
- def [fvalidbeamlets](#)
- def [PPsubroutine](#)
- def [parallelizationPricingProblem](#)
- def [PricingProblem](#)
- def [solveRMC](#)
- def [printresults](#)
- def [colGen](#)
- def [plotAperture](#)
- def [updateOpenAperture](#)

Variables

- string [__author__](#) = 'wilmer'
- [have_mkl](#) = True
- list [kappa](#) = [6, 17, 28, 39, 50, 61, 72, 83, 94, 105, 116, 127, 138, 149, 160, 171, 11, 22, 33, 44, 55, 66, 77, 88, 99, 110, 121, 132, 143, 154, 165, 1, 175, 14, 25, 36, 47, 58, 69, 80, 91, 102, 113, 124, 135, 146, 157, 168, 3, 8, 19, 30, 41, 52, 63, 74, 85, 96, 107, 118, 129, 140, 151, 162, 172, 176, 0, 2, 4, 5, 7, 9, 10, 12, 13, 15, 16, 18, 20, 21, 23, 24, 26, 27, 29, 31, 32, 34, 35, 37, 38, 40, 42, 43, 45, 46, 48, 49, 51, 53, 54, 56, 57, 59, 60, 62, 64, 65, 67, 68, 70, 71, 73, 75, 76, 78, 79, 81, 82, 84, 86, 87, 89, 90, 92, 93, 95, 97, 98, 100, 101, 103, 104, 106, 108, 109, 111, 112, 114, 115, 117, 119, 120, 122, 123, 125, 126, 128, 130, 131, 133, 134, 136, 137, 139, 141, 142, 144, 145, 147, 148, 150, 152, 153, 155, 156, 158, 159, 161, 163, 164, 166, 167, 169, 170, 173, 174, 177]

```

• WholeCircle = False
• string rootFolder = '/media/wilmer/datadrive'
• string readfolder = rootFolder+'/Data/DataProject/HN/'
• string readfolderD = readfolder+'Dij/'
• string outputfolder = '/home/wilmer/Dropbox/Research/VMAT/output/'
• int degreesep = 60
• string objfile = '/home/wilmer/Dropbox/lpOptSolver/TestData/HNdata/objectives/obj1.txt'
• string structurefile = '/home/wilmer/Dropbox/lpOptSolver/TestData/HNdata/structureInputs.txt'
• string algfile = '/home/wilmer/Dropbox/lpOptSolver/TestData/HNdata/algInputsWilmer.txt'
• string mm3voxels = rootFolder+'/Data/DataProject/HN/hn3mmvoxels.mat'
• list priority = [7, 24, 25, 23, 22, 21, 20, 16, 15, 14, 13, 12, 10, 11, 9, 4, 3, 1, 2, 17, 18, 19, 5, 6, 8]
• list mylines = [line.rstrip("\n") for line in open('/home/wilmer/Dropbox/Research/VMAT/VMATwPenCode/beam-
Angles.txt')]
• tuple fig = plt.figure(1)
• list catemp = []
• list gatemp = []
• tuple start = time.time()
• tuple data = vmat_class()
• tuple oldfolder = os.getcwd()

.....#####
• tuple allFiles = glob.glob("*VOILIST.mat")
• tuple allBeamInfos = glob.glob("*Couch0_BEAMINFO.mat")
• tuple allNames = sorted(allFiles)
• tuple allBeamInfoNames = sorted(allBeamInfos)
• tuple numStructs = len(allFiles)
• tuple vdims = readctvoxelinfo()
• list numVoxels = vdims['x']
• list Vorg = []
• tuple bigZ = np.zeros(numVoxels, dtype=int)
• tuple nVox = sum(bigZ)
• int counter = 0
• tuple originalVoxels = np.empty(numVoxels)
• list lines = [myline.split("\t") for myline in [line.rstrip("\n") for line in open(structurefile)]]

    Read in structures .
• list invec = [item for sublist in lines for item in sublist]

    Collapse the above expression to a flat list.
• tuple maskValueFull = np.zeros(nVox.astype(np.int64))

    Assigation of different values.
• tuple maskValueSingle = np.zeros(nVox.astype(np.int64))
• list s = priority[i]
• tuple norepeat = np.unique(originalVoxels[np.invert(np.isnan(originalVoxels))])
• tuple istarget = str(s)
• list tempindicesfull = originalVoxels[Vorg[s]]
• tuple tempindices = np.intersect1d(tempindicesfull, norepeat)
• int gastart = 0
• int gaend = 356
• int gastepe = 2
• list ga = []
• list ca = []
• string fname = 'Gantry'

    Treatment of BEAMINFO data.
• string bletfname = readfolder+'Gantry'
• tuple nBPB = np.zeros(len(ga))
• tuple nDIJSPB = np.zeros(len(ga))

```


- tuple `beamletCounter` = `np.zeros(data.numbeams + 1)`
Beginning of Troy's cpp code (interpreted, not copied) A comment This comes from first two lines in doseInputs txt file (troy's version)
- tuple `binfholder` = `sio.loadmat(bletfname)`
- tuple `N` = `len(data.yinter)`
After reading the beaminfo information.
- tuple `M` = `len(data.xinter)`
- int `overallDijsCounter` = 0
Initial intensities are allocated a value of zero.
- list `DlistT` = [None]
- tuple `pool` = `Pool(processes=8)`
- tuple `Allmats` = `pool.map(readDmatrix, range(0, data.numbeams))`
- list `ininter` = []
- `functionData` = `data.functionData`
Collapse the above expression to a flat list.
- tuple `quadHelperThresh` = `np.zeros(data.numvoxels)`
- tuple `quadHelperOver` = `np.zeros(data.numvoxels)`
- tuple `quadHelperUnder` = `np.zeros(data.numvoxels)`
- tuple `quadHelperAlphaBetas` = `np.zeros(data.numvoxels)`
- tuple `uDose` = `np.zeros(data.numvoxels)`
- tuple `oDose` = `np.zeros(data.numvoxels)`
- tuple `before` = `time.time()`
- tuple `pstar` = `colGen(0, WholeCircle, 16)`
- tuple `after` = `time.time()`

4.1.1 Function Documentation

- 4.1.1.1 `def greedyVMATsampling.calcObjGrad (x, user_data = None)`
- 4.1.1.2 `def greedyVMATsampling.colGen (C, WholeCircle, initialApertures)`
- 4.1.1.3 `def greedyVMATsampling.fvalidbeamlets (i, index)`
- 4.1.1.4 `def greedyVMATsampling.parallelizationPricingProblem (i, C, C2, C3, b, vmax, speedlim, N, M)`
- 4.1.1.5 `def greedyVMATsampling.plotAperture (l, r, M, N, myfolder, iterationNumber, bestAperture)`
- 4.1.1.6 `def greedyVMATsampling.PPsubroutine (C, C2, C3, b, angdistancem, angdistancep, vmax, speedlim, predec, succ, N, M, thisApertureIndex)`
- 4.1.1.7 `def greedyVMATsampling.PricingProblem (C, C2, C3, b, vmax, speedlim, N, M)`
- 4.1.1.8 `def greedyVMATsampling.printresults (iterationNumber, myfolder)`
- 4.1.1.9 `def greedyVMATsampling.readctvoxelinfo ()`
- 4.1.1.10 `def greedyVMATsampling.readDmatrix (i)`
- 4.1.1.11 `def greedyVMATsampling.solveRMC ()`
- 4.1.1.12 `def greedyVMATsampling.updateOpenAperture (i)`

4.1.2 Variable Documentation

```

4.1.2.1 string greedyVMATsampling.__author__ = 'wilmer'

4.1.2.2 tuple greedyVMATsampling.after = time.time()

4.1.2.3 string greedyVMATsampling.algfile = '/home/wilmer/Dropbox/lpOptSolver/TestData/HNdata/algInputsWilmer.txt'

4.1.2.4 tuple greedyVMATsampling.allBeamInfoNames = sorted(allBeamInfos)

4.1.2.5 tuple greedyVMATsampling.allBeamInfos = glob.glob(".*Couch0_BEAMINFO.mat")

4.1.2.6 tuple greedyVMATsampling.allFiles = glob.glob(".*VOILIST.mat")

4.1.2.7 tuple greedyVMATsampling.Allmats = pool.map(readDmatrix, range(0, data.numbeams))

4.1.2.8 tuple greedyVMATsampling.allNames = sorted(allFiles)

4.1.2.9 tuple greedyVMATsampling.beamletCounter = np.zeros(data.numbeams + 1)

```

Beginning of Troy's cpp code (interpreted, not copied) A comment This comes from first two lines in doseInputs txt file (troy's version)

Allocate memory

```

4.1.2.10 tuple greedyVMATsampling.before = time.time()

4.1.2.11 tuple greedyVMATsampling.bigZ = np.zeros(numVoxels, dtype=int)

4.1.2.12 tuple greedyVMATsampling.binfoholder = sio.loadmat(bletfname)

4.1.2.13 string greedyVMATsampling.bletfname = readfolder+'Gantry'

4.1.2.14 list greedyVMATsampling.ca = []

4.1.2.15 list greedyVMATsampling.catemp = []

4.1.2.16 int greedyVMATsampling.counter = 0

4.1.2.17 tuple greedyVMATsampling.data = vmat_class()

4.1.2.18 int greedyVMATsampling.degreeseq = 60

4.1.2.19 list greedyVMATsampling.DlistT = [None]

4.1.2.20 tuple greedyVMATsampling.fig = plt.figure(1)

4.1.2.21 string greedyVMATsampling.fname = 'Gantry'

```

Treatment of BEAMINFO data.

```
4.1.2.22 greedyVMATsampling.functionData = data.functionData
```

Collapse the above expression to a flat list.

Read in the constraint file: NOTHING TO DO ##### FINISHED READING EVERYTHING ##### Work with function data.

- 4.1.2.23 `list greedyVMATsampling.ga = []`
- 4.1.2.24 `int greedyVMATsampling.gaend = 356`
- 4.1.2.25 `int greedyVMATsampling.gastart = 0`
- 4.1.2.26 `int greedyVMATsampling.gastep = 2`
- 4.1.2.27 `list greedyVMATsampling.gatemp = []`
- 4.1.2.28 `greedyVMATsampling.have_mkl = True`
- 4.1.2.29 `list greedyVMATsampling.ininter = []`
- 4.1.2.30 `list greedyVMATsampling.invec = [item for sublist in lines for item in sublist]`

Collapse the above expression to a flat list.

- 4.1.2.31 `tuple greedyVMATsampling.istarget = str(s)`
- 4.1.2.32 `list greedyVMATsampling.kappa = [6, 17, 28, 39, 50, 61, 72, 83, 94, 105, 116, 127, 138, 149, 160, 171, 11, 22, 33, 44, 55, 66, 77, 88, 99, 110, 121, 132, 143, 154, 165, 1, 175, 14, 25, 36, 47, 58, 69, 80, 91, 102, 113, 124, 135, 146, 157, 168, 3, 8, 19, 30, 41, 52, 63, 74, 85, 96, 107, 118, 129, 140, 151, 162, 172, 176, 0, 2, 4, 5, 7, 9, 10, 12, 13, 15, 16, 18, 20, 21, 23, 24, 26, 27, 29, 31, 32, 34, 35, 37, 38, 40, 42, 43, 45, 46, 48, 49, 51, 53, 54, 56, 57, 59, 60, 62, 64, 65, 67, 68, 70, 71, 73, 75, 76, 78, 79, 81, 82, 84, 86, 87, 89, 90, 92, 93, 95, 97, 98, 100, 101, 103, 104, 106, 108, 109, 111, 112, 114, 115, 117, 119, 120, 122, 123, 125, 126, 128, 130, 131, 133, 134, 136, 137, 139, 141, 142, 144, 145, 147, 148, 150, 152, 153, 155, 156, 158, 159, 161, 163, 164, 166, 167, 169, 170, 173, 174, 177]`
- 4.1.2.33 `list greedyVMATsampling.lines = [myline.split('\t') for myline in [line.rstrip('\n') for line in open(structurefile)]]`

Read in structures .

MATRIX CUT DONE Here all matrices are working with the same limits.

CHANGE THIS. Reading from txt file != good!!

Read in the objective file:

- 4.1.2.34 `tuple greedyVMATsampling.M = len(data.xinter)`
- 4.1.2.35 `tuple greedyVMATsampling.maskValueFull = np.zeros(nVox.astype(np.int64))`

Assignment of different values.

- 4.1.2.36 `tuple greedyVMATsampling.maskValueSingle = np.zeros(nVox.astype(np.int64))`
- 4.1.2.37 `string greedyVMATsampling.mm3voxels = rootFolder+'/Data/DataProject/HN/hn3mmvoxels.mat'`
- 4.1.2.38 `list greedyVMATsampling.mylines = [line.rstrip('\n') for line in open('/home/wilmer/Dropbox/Research/VMAT/VMATw-PenCode/beamAngles.txt')]`
- 4.1.2.39 `tuple greedyVMATsampling.N = len(data.yinter)`

After reading the beaminfo information.

Read CUT the data.

```

4.1.2.40 tuple greedyVMATsampling.nBPB = np.zeros(len(ga))
4.1.2.41 tuple greedyVMATsampling.nDIJSPB = np.zeros(len(ga))
4.1.2.42 tuple greedyVMATsampling.norepeat = np.unique(originalVoxels[np.invert(np.isnan(originalVoxels))])
4.1.2.43 tuple greedyVMATsampling.numStructs = len(allFiles)
4.1.2.44 list greedyVMATsampling.numVoxels = vdims['x']
4.1.2.45 tuple greedyVMATsampling.nVox = sum(bigZ)
4.1.2.46 string greedyVMATsampling.objfile = '/home/wilmer/Dropbox/lpOptSolver/TestData/HNdata/objectives/obj1.txt'
4.1.2.47 tuple greedyVMATsampling.oDose = np.zeros(data.numvoxels)
4.1.2.48 tuple greedyVMATsampling.oldfolder = os.getcwd()

```

```

.....#####

```

```

4.1.2.49 tuple greedyVMATsampling.originalVoxels = np.empty(numVoxels)
4.1.2.50 string greedyVMATsampling.outputfolder = '/home/wilmer/Dropbox/Research/VMAT/output'
4.1.2.51 int greedyVMATsampling.overallDijCounter = 0

```

Initial intensities are allocated a value of zero.

```

4.1.2.52 tuple greedyVMATsampling.pool = Pool(processes=8)
4.1.2.53 tuple greedyVMATsampling.priority = [7, 24, 25, 23, 22, 21, 20, 16, 15, 14, 13, 12, 10, 11, 9, 4, 3, 1, 2, 17, 18, 19, 5, 6, 8]
4.1.2.54 tuple greedyVMATsampling.pstar = colGen(0, WholeCircle, 16)
4.1.2.55 tuple greedyVMATsampling.quadHelperAlphaBetas = np.zeros(data.numvoxels)
4.1.2.56 tuple greedyVMATsampling.quadHelperOver = np.zeros(data.numvoxels)
4.1.2.57 tuple greedyVMATsampling.quadHelperThresh = np.zeros(data.numvoxels)
4.1.2.58 tuple greedyVMATsampling.quadHelperUnder = np.zeros(data.numvoxels)
4.1.2.59 string greedyVMATsampling.readfolder = rootFolder+'/Data/DataProject/HN/'
4.1.2.60 string greedyVMATsampling.readfolderD = readfolder+'Dij/'
4.1.2.61 string greedyVMATsampling.rootFolder = '/media/wilmer/datadrive'
4.1.2.62 list greedyVMATsampling.s = priority[i]
4.1.2.63 tuple greedyVMATsampling.start = time.time()
4.1.2.64 string greedyVMATsampling.structurefile = '/home/wilmer/Dropbox/lpOptSolver/TestData/HNdata/structureInputs.txt'
4.1.2.65 tuple greedyVMATsampling.tempindices = np.intersect1d(tempindicesfull, norepeat)

```

4.1.2.66 list greedyVMATsampling.tempindicesfull = originalVoxels[Vorg[s]]

4.1.2.67 tuple greedyVMATsampling.uDose = np.zeros(data.numvoxels)

4.1.2.68 tuple greedyVMATsampling.vdims = readctvoxelinfo()

4.1.2.69 list greedyVMATsampling.Vorg = []

4.1.2.70 greedyVMATsampling.WholeCircle = False

Chapter 5

Class Documentation

5.1 greedyVMATsampling.apertureList Class Reference

[apertureList](#) is a class definition of locs and angles that is always sorted.

Public Member Functions

- def [__init__](#)
constructor initializes empty lists
- def [insertAngle](#)
Insert a new angle in the list of angles to analyse.
- def [removeIndex](#)
Removes the index and its corresponding angle from the list.
- def [removeAngle](#)
Looks for the angle and removes the index and the angle corresponding to it from the list.
- def [__call__](#)
Overloads parenthesis operator in order to fetch the ANGLE given an index.
- def [len](#)
Returns the length of this instantiation without the need to pass parameters.
- def [isEmpty](#)
Returns True if the list is empty; otherwise returns False.

Public Attributes

- [loc](#)
Location in index range(0,numbeams)
- [angle](#)
Angles ranges from 0 to 360.

5.1.1 Detailed Description

[apertureList](#) is a class definition of locs and angles that is always sorted.

Its attributes are loc which is the numeric location; It has range 0 to 178 for the HN case; Angle is the numeric angle in degrees; It ranges from 0 to 358 degrees [apertureList](#) should be sorted in ascending order everytime you add a new element; User CAN make this safe assumption

5.1.2 Constructor & Destructor Documentation

5.1.2.1 `def greedyVMATsampling.apertureList.__init__(self)`

constructor initializes empty lists

5.1.3 Member Function Documentation

5.1.3.1 `def greedyVMATsampling.apertureList.__call__(self, index)`

Overloads parenthesis operator in order to fetch the ANGLE given an index.

Returns the angle at the ith location given by the index. First Find the location of that index in the series of loc Notice that this function overloads the parenthesis operator for elements of this class.

5.1.3.2 `def greedyVMATsampling.apertureList.insertAngle(self, i, aperangle)`

Insert a new angle in the list of angles to analyse.

Gets angle information and inserts location and angle In the end it sorts the list in increasing order

5.1.3.3 `def greedyVMATsampling.apertureList.isEmpty(self)`

Returns True if the list is empty; otherwise returns False.

5.1.3.4 `def greedyVMATsampling.apertureList.len(self)`

Returns the length of this instantiation without the need to pass parameters.

5.1.3.5 `def greedyVMATsampling.apertureList.removeAngle(self, tangl)`

Looks for the angle and removes the index and the angle corresponding to it from the list.

5.1.3.6 `def greedyVMATsampling.apertureList.removeIndex(self, index)`

Removes the index and its corresponding angle from the list.

Notice that it only removes the first occurrence; but if you have done everything correctly this should never be a problem

5.1.4 Member Data Documentation

5.1.4.1 `greedyVMATsampling.apertureList.angle`

Angles ranges from 0 to 360.

5.1.4.2 `greedyVMATsampling.apertureList.loc`

Location in index range(0,numbeams)

The documentation for this class was generated from the following file:

- [greedyVMATsampling.py](#)

5.2 greedyVMATsampling.region Class Reference

Public Member Functions

- [def __init__](#)

Public Attributes

- [index](#)
- [sizeInVoxels](#)
- [indices](#)
- [fullIndices](#)

Static Public Attributes

- tuple [index](#) = int()
- tuple [sizeInVoxels](#) = int()
- tuple [indices](#) = np.empty(1, dtype=int)
- tuple [fullIndices](#) = np.empty(1, dtype=int)
- [target](#) = False

5.2.1 Detailed Description

Contains all information relevant to a particular region

5.2.2 Constructor & Destructor Documentation

5.2.2.1 `def greedyVMATsampling.region.__init__(self, iind, iindi, ifullindi, itarget)`

5.2.3 Member Data Documentation

5.2.3.1 `tuple greedyVMATsampling.region.fullIndices = np.empty(1, dtype=int)` `[static]`

5.2.3.2 `greedyVMATsampling.region.fullIndices`

5.2.3.3 `tuple greedyVMATsampling.region.index = int()` `[static]`

5.2.3.4 `greedyVMATsampling.region.index`

5.2.3.5 `tuple greedyVMATsampling.region.indices = np.empty(1, dtype=int)` `[static]`

5.2.3.6 `greedyVMATsampling.region.indices`

5.2.3.7 `tuple greedyVMATsampling.region.sizeInVoxels = int()` `[static]`

5.2.3.8 `greedyVMATsampling.region.sizeInVoxels`

5.2.3.9 `greedyVMATsampling.region.target = False` `[static]`

The documentation for this class was generated from the following file:

- [greedyVMATsampling.py](#)

5.3 greedyVMATsampling.vmat_class Class Reference

This defines the global VMAT class that contains most of the VMAT data to be used in the implementation. Most of the values were defined as static attributes and only one instantiation at a time is possible.

Public Member Functions

- def `calcDose`
- def `calcGradientandObjValue`
- def `__init__`

Public Attributes

- `currentDose`
- `dZdK`
- `objectiveValue`
- `voxelgradient`
- `aperturegradient`
- `numX`

Static Public Attributes

- int `numX` = 0
number of beamlets
- tuple `numvoxels` = int()
number of voxels in the small voxel space
- int `numstructs` = 0
number of structures/regions
- int `numoars` = 0
number of organs at risk
- int `numtargets` = 0
num of targets
- int `numbeams` = 0
num of beams
- int `totaldijs` = 0
num of nonzeros in Dij matrix
- tuple `objectiveValue` = float("inf")
objectiveValue of the final function
- list `beamletsPerBeam` = []
number of beamlets per beam
- list `dijsPerBeam` = []
number of nonzeros in Dij per beam
- list `maskValue` = []
non-overlapping mask value per voxel
- list `fullMaskValue` = []
complete mask value per voxel (A voxel may cover more than one structure = OAR's + T's)
- list `regionIndices` = []
index values of structures in region list (should be 0,1,etc)
- list `targets` = []
region indices of target structures (from region vector)
- list `oars` = []

- region indices of oars*
- list `regions` = []
 - vector of regions (holds structure information)*
- list `objectiveInputFiles` = []
 - vector of data input files for objectives*
- list `constraintInputFiles` = []
 - vector of data input files for constraints*
- list `algOptions` = []
 - vector of data input for algorithm options*
- list `functionData` = []
 - Holds function data parameters from objectFunctioninput file.*
- list `voxelAssignment` = []
- tuple `notinC` = `apertureList()`
 - List of apertures not yet selected.*
- tuple `caligraphicC` = `apertureList()`
 - List of apertures already selected.*
- string `outputDirectory` = ""
 - various folders*
- string `dataDirectory` = ""
- tuple `currentDose` = `np.empty(1)`
- tuple `currentIntensities` = `np.empty(1)`
- list `xinter` = []
 - this is the intersection of all beamlets geographical locations in centimeters It is unique for each value in the x coordinate axis.*
- list `yinter` = []
 - Same as xinter but for y axis.*
- list `xdirection` = []
 - This is a list of lists.*
- list `ydirection` = []
- list `llist` = []
- list `rlist` = []
- list `voxelgradient` = []
- list `scipygradient` = []
- list `openApertureMaps` = []
- list `diagmakers` = []
- float `dZdK` = 0.0
- list `pointtoAngle` = []
- list `Dlist` = []

5.3.1 Detailed Description

This defines the global VMAT class that contains most of the VMAT data to be used in the implementation Most of the values were defined as static attributes and only one instantiation at a time is possible.

But this should not be a problem. The file also contains functions to be used when you call the optimizer.

5.3.2 Constructor & Destructor Documentation

5.3.2.1 `def greedyVMATsampling.vmat_class.__init__(self)`

5.3.3 Member Function Documentation

5.3.3.1 `def greedyVMATsampling.vmat_class.calcDose(self)`

5.3.3.2 `def greedyVMATsampling.vmat_class.calcGradientandObjValue(self)`

5.3.4 Member Data Documentation

5.3.4.1 `list greedyVMATsampling.vmat_class.algOptions = [] [static]`

vector of data input for algorithm options

5.3.4.2 `greedyVMATsampling.vmat_class.aperturegradient`

5.3.4.3 `list greedyVMATsampling.vmat_class.beamletsPerBeam = [] [static]`

number of beamlets per beam

5.3.4.4 `tuple greedyVMATsampling.vmat_class.caligraphicC = apertureList() [static]`

List of apertures already selected.

5.3.4.5 `list greedyVMATsampling.vmat_class.constraintInputFiles = [] [static]`

vector of data input files for constraints

5.3.4.6 `tuple greedyVMATsampling.vmat_class.currentDose = np.empty(1) [static]`

5.3.4.7 `greedyVMATsampling.vmat_class.currentDose`

5.3.4.8 `tuple greedyVMATsampling.vmat_class.currentIntensities = np.empty(1) [static]`

5.3.4.9 `string greedyVMATsampling.vmat_class.dataDirectory = "" [static]`

5.3.4.10 `list greedyVMATsampling.vmat_class.diagmakers = [] [static]`

5.3.4.11 `list greedyVMATsampling.vmat_class.dijsPerBeam = [] [static]`

number of nonzeros in Dij per beam

5.3.4.12 `list greedyVMATsampling.vmat_class.Dlist = [] [static]`

5.3.4.13 `float greedyVMATsampling.vmat_class.dZdK = 0.0 [static]`

5.3.4.14 `greedyVMATsampling.vmat_class.dZdK`

5.3.4.15 `list greedyVMATsampling.vmat_class.fullMaskValue = [] [static]`

complete mask value per voxel (A voxel may cover more than one structure = OAR's + T's)

5.3.4.16 list greedyVMATsampling.vmat_class.functionData = [] [static]

Holds function data parameters from objectFunctioninput file.

5.3.4.17 list greedyVMATsampling.vmat_class.llist = [] [static]

5.3.4.18 list greedyVMATsampling.vmat_class.maskValue = [] [static]

non-overlapping mask value per voxel

5.3.4.19 tuple greedyVMATsampling.vmat_class.notinC = apertureList() [static]

List of apertures not yet selected.

5.3.4.20 int greedyVMATsampling.vmat_class.numbeams = 0 [static]

num of beams

5.3.4.21 int greedyVMATsampling.vmat_class.numoars = 0 [static]

number of organs at risk

5.3.4.22 int greedyVMATsampling.vmat_class.numstructs = 0 [static]

number of structures/regions

5.3.4.23 int greedyVMATsampling.vmat_class.numtargets = 0 [static]

num of targets

5.3.4.24 tuple greedyVMATsampling.vmat_class.numvoxels = int() [static]

number of voxels in the small voxel space

5.3.4.25 int greedyVMATsampling.vmat_class.numX = 0 [static]

number of beamlets

5.3.4.26 greedyVMATsampling.vmat_class.numX

5.3.4.27 list greedyVMATsampling.vmat_class.oars = [] [static]

region indices of oars

5.3.4.28 list greedyVMATsampling.vmat_class.objectiveInputFiles = [] [static]

vector of data input files for objectives

5.3.4.29 tuple greedyVMATsampling.vmat_class.objectiveValue = float("inf") [static]

objectiveValue of the final function

5.3.4.30 greedyVMATsampling.vmat_class.objectiveValue

5.3.4.31 list greedyVMATsampling.vmat_class.openApertureMaps = [] [static]

5.3.4.32 string greedyVMATsampling.vmat_class.outputDirectory = "" [static]

various folders

5.3.4.33 list greedyVMATsampling.vmat_class.pointtoAngle = [] [static]

5.3.4.34 list greedyVMATsampling.vmat_class.regionIndices = [] [static]

index values of structures in region list (should be 0,1,etc)

5.3.4.35 list greedyVMATsampling.vmat_class.regions = [] [static]

vector of regions (holds structure information)

5.3.4.36 list greedyVMATsampling.vmat_class.rlist = [] [static]

5.3.4.37 list greedyVMATsampling.vmat_class.scipygradient = [] [static]

5.3.4.38 list greedyVMATsampling.vmat_class.targets = [] [static]

region indices of target structures (from region vector)

5.3.4.39 int greedyVMATsampling.vmat_class.totaldijs = 0 [static]

num of nonzeros in Dij matrix

5.3.4.40 list greedyVMATsampling.vmat_class.voxelAssignment = [] [static]

5.3.4.41 list greedyVMATsampling.vmat_class.voxelgradient = [] [static]

5.3.4.42 greedyVMATsampling.vmat_class.voxelgradient

5.3.4.43 list greedyVMATsampling.vmat_class.xdirection = [] [static]

This is a list of lists.

There is one for each

5.3.4.44 list greedyVMATsampling.vmat_class.xinter = [] [static]

this is the intersection of all beamlets geographical locations in centimeters It is unique for each value in the x coordinate axis.

Beamlet data is organized first in the X axis and then moves onto the Y axis

5.3.4.45 list greedyVMATsampling.vmat_class.ydirection = [] [static]

5.3.4.46 list greedyVMATsampling.vmat_class.yinter = [] [static]

Same as xinter but for y axis.

The documentation for this class was generated from the following file:

- [greedyVMATsampling.py](#)

Chapter 6

File Documentation

6.1 greedyVMATsampling.py File Reference

Classes

- class [greedyVMATsampling.region](#)
- class [greedyVMATsampling.apertureList](#)
apertureList is a class definition of locs and angles that is always sorted.
- class [greedyVMATsampling.vmat_class](#)
This defines the global VMAT class that contains most of the VMAT data to be used in the implementation Most of the values were defined as static attributes and only one instantiation at a time is possible.

Namespaces

- [greedyVMATsampling](#)

Functions

- def [greedyVMATsampling.readctvoxelinfo](#)
- def [greedyVMATsampling.readDmatrix](#)
- def [greedyVMATsampling.calcObjGrad](#)
- def [greedyVMATsampling.fvalidbeamlets](#)
- def [greedyVMATsampling.PPsubroutine](#)
- def [greedyVMATsampling.parallelizationPricingProblem](#)
- def [greedyVMATsampling.PricingProblem](#)
- def [greedyVMATsampling.solveRMC](#)
- def [greedyVMATsampling.printresults](#)
- def [greedyVMATsampling.colGen](#)
- def [greedyVMATsampling.plotAperture](#)
- def [greedyVMATsampling.updateOpenAperture](#)

Variables

- string [greedyVMATsampling.__author__](#) = 'wilmer'
- [greedyVMATsampling.have_mkl](#) = True

- list `greedyVMATsampling.kappa` = [6, 17, 28, 39, 50, 61, 72, 83, 94, 105, 116, 127, 138, 149, 160, 171, 11, 22, 33, 44, 55, 66, 77, 88, 99, 110, 121, 132, 143, 154, 165, 1, 175, 14, 25, 36, 47, 58, 69, 80, 91, 102, 113, 124, 135, 146, 157, 168, 3, 8, 19, 30, 41, 52, 63, 74, 85, 96, 107, 118, 129, 140, 151, 162, 172, 176, 0, 2, 4, 5, 7, 9, 10, 12, 13, 15, 16, 18, 20, 21, 23, 24, 26, 27, 29, 31, 32, 34, 35, 37, 38, 40, 42, 43, 45, 46, 48, 49, 51, 53, 54, 56, 57, 59, 60, 62, 64, 65, 67, 68, 70, 71, 73, 75, 76, 78, 79, 81, 82, 84, 86, 87, 89, 90, 92, 93, 95, 97, 98, 100, 101, 103, 104, 106, 108, 109, 111, 112, 114, 115, 117, 119, 120, 122, 123, 125, 126, 128, 130, 131, 133, 134, 136, 137, 139, 141, 142, 144, 145, 147, 148, 150, 152, 153, 155, 156, 158, 159, 161, 163, 164, 166, 167, 169, 170, 173, 174, 177]
- `greedyVMATsampling.WholeCircle` = False
- string `greedyVMATsampling.rootFolder` = '/media/wilmer/datadrive'
- string `greedyVMATsampling.readfolder` = rootFolder+'/Data/DataProject/HN/'
- string `greedyVMATsampling.readfolderD` = readfolder+'Dij/'
- string `greedyVMATsampling.outputfolder` = '/home/wilmer/Dropbox/Research/VMAT/output/'
- int `greedyVMATsampling.degreeseq` = 60
- string `greedyVMATsampling.objfile` = '/home/wilmer/Dropbox/lpOptSolver/TestData/HNdata/objectives/obj1.-txt'
- string `greedyVMATsampling.structurefile` = '/home/wilmer/Dropbox/lpOptSolver/TestData/HNdata/structure-Inputs.txt'
- string `greedyVMATsampling.algfile` = '/home/wilmer/Dropbox/lpOptSolver/TestData/HNdata/algInputs-Wilmer.txt'
- string `greedyVMATsampling.mm3voxels` = rootFolder+'/Data/DataProject/HN/hn3mmvoxels.mat'
- list `greedyVMATsampling.priority` = [7, 24, 25, 23, 22, 21, 20, 16, 15, 14, 13, 12, 10, 11, 9, 4, 3, 1, 2, 17, 18, 19, 5, 6, 8]
- list `greedyVMATsampling.mylines` = [line.rstrip("\n") for line in open('/home/wilmer/Dropbox/Research/VMA-T/VMATwPenCode/beamAngles.txt')]
- tuple `greedyVMATsampling.fig` = plt.figure(1)
- list `greedyVMATsampling.catemp` = []
- list `greedyVMATsampling.gatemp` = []
- tuple `greedyVMATsampling.start` = time.time()
- tuple `greedyVMATsampling.data` = vmat_class()
- tuple `greedyVMATsampling.oldfolder` = os.getcwd()
-#####
- tuple `greedyVMATsampling.allFiles` = glob.glob("*VOILIST.mat")
- tuple `greedyVMATsampling.allBeamInfos` = glob.glob("*Couch0_BEAMINFO.mat")
- tuple `greedyVMATsampling.allNames` = sorted(allFiles)
- tuple `greedyVMATsampling.allBeamInfoNames` = sorted(allBeamInfos)
- tuple `greedyVMATsampling.numStructs` = len(allFiles)
- tuple `greedyVMATsampling.vdims` = readctvoxelinfo()
- list `greedyVMATsampling.numVoxels` = vdims['x']
- list `greedyVMATsampling.Vorg` = []
- tuple `greedyVMATsampling.bigZ` = np.zeros(numVoxels, dtype=int)
- tuple `greedyVMATsampling.nVox` = sum(bigZ)
- int `greedyVMATsampling.counter` = 0
- tuple `greedyVMATsampling.originalVoxels` = np.empty(numVoxels)
- list `greedyVMATsampling.lines` = [myline.split("\t") for myline in [line.rstrip("\n") for line in open(structurefile)]]
- *Read in structures .*
- list `greedyVMATsampling.invec` = [item for sublist in lines for item in sublist]
- *Collapse the above expression to a flat list.*
- tuple `greedyVMATsampling.maskValueFull` = np.zeros(nVox.astype(np.int64))
- *Assignment of different values.*
- tuple `greedyVMATsampling.maskValueSingle` = np.zeros(nVox.astype(np.int64))
- list `greedyVMATsampling.s` = priority[i]
- tuple `greedyVMATsampling.norepeat` = np.unique(originalVoxels[np.invert(np.isnan(originalVoxels))])
- tuple `greedyVMATsampling.istarget` = str(s)
- list `greedyVMATsampling.tempindicesfull` = originalVoxels[Vorg[s]]

- tuple `greedyVMATsampling.tempindices` = `np.intersect1d(tempindicesfull, norepeat)`
- int `greedyVMATsampling.gastart` = 0
- int `greedyVMATsampling.gaend` = 356
- int `greedyVMATsampling.gastep` = 2
- list `greedyVMATsampling.ga` = []
- list `greedyVMATsampling.ca` = []
- string `greedyVMATsampling.fname` = 'Gantry'
- Treatment of BEAMINFO data.*
- string `greedyVMATsampling.bletfname` = `readfolder+'Gantry'`
- tuple `greedyVMATsampling.nBPB` = `np.zeros(len(ga))`
- tuple `greedyVMATsampling.nDIJSPB` = `np.zeros(len(ga))`
- tuple `greedyVMATsampling.beamletCounter` = `np.zeros(data.numbeams + 1)`
- Beginning of Troy's cpp code (interpreted, not copied) A comment This comes from first two lines in doseInputs txt file (troy's version)*
- tuple `greedyVMATsampling.binfoholder` = `sio.loadmat(bletfname)`
- tuple `greedyVMATsampling.N` = `len(data.yinter)`
- After reading the beaminfo information.*
- tuple `greedyVMATsampling.M` = `len(data.xinter)`
- int `greedyVMATsampling.overallDijsCounter` = 0
- Initial intensities are allocated a value of zero.*
- list `greedyVMATsampling.DlistT` = [None]
- tuple `greedyVMATsampling.pool` = `Pool(processes=8)`
- tuple `greedyVMATsampling.Allmats` = `pool.map(readDmatrix, range(0, data.numbeams))`
- list `greedyVMATsampling.ininter` = []
- `greedyVMATsampling.functionData` = `data.functionData`
- Collapse the above expression to a flat list.*
- tuple `greedyVMATsampling.quadHelperThresh` = `np.zeros(data.numvoxels)`
- tuple `greedyVMATsampling.quadHelperOver` = `np.zeros(data.numvoxels)`
- tuple `greedyVMATsampling.quadHelperUnder` = `np.zeros(data.numvoxels)`
- tuple `greedyVMATsampling.quadHelperAlphaBetas` = `np.zeros(data.numvoxels)`
- tuple `greedyVMATsampling.uDose` = `np.zeros(data.numvoxels)`
- tuple `greedyVMATsampling.oDose` = `np.zeros(data.numvoxels)`
- tuple `greedyVMATsampling.before` = `time.time()`
- tuple `greedyVMATsampling.pstar` = `colGen(0, WholeCircle, 16)`
- tuple `greedyVMATsampling.after` = `time.time()`

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