```
# image
                    # outputFilepath
                    # debugMode
                    # outputImage
                    # detectMethodCalled
                    # detectorSpecificFieldsInitialised
                    # origin
                    # ERR_OUTPUT_WITHOUT
                     DETECT
                    #ERR OUTPUT FILE
                    # ERR_INVALID_IMAGE
                    #OUTPUT_EXTENSION
                    # IMG_EXTENSION
                    # WIN_OUTPUT_IMAGE
                    #KEY ESC
                    # KEY_SAVE
                    + Detector()
                    + ~Detector()
                    + detect()
                    + outputResults()
                    # initialise()
                    # initialiseDetectorSpecific
                    FieldsIfNotSet()
                    # setDetectorSpecificFields
                    InitialisationFlag()
                    # initialiseDetectorSpecific
                    Fields()
                    # initialiseImageDependent
                    Fields()
                    # initialiseDetectorSpecific
                    ImageDependentFields()
                    # initialiseImageOrigin()
                    # isValidInputImage()
                    # detect()
                    # detectInDebugMode()
                    # detectInReleaseMode()
                    # polygonAngle()
                    # polygonAngle()
                    # minAreaRectCentre()
                    # findGoodPointsForAngle()
                    # findGoodIntersectionPoints()
                    # displayResultsInWindow()
                    # outputResultsToFile()
                    # outputResultsToImage()
                    # storeOutputImageOnDisk()
                    # outputResultsToCsvFile()
                    # outputResultsToCsvFile()
                    # processImageAndDetect()
                    # clearPreviousDetectionResults()
                    # createTrackbars()
                    # createTrackbarsWindow()
                    # createDetectorSpecificTrackbars()
                    # processPressedKeyRequest()
                    # displayImage()
                    # printOutputErrorMessage()
                                        multiscale::analysis
                                                 ::RegionDetector

    avgClusterednessDegree

                                        - avgDensity
                                        - alpha

    beta

                                        - blurKernelSize
                                        - morphologicalCloseIterations
                                        - epsilon
                                        - regionAreaThresh
                                        - thresholdValue
                                        - regions
                                        - OUTPUT_CLUSTEREDNESS
                                        - OUTPUT DENSITY
                                        - TRACKBAR_ALPHA
                                         TRACKBAR BETA
                                        TRACKBAR_KERNEL
                                        TRACKBAR_MORPH

    TRACKBAR CANNY

                                        - TRACKBAR_EPSILON
                                         TRACKBAR REGION AREA
                                         THRESH
multiscale::analysis
                                        - TRACKBAR_THRESHOLD
        ::ClusterDetector
                                        - USE_CANNY_L2
# clusterednessIndex
                                        - CONTOUR AREA ORIENTED
# avgPileUpDegree
                                        - ALPHA REAL MIN
# entityPileupDegree
                                        ALPHA_REAL_MAX
                                        - BETA_REAL_MIN
                                        - BETA_REAL_MAX
                                        - ALPHA_MAX
OUTPUT_CLUSTEREDNESS
                                        BETA_MAX
- OUTPUT_PILE_UP
                                        - KERNEL MAX
                                        MORPH_ITER_MAX
TRACKBAR_EPS
                                        - CANNY_THRESH_MAX
TRACKBAR_MINPOINTS
- MIN_POINTS_MIN
                                        - EPSILON_MAX
MIN_POINTS_MAX
                                        REGION_AREA_THRESH_MAX
                                        - THRESHOLD_MAX
                                        - THRESHOLD_CLUSTEREDNESS
- EPS_REAL_MIN
                                        - INTENSITY_MAX
- EPS_REAL_MAX
                                        POLYGON_CLOSED
                                        DISPLAY_LINE_THICKNESS
+ ClusterDetector()
+ ~ClusterDetector()
                                        + RegionDetector()
                                        + ~RegionDetector()
+ getMinPoints()
                                        + getAlpha()
+ getClusters()
                                        + getBeta()
                                        + getBlurKernelSize()
+ setMinPoints()
                                        + getEpsilon()
# initialiseDetectorSpecific
                                        + getMorphologicalCloseIterations()
                                        + getOriginXCoordinate()
# createDetectorSpecificTrackbars()
                                        + getOriginYCoordinate()
# clearPreviousDetectionResults()
                                        + getRegionAreaThresh()
# processImageAndDetect()
                                        + getThresholdValue()
# detectEntitiesInImage()
                                        + getRegions()
# detectAndAnalyseClusters()
                                        + setAlpha()
# detectClusters()
                                        + setBeta()
# convertEntities()
                                        + setBlurKernelSize()
# convertNonPiledUpEntities()
                                        + setEpsilon()
                                        + setMorphologicalCloseIterations()
# convertPiledUpEntities()
# addEntitiesToClusters()
                                        + setOriginXCoordinate()
# analyseClusters()
                                        + setOriginYCoordinate()
# analyseClustersOriginDependent
                                        + setRegionAreaThresh()
                                        + setThresholdValue()
# updateClusterOriginDependent
                                        - initialiseDetectorSpecific
                                        Fields()
# getClusterConvexHull()

    initialiseDetectorSpecific

# computeClusterednessIndex()
                                        ImageDependentFields()
                                        - createDetectorSpecificTrackbars()
# computeAveragePileUpDegree()
# outputResultsToCsvFile()
                                        processImageAndDetect()
# convertEpsValue()
                                        - changeContrastAndBrightness()
# getValidMinPointsValue()
                                        - smoothImage()
                                        - morphologicalClose()
                                        thresholdImage()
                                        findRegions()
                                        computeAverageMeasures()
                                        - computeAverageClusteredness
```

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::Detector

::SimulationClusterDetector

Degree()

- isValidRegion()

- regionDensity() - regionArea() - regionHolesArea()

CsvFile()

convertAlpha() - convertBeta()

- computeAverageDensity() findContoursInImage() - createRegionFromPolygon()

- regionClusterednessDegree()

- clearPreviousDetectionResults()

- outputResultsToCsvFile() - outputRegionsToCsvFile() outputAveragedMeasuresTo

- outputResultsToImage()

- height - width - entityHeight

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thresholdedImage

- entityWidth

- THRESHOLD

- THRESHOLD MAX - ENTITY THRESH

eps

minPoints

EPS_MIN

- EPS MAX

+ getEps()

+ setEps()

Values()

Values()

clusters

- DATAPOINT_WIDTH
- DATAPOINT_THICKNESS
- + SimulationClusterDetector()
- + ~SimulationClusterDetector() - initialiseDetectorSpecific
- ImageDependentFields()
- initialiseThresholdedImage()
- detectEntitiesInImage()
- isEntityAtPosition()

- getEntityContourPoints()
- computePileUpDegreeAtPosition() - outputResultsToImage()
- outputClusterToImage() - outputClusterShape()
- Shape() - outputClusterCircularShape()
- getEntityCentrePoint()
- outputClusterTriangularShape()
- outputClusterRectangular