

## BE244 Glossary of Image Processing and Analysis – C. Klifa – January 2009

**artifact:** artificial defect in the image, due to problems in sensing equipment (scratches in Xray digitized films), or during examinations (patient motion), ....

**binary image:** image where pixels have only two values, generally 0 and 1

**brightness:** The gray level value of a pixel within an image that corresponds to energy intensity. The larger the gray level value, the greater the brightness.

**clustering:** concept of grouping data in classes based upon the similarity of the data

**compression:** removal of any redundant data that may be present within the image, to reduce amount of data to manipulate or store.

**contrast:** the amount of gray level variation within an image

**digitizer:** electronic circuit that converts analog or continuous signals into discrete or digital data

**dilation:** a morphological operation that *enlarges* the geometrical size of objects within an image

**discrete convolution:** process where 2 images are combined using a shift, multiply and add operation. Typically one image is substantially smaller than the other and is called the “mask” or “window”. Masks can be designed to perform a wide range of filtering functions.

**enhancement:** algorithms and processes that improve an image based on subjective measures. The goal is to accentuate certain image features for subsequent analysis or for display.

**erosion:** morphological operation that *reduces* the geometrical size of objects within an image

**feature:** any of the properties that are characteristic of an image, from which a description, interpretation or understanding of the scene can be provided by a machine.

**graylevel:** value of gray from a black and white (monochrome) image

**grayscale:** range of gray shades, or gray levels corresponding to pixel values that a monochrome image incorporates

**histogram:** distribution of pixel graylevel values. A graph of number of pixels at each graylevel possible in an image.

**mask:** refers to a small image used to specify the area of operation to take place on a larger image in an algorithm

**matrix:** image representation using MxN matrix is a 90° clockwise rotation of the conventional two-dimensional Cartesian coordinate representation.

**mean:** the average of a set of data values (mean of {3,5,6,7,4,3,2,2} is  $3+5+6+7+4+3+2+2/8=4$ )

**median:** the middle value of a set of *ordered* data values (median of {3,5,6,7,4,3,2,2} is {2 2 3 3 | 4 5 6 7}=3.5)

**morphology:** originally comes from the study of forms, of plants or animals. Image morphology represents study of topology or structure of objects from their images. Morphological processing refers to certain operations where an object is “hit” with a structuring element and thereby reduced to a more revealing shape.

**noise:** degradation of image due to equipment (i.e. sensor, camera misfocus), type of modality, motion, turbulence, ...

**object boundaries:** linked edges that characterize the shape of an object

**opening:** morphological operation that is used to smooth the geometrical shape of objects within an image. Opening is a morphological erosion followed by a morphological dilation operation.

**outline:** the contour of objects within an image

**patterns:** a reliable sample of observable characteristics of an image

**pixel:** slang for picture element, the smallest element of an image

**profile:** imaging function that plots or displays pixel data along a line within an image to yield a cross section of values

**quantization:** range of values that a pixel can represent

**region of interest (ROI):** zone under study within the image (2D or 3D)

**representation:** characterization of the quantity that each pixel represents. For example an image could represent the absorption characteristics of the body tissue (Xray imaging) or the temperature profile of a region (infrared imaging)

**resolution:** smallest feature (spatial) or graylevel value (quantization) that an image system can resolve.

**restoration:** algorithms or processes that attempt to remove a degradation (noise, blurring, and defocusing effects) based on an objective criterion

**sampling:** used to describe spatial resolution of an image

**segmentation:** separation of different objects in the image (for example by extracting their boundaries).

**slice:** 2D image often described as part of a 3D volume

**skeletonization:** algorithm used to find the central axis (skeleton) of an image object

**structuring set:** set of pixels used to describe the structuring function used in the morphological erosion and dilation

**texture:** structural patterns of surfaces of objects such as wood, grain, sand, grass, cloth. The term texture generally refers to repetition of basic texture elements called texels. A texel contains several pixels whose placement could be periodic or random. Texture may be coarse, fine, smooth, granulated, regular, irregular, linear, etc...

**threshold:** a value used to segment the graylevel values of an image into two different regions. Also called the binarization of an image.

**voxel:** 3D pixel

**zoom:** process by which an image is magnified by a computer algorithm.

- All definitions extracted from:
  - “The Pocket Handbook of Image Processing Algorithms in C”, H. Myler, A. Weeks, Prentice Hall, 1993, ISBN 0-13-642240-3
  - “Fundamentals of Electronic Image Processing”, A. Weeks, SPIE/IEEE Series, 1996
  - “Fundamentals of Digital Image Processing”, A. Jain, Prentice Hall, 1989