

Algorithms For Image Processing And Computer Vision

Computer vision

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Computer vision tasks include methods for acquiring, processing, analyzing, and understanding digital images, and extraction of high-dimensional data from the real world in order to produce numerical or symbolic information, e.g. in the form of decisions. "Understanding" in this context signifies the transformation of visual images (the input to the retina) into descriptions of the world that make sense to thought processes and can elicit appropriate action. This image understanding can be seen as the disentangling of symbolic information from image data using models constructed with the aid of geometry, physics, statistics, and learning theory.

The scientific discipline of computer vision is concerned with the theory behind artificial systems that extract information from images. Image data...

Digital image processing

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Digital image processing is the use of a digital computer to process digital images through an algorithm. As a subcategory or

field of digital signal processing, digital image processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and distortion during processing. Since images are defined over two dimensions (perhaps more), digital image processing may be modeled in the form of multidimensional systems. The generation and development of digital image processing are mainly affected by three factors: first, the development of computers; second, the development of mathematics (especially the creation and improvement of discrete mathematics theory); and third, the...

Feature (computer vision)

In computer vision and image processing, a feature is a piece of information about the content of an image; typically about whether a certain region of

In computer vision and image processing, a feature is a piece of information about the content of an image; typically about whether a certain region of the image has certain properties. Features may be specific structures in the image such as points, edges or objects. Features may also be the result of a general neighborhood operation or feature detection applied to the image. Other examples of features are related to motion in image sequences, or to shapes defined in terms of curves or boundaries between different image regions.

More broadly a feature is any piece of information that is relevant for solving the computational task related to a certain application. This is the same sense as feature in machine learning and pattern recognition generally, though image processing has a very sophisticated...

Image rectification

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Image rectification is a transformation process used to project images onto a common image plane. This process has several degrees of freedom and there are many strategies for transforming images to the common plane. Image rectification is used in computer stereo vision to simplify the problem of finding matching points between images (i.e. the correspondence problem), and in geographic information systems (GIS) to merge images taken from multiple perspectives into a common map coordinate system.

Computer graphics (computer science)

Computational topology Computer vision Image processing Information visualization Scientific visualization Applications of computer graphics include: Print

Computer graphics is a sub-field of computer science which studies methods for digitally synthesizing and manipulating visual content. Although the term often refers to the study of three-dimensional computer graphics, it also encompasses two-dimensional graphics and image processing.

Vision processing unit

accelerate machine vision tasks. Vision processing units are distinct from graphics processing units (which are specialised for video encoding and decoding) in

A vision processing unit (VPU) is (as of 2023) an emerging class of microprocessor; it is a specific type of AI accelerator, designed to accelerate machine vision tasks.

Image registration

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images and data from satellites

Image registration is the process of transforming different sets of data into one coordinate system. Data may be multiple photographs, data from different sensors, times, depths, or viewpoints. It is used in computer vision, medical imaging, military automatic target recognition, and compiling and analyzing images and data from satellites. Registration is necessary in order to be able to compare or integrate the data obtained from these different measurements.

Computer stereo vision

In a computer vision system, several pre-processing steps are required. The image must first be undistorted, such that barrel distortion and tangential

Computer stereo vision is the extraction of 3D information from digital images, such as those obtained by a CCD camera. By comparing information about a scene from two vantage points, 3D information can be extracted by examining the relative positions of objects in the two panels. This is similar to the biological process of stereopsis.

Pyramid (image processing)

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Pyramid, or pyramid representation, is a type of multi-scale signal representation developed by the computer vision, image processing and signal processing communities, in which a signal or an image is subject to repeated smoothing and subsampling. Pyramid representation is a predecessor to scale-space representation and multiresolution analysis.

Image segmentation

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In digital image processing and computer vision, image segmentation is the process of partitioning a digital image into multiple image segments, also known as image regions or image objects (sets of pixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics.

The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image (see edge detection). Each of the pixels...

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