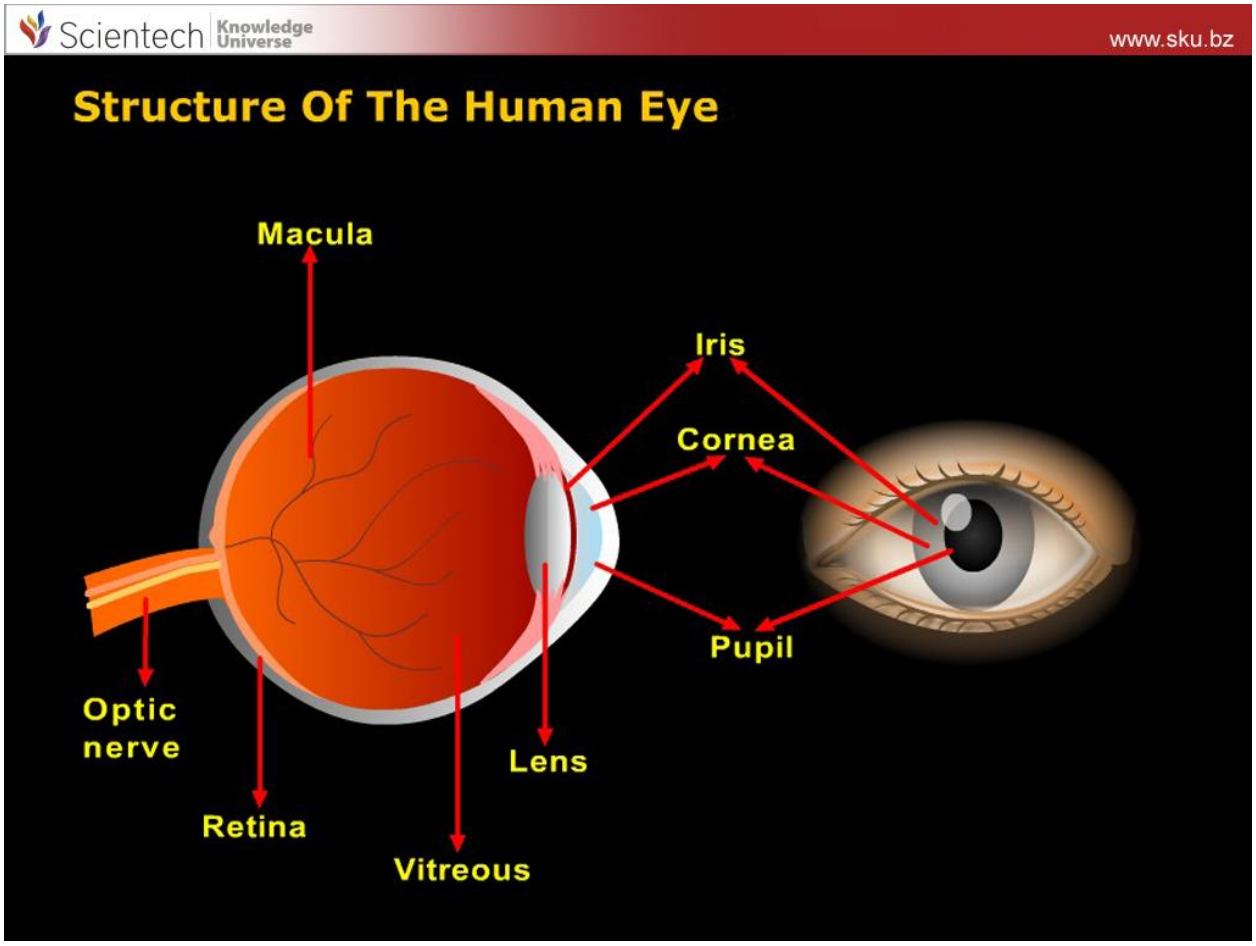
SKU-Digital Image Processing

Digital image processing is essential for engineers and students to fully understand both the fundamentals and also the implementation and application principles of the same. This courseware introduces the fundamental concepts of digital image processing systems which are illustrated by various animations and relevant examples for quick understanding of students along with the simplified theory. At the end of each topic relevant quizzes & FAQs are also given for the students to self estimate their understanding. It is helpful for the students to develop their base to deal with higher semester subjects as well.



Topics covered in SKU-Digital Image Processing

Introduction

Topics covered: What is Digital Image Processing, Background on MATLAB and the Image Processing Toolbox, Areas of the Image Processing Covered in the Book, Notation, The MATLAB Working Environment, The MATLAB Desktop Using the MATLAB Editor to Create M Files, Getting Help.

Fundamentals

Topics covered: Digital Image Representation, Coordinate Conventions ,Images and Matrices, Reading Images, Displaying Images, Writing Images, Data Classes, Image Types, Intensity Images, Binary Images, A Note on Terminology, Converting between Data Classes and Image Types, Converting between Data Classes , Converting between Image Classes and Types ,Array Indexing, Vector Indexing ,Matrix Indexing, Selecting Array Dimensions ,Some Important Standard Arrays, Introduction to M-Function Programming ,M-Files, Operators, Flow Control, Code Optimization, Interactive I/O, A Brief Introduction to Cell Array and Structures.

Intensity Transformations and Spatial Filtering

Topics covered: Intensity Transformation Functions, MATLAB Functions, Logarithmic and Contrast-Stretching Transformations, Some Utility M-Functions for Intensity Transformations ,Histogram Processing and Function Plotting, Generating and Plotting Image Histograms ,Histogram Equalization, Histogram Matching (Specification),Spatial Filtering, Linear Spatial Filtering, Nonlinear Spatial Filtering ,Image Processing Toolbox Standard Spatial Filters ,Linear Spatial Filters ,Nonlinear Spatial Filters .

Frequency Domain Processing

Topics covered: The 2D Discrete Fourier Transform ,Computing and Visualizing the 2-D DFT in MATLAB, Filtering in the Frequency Domain, Fundamental Concepts, Basic Steps in DFT Filtering, An M-Function for Filtering in the Frequency Domain ,Obtaining Frequency Domain Filters from Spatial Filters ,Generating Filters Directly in the Frequency Domain, Creating Mesh-grid Arrays for Use in Implementing Filters in the Frequency Domain , Low-pass Frequency Domain Filters ,Wireframe and Surface Plotting, Sharpening Frequency Domain Filters, Basic High-pass Filtering, High-Frequency Emphasis Filtering

Image Restoration

Topics covered: A Model of the Image Degradation/Restoration Process, Noise Models, Adding Noise: MATLAB Function, Generating Spatial Random Noise with a Specified Distribution, Periodic Noise ,Estimating Noise Parameters, Restoration in the Presence of Noisy Only Spatial Filtering, Spatial Noise Filters, Adaptive Spatial Filters, Periodic Noise Reduction by Frequency Domain Filtering, Modeling the Degradation Function, Direct Inverse Filtering, Wiener Filtering, Constrained Least Squares (Regularized) Filtering ,Iterative Nonlinear Restoration Using the Lucy-Richardson Algorithm, Blind Deconvolution ,Geometric Transformations and Image Registration, Geometric Spatial Transformation, Applying Spatial Transformation to Image, Image Registration .

Color Image Processing

Topics covered: Color Image Representation in MATLAB,RGB Images, Indexed Images, IPT Functions for Manipulating RGB and indexed Images ,Converting to Other Color Spaces, NTSC Color Space, The YCbCr Color Space, The HSV Color Space ,The CMY and CMYK Color Spaces, The HSI Color Space, The Basics of Color Image Processing, Color Transformations, Spatial Filtering of Color Images, Color Image Smoothing, Color Image Sharpening, Working

Directly in RGB Vector Space, Color Edge Detection Using the Gradient, Image Segmentation in RGB Vector Space.

Wavelets

Topics covered: The Fast Wavelet Transform, FWTs using the Wavelet Toolbox, FWTs without the Wavelet Toolbox, Working with Wavelet Decomposition Structure, Editing Wavelet Decomposition Coefficients without the Wavelet Toolbox, Editing Wavelet Decomposition Coefficients, The Inverse Fast Wavelet Transform, Wavelets in Image Processing.

Image Compression

Topics covered: Coding Redundancy, Huffman Codes, Huffman Encoding, Huffman Decoding ,Inter-pixel Redundancy , Psycho-visual Redundancy, JPEG Compression, JPEG ,JPEG 2000.

Morphological Image Processing

Topics covered: Preliminaries, Some Basic Concepts from Set Theory, Binary Images, Sets, and Logical Operators ,Dilation and Erosion, Dilation, Structuring Element Decomposition, The Strel Function, Erosion, Combining Dilation and Erosion, Opening and Closing, The Hit-Or-Miss Transformation, Using Lookup Tables, Function bwmorph , Labeling Connected Components, Morphological Reconstruction, Opening by Reconstruction, Filling Holes, Clearing Border Objects, Gray-Scale Morphology ,Dilation and Erosion, Opening and Closing, Reconstruction.

Image Segmentation

Topics covered: Point Line and Edge Detection ,Point Detection, Line Detection, Edge Detection Using Function Edge, Line Detection using the Hough Transform, Hough Transform Peak Detection, Hough Transform Line Detection and Linking, Thresholding, Global Thresolding, Local Thresolding, Region-Based Segmentation, Basic Formulation, Region Growing, Region Splitting and Merging, Segmentation Using the Watershed Transform, Watershed Segmentation Using the Distance Transform, Watershed Segmentation Using Gradients, Marker-Controlled Watershed Segmentation .

Representation & Description

Topics covered: Cell Arrays and Structure, Some Additional MATLAB Functions, Some Basic Utility M-Functions, Representation, Chain Codes, Polygonal Approximations Using Minimum-perimeter polygons, Signatures, Boundary Segments, Skeletons, Boundary Descriptors, Some Simple Descriptors ,Shape Numbers, Fourier Descriptors, Statistical Moments, Regional Descriptors, Function regionprops, Texture, Moment Invariants, Using Principal Components for Description.

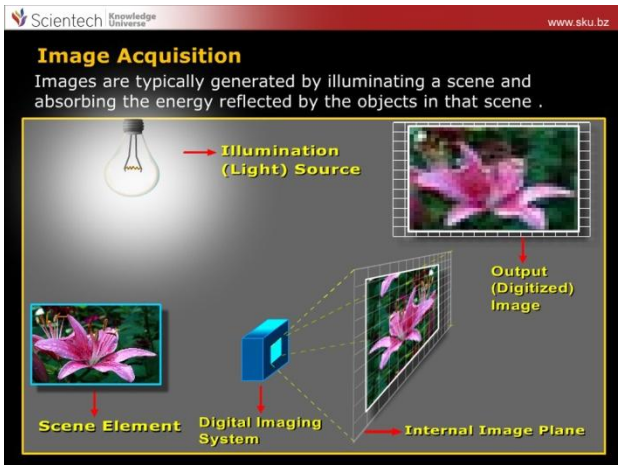
Object Recognition

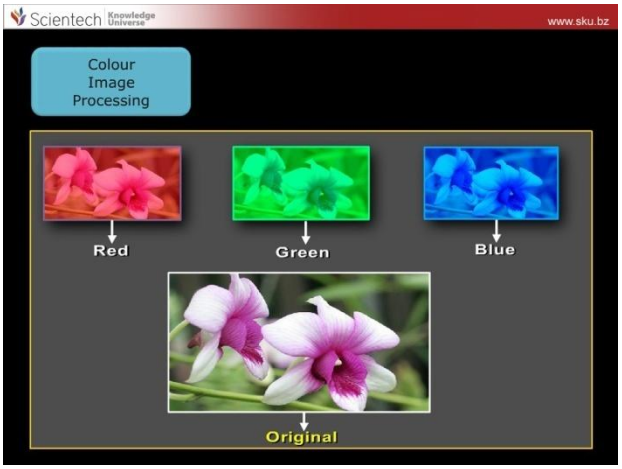
Topics covered: Computing Distance Measures in MATLAB ,Recognition Based on Decision-Theoretic Methods, Formatting Pattern Vectors, Pattern Matching Using Minimum-Distance Classifiers, Matching by Correlation, Optimum Statistical Classifiers ,Adaptive Learning Systems, Structural Recognition, Working with Strings in MATLAB, String Matching.

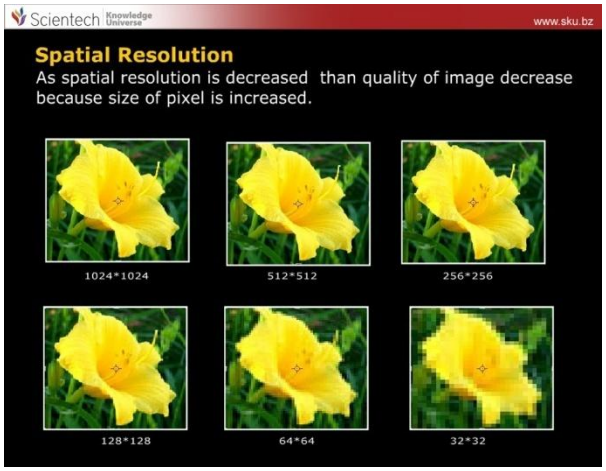
Applications

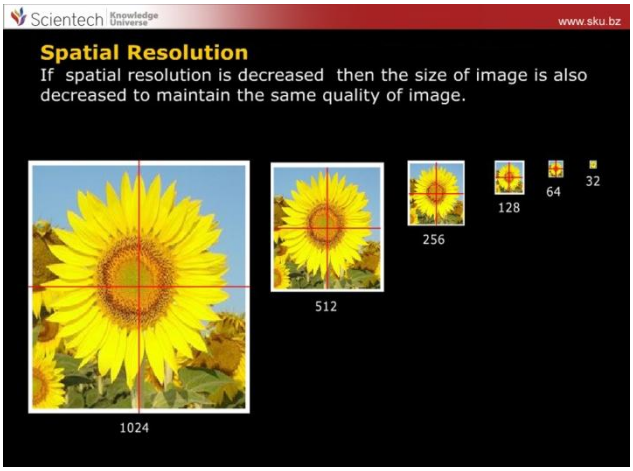
Topics covered: Biomedical, Biometrics, Compression, Remote Sensing, Multimedia, Machine vision and pattern recognition, Surveillance.

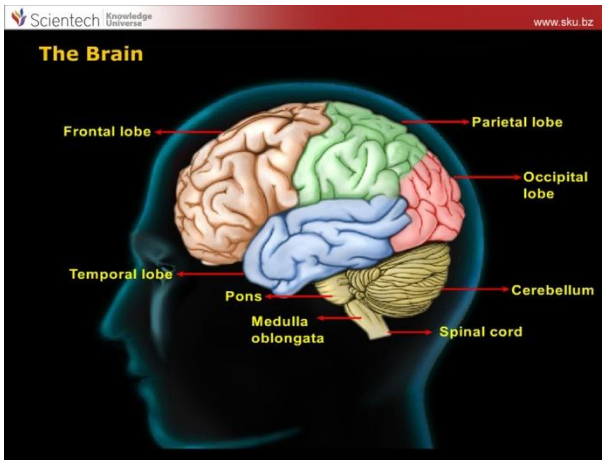
Print Shots of SKU-Digital Image Processing







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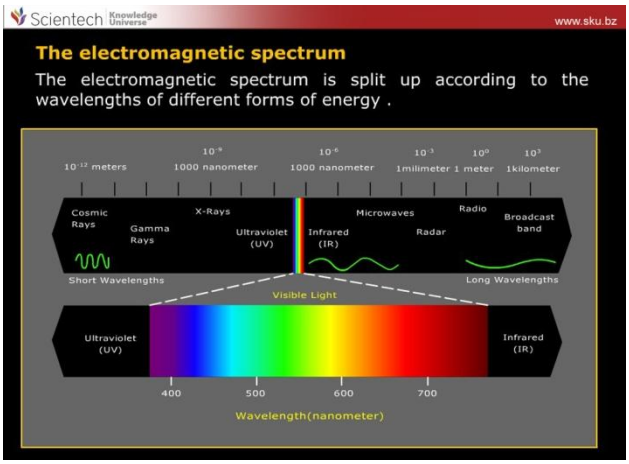
The Brain
Frontal lobe
Parietal lobe
Occipital lobe
Temporal lobe
Pons
Cerebellum
Medulla oblongata
Spinal cord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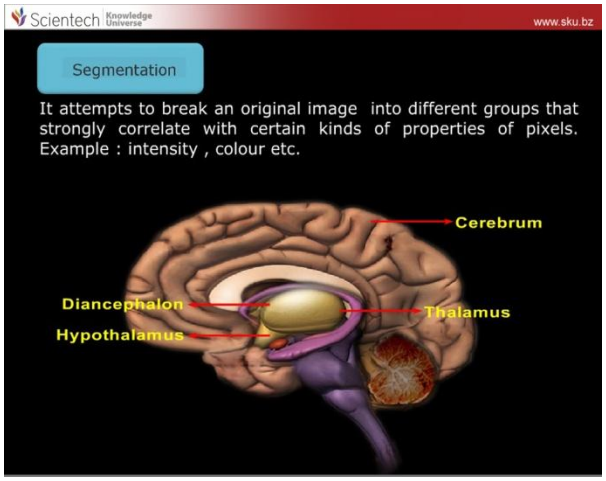
The electromagnetic spectrum
The electromagnetic spectrum is split up according to the wavelengths of different forms of energy .
10⁻¹² meters
10⁻⁹ 1000 nanometer
10⁻⁶ 1000 nanometer
10⁻³ 1milimeter
10⁰ 1 meter
10³ 1kilometer
Cosmic Rays
Gamma Rays
X-Rays
Ultraviolet (UV)
Infrared (IR)
Microwaves
Radar
Radio
Broadcast band
Short Wavelengths
Long Wavelengths
Visible Light
Ultraviolet (UV)
Infrared (IR)
400
500
600
700
Wavelength(nanometer)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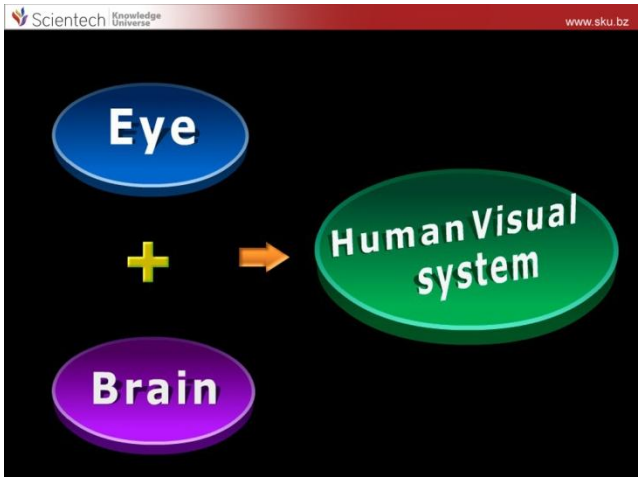
Segmentation
It attempts to break an original image into different groups that strongly correlate with certain kinds of properties of pixels. Example : intensity , colour etc.
Cerebrum
Diancephalon
Thalamus
Hypothalamus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Eye
Human Visual system
Brain