

研究生课程教学大纲

课程 编号	中英文课程名称	学分	学时	开课 学期	开课单位	任课教师	
						姓名	职称
11M0301	遥感数字图像处理（双语） Remotely Sensed Digital Image Processing	2	32	秋	地学院	周绍光	副教授
授课对象		授课专业			教学方式		考核方式
硕士（ √ ） 博士（ ）		摄影测量与遥感			讲授、研讨、实习		考查
使用教材名称			出版社		著作人		出版时间
数字图像处理			电子工业出版社		冈萨雷斯		2003-3
课 程 内 容	1 Introduction						
	1.1 What Is Digital Image Processing?						
	1.2 The Origins of Digital Image Processing						
	1.3 Examples of Fields that Use Digital Image Processing						
	1.4 Fundamental Steps in Digital Image Processing						
	1.5 Components of an Image Processing System						
	2 Digital Image Fundamentals						
	2.1 Elements of Visual Perception						
	2.2 Light and the Electromagnetic Spectrum						
	2.3 Image Sensing and Acquisition						
	2.4 Image Sampling and Quantization						
	2.5 Some Basic Relationships Between Pixels						
	2.6 Linear and Nonlinear Operations						
	3 Image Enhancement in the Spatial Domain						
	3.1 Background						
	3.2 Some Basic Gray Level Transformations						
	3.3 Histogram Processing						
	3.4 Enhancement Using Arithmetic/Logic Operations						
	3.5 Basics of Spatial Filtering						
	3.6 Smoothing Spatial Filters						
	3.7 Sharpening Spatial Filters						
	3.8 Combining Spatial Enhancement Methods						
	4 Image Enhancement in the Frequency Domain						
	4.1 Background						
	4.2 Introduction to the Fourier Transform and the Frequency Domain						
	4.3 Smoothing Frequency-Domain Filters						
	4.4 Sharpening Frequency Domain Filters						
	4.5 Homomorphic Filtering						
4.6 Implementation							
5 Image Restoration							
5.1 A Model of the Image Degradation/Restoration Process							
5.2 Noise Models							

- 5.3 Restoration in the Presence of Noise Only–Spatial Filtering
- 5.4 Periodic Noise Reduction by Frequency Domain Filtering
- 5.5 Linear, Position-Invariant Degradations
- 5.6 Estimating the Degradation Function
- 5.7 Inverse Filtering
- 5.8 Minimum Mean Square Error (Wiener) Filtering
- 5.9 Constrained Least Squares Filtering
- 5.10 Geometric Mean Filter
- 5.11 Geometric Transformations
- 6 Color Image Processing
- 6.1 Color Fundamentals
- 6.2 Color Models
- 6.3 Pseudocolor Image Processing
- 6.4 Basics of Full-Color Image Processing
- 6.5 Color Transformations
- 6.6 Smoothing and Sharpening
- 6.7 Color Segmentation
- 6.8 Noise in Color Images
- 6.9 Color Image Compression
- 7 Wavelets and Multiresolution Processing
- 7.1 Background
- 7.2 Multiresolution Expansions
- 7.3 Wavelet Transforms in One Dimension
- 7.4 The Fast Wavelet Transform
- 7.5 Wavelet Transforms in Two Dimensions
- 7.6 Wavelet Packets
- 8 Image Compression
- 8.1 Fundamentals
- 8.2 Image Compression Models
- 8.3 Elements of Information Theory
- 8.4 Error-Free Compression
- 8.5 Lossy Compression
- 8.6 Image Compression Standards
- 9 Morphological Image Processing
- 9.1 Preliminaries
- 9.2 Dilation and Erosion
- 9.3 Opening and Closing
- 9.4 The Hit-or-Miss Transformation
- 9.5 Some Basic Morphological Algorithms
- 9.6 Extensions to Gray-Scale Images
- 10 Image Segmentation
- 10.1 Detection of Discontinuities
- 10.2 Edge Linking and Boundary Detection
- 10.3 Thresholding
- 10.4 Region-Based Segmentation
- 10.5 Segmentation by Morphological Watersheds
- 10.6 The Use of Motion in Segmentation

	11 Representation and Description 11.1 Representation 11.2 Boundary Descriptors 11.3 Regional Descriptors 11.4 Use of Principal Components for Description 11.5 Relational Descriptors 12 Object Recognition 12.1 Patterns and Pattern Classes 12.2 Recognition Based on Decision-Theoretic Methods 12.3 Structural Methods
课程目标	使学生掌握遥感数字图像处理的基本概念、基本原理和经典的方法，能够编程对遥感影像进行相关处理。
教学要求	常规要求
先修课程	高数、线性代数、数理统计
参考书目	1. Digital Analysis of Remotely Sensed Imagery, McGraw-Hill , Jay Gao, 2009.8 2. 数字图像处理 matlab 版，电子工业出版社，Rafael C. Gonzalez 等，2005.9 3. 现代数字图像处理，电子工业出版社，Henri Maitre 等，2006.7 4. 遥感图像处理与应用，科学出版社，朱述龙等编著，2006.2
备 注	