

Contents

	<i>Preface to the first edition</i>	<i>page x</i>
	<i>Preface to the second edition</i>	<i>xiii</i>
1	Introduction	1
	1.1 Nomenclature	2
	1.2 Why use CCDs?	4
	1.3 Exercises	6
2	CCD manufacturing and operation	8
	2.1 CCD operation	9
	2.2 CCD types	14
	2.3 CCD coatings	28
	2.4 Analog-to-digital converters	30
	2.5 Exercises	33
3	Characterization of charge-coupled devices	36
	3.1 Quantum efficiency	36
	3.2 Charge diffusion	42
	3.3 Charge transfer efficiency	44
	3.4 Readout noise	45
	3.5 Dark current	47
	3.6 CCD pixel size, pixel binning, full well capacity, and windowing	50
	3.7 Overscan and bias	52
	3.8 CCD gain and dynamic range	55
	3.9 Summary	62
	3.10 Exercises	64

viii	<i>Contents</i>	
4	CCD imaging	66
4.1	Image or plate scale	66
4.2	Flat fielding	67
4.3	Calculation of read noise and gain	71
4.4	Signal-to-noise ratio	73
4.5	Basic CCD data reduction	77
4.6	CCD imaging	82
4.7	Exercises	100
5	Photometry and astrometry	102
5.1	Stellar photometry from digital images	104
5.2	Two-dimensional profile fitting	111
5.3	Difference image photometry	114
5.4	Aperture photometry	116
5.5	Absolute versus differential photometry	121
5.6	High speed photometry	123
5.7	PSF shaped photometry	125
5.8	Astrometry	128
5.9	Pixel sampling	130
5.10	Exercises	133
6	Spectroscopy with CCDs	135
6.1	Review of spectrographs	137
6.2	CCD spectrographs	142
6.3	CCD spectroscopy	146
6.4	Signal-to-noise calculations for spectroscopy	150
6.5	Data reduction for CCD spectroscopy	151
6.6	Extended object spectroscopy	157
6.7	Slitless spectroscopy	159
6.8	Exercises	165
7	CCDs used in space and at short wavelengths	167
7.1	CCDs in space	169
7.2	Radiation damage in CCDs	175
7.3	CCDs in the UV and EUV (300–3000 Å) spectral range	179
7.4	CCDs in the X-ray (<500 Å) spectral range	181
7.5	Exercises	184
	<i>Appendices</i>	
A	CCD reading list	186
A.1	General CCD references	187

Cambridge University Press
0521617626 - Handbook of CCD Astronomy, Second Edition
Steve B. Howell
Table of Contents
[More information](#)

	<i>Contents</i>	ix
B	CCD manufacturers: websites & information	190
C	Some basics of image displays and color images	191
	C.1 False color and pseudo-color images	194
	C.2 Exercises	197
	<i>References</i>	198
	<i>Index</i>	206