Digital Imaging and Image Processing
PH410/510 — Summer 2002 — Richard Berry

Syllabus

Instructor: Richard Berry
Office: 422 Science II
Hours: TTh 17:00-18:00
or by appointment
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COURSE DESCRIPTION

This course covers practical and theoretical aspects of digital imaging and image manipulation using astronomical imaging as its model. You will discover the basic principles behind making good images, extracting data, and enhancing what can be seen in images. For computer programmers, important processes will be discussed with examples in pseudocode. Because the course focuses on the nature of images, tools for measuring them, and methods of image enhancement found in all technical imaging, this course has relevance in many engineering and scientific fields.

PLACE AND TIME

Science I, Room 201
Evening lab sessions: On the roof of Science I (or Room 201).

June 25, 2 to 5 p.m.
June 27, 2 to 5 p.m. and 8 to 11 p.m.
July 2, 2 to 5 p.m.
July 4, 2 to 5 p.m. and 8 to 11 p.m.
July 9, 2 to 5 p.m.
July 11, 2 to 5 p.m. and 8 to 11 p.m.
July 16, 2 to 5 p.m.
July 18, 2 to 5 p.m. and 8 to 11 p.m.

TEXTBOOK

The Handbook of Astronomical Image Processing, by Richard Berry & James Burnell. The bookstore has ordered copies, but if they are not available, you can order a copy directly from the publisher, Willmann-Bell, Inc., Richmond, VA. by Internet at www.willbell.com or by telephone at (804) 320-7016. $79.95.

Please install the ***AIP for Windows*** software (included with the book) and then download and install the most recent release from **www.willbell.com/aip4win/AIP.htm**.

COURSE GOALS

The primary goal of this course is for you to discover what is important in making, looking at, and analyzing digital images.

You are expected to participate actively in class discussions, demonstrate a willingness to learn, apply theoretical concepts to real-world situations, and do your best to improve your problem-solving skills, especially when confronted with unexpected difficulties and setbacks that will undoubtedly occur during our laboratory sessions.

COURSE OUTLINE

The following is a rough guide to the content of the classes. Please read the suggested chapters from ***The Handbook of Astronomical Image Processing*** before coming to class, so that you know what you don't understand and can ask intelligent questions.

June 25. All About Images. Read Chapters 1 and 2.
June 27: Making Images. Read Chapters 3 and 4.
July 2: Basic Image Analysis. Read Chapter 5.
July 4: Science from Images. Read Chapters 7, 8, and 9.
July 9: Basic Image Manipulation. Read Chapters 10, 11, and 14.
July 11: Making Detail Visible. Read Chapters 12, 15, and 16.
July 16: Color Images. Read Chapter 17.
July 18: Imaging Review.

ASSIGNMENTS

You will be responsible for completing four assignments and one self-assigned "project" during the course. Each of these counts 20% toward your grade. The project and assignments are due on the last day of class, but it would make sense to turn them in as soon as you complete them because if you have not done a good job, I will pass it back to you to rework. If you run into trouble with your project or one of the assignments, feel free to see me during office hours or by appointment.

You are responsible for selecting and proposing your project during the first week of classes. Pick a subject or topic involving digital imaging that you find interesting and/or challenging, and submit a brief (3 to 5 paragraph) project proposal to me. I will approve it, and you should begin work on it immediately.

The assignments will be placed on CD-ROMs available in the Physics Department office; you may borrow them during normal office hours. Copy the materials from the CD-ROM to your computer, and return the CD-ROM promptly so that others can borrow it, too. The first two assignments will be available June 25, and the second two will become available July 2.

In preparing the project and assignments, think of me as your immediate boss in a small, high-tech firm. We have a job to do, we work with technical issues, and I want you to succeed. Your written assignment reports must be well-organized and clear, since in this scenario, I will probably show your reports to the President of the firm and I do not wish to be embarrassed by misspelled words, poor grammar, or (worst of all) sloppy thinking.

COURSE POLICIES

As a general rule, the course will be run in accord with normal policies in effect in classes at PSU.