1051-361 Digital Image Processing I

Course Catalog Description:
This course is an introduction to the basic concepts of digital image processing. The student will be exposed to image capture and image formation methodologies, sampling and quantization concepts, statistical descriptors and enhancement techniques based upon the image histogram. This course is an introduction to the basic concepts of digital image processing. The student will be exposed to image capture and image formation methodologies, sampling and quantization concepts, statistical descriptors and enhancement techniques based upon the image histogram, point processing, neighborhood processing, and global processing techniques based upon kernel operations and discrete convolution as well as the frequency domain equivalents, geometrical operations for scale and rotation, and grey-level resampling techniques. Emphasis is placed on applications and efficient algorithmic implementation using the IDL programming language.

Prerequisites:
1016-283 Project-based Calculus III, 1016-305 Multivariable Calculus, 1051-211 Programming for Imaging Science (or equivalent). 1051-320 Linear Mathematics for Imaging will be helpful.

Course Materials:
Website: http://www.cis.rit.edu/class/simg361/ (open website, no password necessary; includes links to the recorded lectures and notes from each class, NOT part of the RIT “MyCourses” system)

Instructor:
Roger L. Easton, Jr., easton@cis.rit.edu, Office 76-2112, Phone 1-585-475-5969, FAX 1-585-475-5988
Office Hours TBD, and by appointment

Meeting Rooms/Times:
Quarter 20101: TTh, 2:00PM - 3:50PM, Room 76-1230
I expect to attend an imaging conference in Helsinki, Finland from 25-29 October. We will deal with the missed classes on TTh 10/26, 10/28 either by scheduling makeup classes (most likely) or having a substitute lecturer.

Details:
Homework will be assigned, and is to be handed in on time (adjustments will be considered in advance except in case of unforeseeable emergency). Scores for assignments handed in late will be penalized and homework will not be accepted after solutions have been posted.

Homework (both paper and computer assignments, usually due in 1 week at start of class.) – 50%
Midterm Exam (closed book, closed notes, 2 hours, anticipated date: Th, 14 October) – 20 %
Final Exam (cumulative, closed book, closed notes, 2 hours, Th 18 November, room TBA) – 30%

For the next three years, RIT remains on the quarter schedule. Note that time FLIES by (particularly for offsite students!). If you are having problems learning the material, DON'T WAIT; ASK for help EARLY – in and/or out of class. Though I keep my office door closed, feel free to knock; if I am not doing something urgent, I will set aside time to help – working with students individually or in small groups is the most enjoyable part of my job.

A word of warning: one pet peeve is the student who asks no questions, in class or otherwise, until just before some deadline (homework due or exam), at which time all questions suddenly are urgent. My advice is to your homework and exam studying early so that you can ask questions in time to have a positive impact on your understanding.

Grading:
I reserve the right for some flexibility, but the approximate mapping of numerical to letter grades is:

<table>
<thead>
<tr>
<th>Numerical Score</th>
<th>Letter Grade</th>
</tr>
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<tbody>
<tr>
<td>88 - 100</td>
<td>A</td>
</tr>
<tr>
<td>76.0 - 87.9</td>
<td>B</td>
</tr>
<tr>
<td>68.0 - 75.9</td>
<td>C</td>
</tr>
<tr>
<td>60.0 - 67.9</td>
<td>D</td>
</tr>
<tr>
<td>&lt; 60</td>
<td>F</td>
</tr>
</tbody>
</table>
Note that the histogram bins are a bit wider for higher scores. Since I do not use MyCourses, you will have to keep track of your own grade average (if desired).

**Text Materials:**

Note that MANY texts are available for this subject. I expect to make use of the assigned text AND the following:
Castleman, K., Digital Image Processing
Niblack, W., An Introduction to Digital Image Processing
Pratt, W.K., Digital Image Processing
Marion, A., An Introduction to Image Processing
Rosenfeld, A., and Kak, Digital Picture Processing
Hall, E., Computer Image Processing and Recognition

**Signals Software:**
For some specific applications in image processing, my program “**SIGNAL**” may be useful. It was written with the intent to demonstrate many of the principles considered in this class and is keystroke driven from menus to be (relatively) easy to use. The program runs quite well on many platforms including Macintosh OS and Linux in **DOSBox**, which is a DOS emulator that is available for many platforms for free from [http://www.dosbox.com/](http://www.dosbox.com/). The program is available for free from [ftp://ftp.cis.rit.edu/software/sgnls554.zip](ftp://ftp.cis.rit.edu/software/sgnls554.zip) and an old “user manual” is available at: [http://www.cis.rit.edu/resources/software/sig_manual/index.html](http://www.cis.rit.edu/resources/software/sig_manual/index.html)

**SignalShow:**
The new Java counterpart of **Signals**, called **SignalShow**, which was written by Juliet Bernstein, illustrates both 1-D and 2-D examples of Fourier mathematics and imaging. The beta releases for the three primary computing platforms (Windows, Macintosh OSX, and Linux) are available online at [http://www.signalshow.com/](http://www.signalshow.com/). This site includes links to help videos that are posted on YouTube.

7 September 2010