INTRODUCTION TO DIGITAL IMAGE PROCESSING
Fall Term 2000
Number: CS 6964/5964
Section: 1
Time: 3:40–5:00 P.M Mon. & Wed. Place: EMCB 120

• Instructor: Dr. R. T. Whitaker
• Office: MEB 4540
• Office Hours: TBA
• e-mail: whitaker@cs.utah.edu
• Telephone Numbers:
  - (OFFICE/VOICE MAIL): 587-9549
  - (HOME): 832-9509

Prerequisites:

• Programming, data structures, linear algebra, calculus.

Books:


Course Objectives:

This is an introductory course in processing grey-scale and color images — taught at the senior/grad level. This course will cover both mathematical fundamentals and implementation. It will introduce students to the basic principles of processing digital signals and how those principles apply to images. These fundamentals will include sampling theory, transforms, and filtering. The course will also cover a series of basic image-processing problems including enhancement, reconstruction, segmentation, feature detection, and compression. Assignments will include several projects with software implementations and analysis of real data.

Grading Policy:

• Projects (2 or 3) — 40%
• Homework — 15%
• Midterm — 15%
• Final exam (comprehensive) — 30%
Course Outline:

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Lectures &amp; Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>08/23</td>
<td>Motivation: Images and Applications</td>
</tr>
<tr>
<td>02</td>
<td>08/28–30</td>
<td>Point Operations, Geometric Operations</td>
</tr>
<tr>
<td>03</td>
<td>09/04&amp;06</td>
<td>Geometric Operations (Class cancelled 9/6)</td>
</tr>
<tr>
<td>04</td>
<td>09/11&amp;13</td>
<td>Linear Systems</td>
</tr>
<tr>
<td>05</td>
<td>09/18&amp;20</td>
<td>Fourier Transforms</td>
</tr>
<tr>
<td>06</td>
<td>09/25&amp;27</td>
<td>Filtering</td>
</tr>
<tr>
<td>07</td>
<td>10/02&amp;04</td>
<td>Filtering</td>
</tr>
<tr>
<td>08</td>
<td>10/09&amp;11</td>
<td>Discrete Signals</td>
</tr>
<tr>
<td>09</td>
<td>10/16&amp;18</td>
<td>Discrete Signals</td>
</tr>
<tr>
<td>10</td>
<td>10/23&amp;25</td>
<td>Color/Neighborhood Operations</td>
</tr>
<tr>
<td>11</td>
<td>10/30&amp;11</td>
<td>Geometry and Scale Space</td>
</tr>
<tr>
<td>12</td>
<td>11/6&amp;8</td>
<td>Restoration</td>
</tr>
<tr>
<td>13</td>
<td>11/13&amp;15</td>
<td>Compression</td>
</tr>
<tr>
<td>14</td>
<td>11/20&amp;22</td>
<td>Feature Extraction</td>
</tr>
<tr>
<td>15</td>
<td>11/27&amp;29</td>
<td>Segmentation</td>
</tr>
<tr>
<td>16</td>
<td>12/4&amp;6</td>
<td>Wrapping Up</td>
</tr>
<tr>
<td>**</td>
<td>12/15</td>
<td><strong>FINAL EXAM</strong></td>
</tr>
</tbody>
</table>
Homework
- Not extensive.
- Work together but no copying.
- Check that it’s done (√, √+ system) adequately.
- Not late homework accepted.

Projects
- Work together but no copying (write your own code!).
  - Code
    - C++
    - C
    - Java
    - No specific image processing packages or modules (without permission)!
  - Report
    1. Describe task
    2. Describe strategy/algorithm
    3. Describe results (analyze — shortcomings, special tricks, etc.)
    4. Hardcopy code
  - Software
    1. Email code (whitaker@cs.utah.edu)
    2. Directions on how to compile and run it
    3. Cut and paste to UNIX
Typed or printed neatly on $8\frac{1}{2} \times 11$ paper, your project must include the following:

1. Cover page, which includes
   - Project title
   - Project number
   - Course number
   - Student name
   - Date submitted/Date due
   - Abstract (one paragraph)

2. A design diagram with labels to specific software components.

3. One or two pages of technical discussion.

4. Discussion of results (one or two pages). ¹

5. Appendix containing a listing of the program ($8\frac{1}{2} \times 11$ paper).

**Grading:** Grades will be based on the completeness and accurate performance of the assignment as well as software design and readability.

¹Images can be saved in PostScript format using the *xv* software package. They can then be sent to a printer using the UNIX *lpr* command.