16-720

http://www.blackboard.andrew.cmu.edu
http://www.cmu.edu/blackboard
• Instructor: Martial Hebert, hebert@ri.cmu.edu, x82585, Office hours: Mondays, 10am - noon

• TAs:

  Tomas Simon        tsimon@andrew.cmu.edu
  Office:  EDSH117
  Office Hours: Thursday 2pm-3pm

  Varun Ramakrishna   varunnr@cmu.edu
  Office : EDSH117
  Office Hours: Tuesday 10am-11am
Reference Material

• “Text”:
  – Computer Vision – A Modern Approach
    • Forsyth & Ponce
    • www.cs.berkeley.edu/~daf
  – Computer Vision: Algorithms and Applications
    • Richard Szeliski
    • http://szeliski.org/Book/
Reference Material

• Others:
  – Introductory Techniques for 3-D Computer Vision, E. Trucco & A. Verri
  – Vision Science, R. Palmer
  – Multiple View Geometry, Hartley & Zisserman
  – The Geometry of Multiple Images, Faugeras

• Compendium of vision:
  – www.dai.ed.ac.uk/CVonline/

• IEEE Publications (on CMU machines):
  – www.ieeexplore.org
• **Homeworks**
  – 2-week period
  – MATLAB implementation + problems

• **Final Project**
  – Literature search + Implementation

• **Review Sessions**
  – Thursdays 6:00pm - 8:00pm NSH 1305 (announced via e-mail and blackboard)

• **MATLAB**
  – Mandatory
  – Intro lecture coming up → Thursday Sept. 1
  – Intro document online (MATLAB primer)
  – Homework 0

• **Math**
  – Basic math tools (See “Math Primer” online)
    • Linear Algebra
    • Basic optimization/calculus
  – Probability (see link to Andrew Moore’s tutorials)
    • Basic probability (first part only)
    • Densities/estimation
    • Gaussian distributions

• **Handouts**
  – Posted before class
Communication

• All notes, homeworks, discussion, through “blackboard”

Homework due on time:
  – You will be allowed 3 total late days without penalty for the entire semester. For instance, you may be late by 1 day on three different homeworks or late by 3 days on one homework. Each late day corresponds to 24 hours or part thereof. Once those days are used, you will be penalized according to the policy below:
    • Homework is worth full credit at the beginning of class on the due date.
    • It is worth half credit for the next 48 hours.
    • It is worth zero credit after that.

Example of a bad excuse:
  • I am busy with the Machine Learning class
<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>29-Aug</td>
<td>Mon</td>
<td>Intro + Image formation: Geometry</td>
</tr>
<tr>
<td>31-Aug</td>
<td>Wed</td>
<td>Camera geometry</td>
</tr>
<tr>
<td>1-Sep</td>
<td>Thu</td>
<td>(optional) Matlab review session 6pm - 8pm NSH 1305</td>
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<tr>
<td>5-Sep</td>
<td>Mon</td>
<td>LABOR DAY</td>
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<tr>
<td>7-Sep</td>
<td>Wed</td>
<td>Calibration</td>
</tr>
<tr>
<td>12-Sep</td>
<td>Mon</td>
<td>Filtering / Image features</td>
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<tr>
<td>14-Sep</td>
<td>Wed</td>
<td>Filtering / Image features</td>
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<tr>
<td>19-Sep</td>
<td>Mon</td>
<td>Filtering / Image features</td>
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<tr>
<td>21-Sep</td>
<td>Wed</td>
<td>Filtering / Image features</td>
</tr>
<tr>
<td>26-Sep</td>
<td>Mon</td>
<td>Image formation, shading, color [HWV-1 DUE] [HWV-2 OUT]</td>
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<tr>
<td>28-Sep</td>
<td>Wed</td>
<td>Image formation, shading, color</td>
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<tr>
<td>3-Oct</td>
<td>Mon</td>
<td>Optical Flow, Tracking and Motion Segmentation</td>
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<tr>
<td>5-Oct</td>
<td>Wed</td>
<td>Optical Flow, Tracking and Motion Segmentation</td>
</tr>
<tr>
<td>10-Oct</td>
<td>Mon</td>
<td>Optical Flow, Tracking and Motion Segmentation [HWV-2 DUE] [HWV-3 OUT]</td>
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<tr>
<td>12-Oct</td>
<td>Wed</td>
<td>Multi-View Geometry</td>
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<tr>
<td>17-Oct</td>
<td>Mon</td>
<td>Multi-View Geometry</td>
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<tr>
<td>19-Oct</td>
<td>Wed</td>
<td>Stereo</td>
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<tr>
<td>24-Oct</td>
<td>Mon</td>
<td>Structure from Motion, Multi-View stereo [HWV-3 DUE] [HWV-4 OUT]</td>
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<tr>
<td>26-Oct</td>
<td>Wed</td>
<td>Structure from Motion, Multi-View stereo</td>
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<tr>
<td>31-Oct</td>
<td>Mon</td>
<td>Structure from Motion, Multi-View stereo</td>
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<tr>
<td>2-Nov</td>
<td>Wed</td>
<td>Segmentation / Fitting</td>
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<tr>
<td>7-Nov</td>
<td>Mon</td>
<td>(ICCV) [HWV-4 DUE] [HWV-5 OUT]</td>
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<tr>
<td>9-Nov</td>
<td>Wed</td>
<td>(ICCV)</td>
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<td>14-Nov</td>
<td>Mon</td>
<td>Segmentation/Fitting</td>
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<tr>
<td>16-Nov</td>
<td>Wed</td>
<td>Segmentation/Fitting</td>
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<tr>
<td>21-Nov</td>
<td>Mon</td>
<td>Recognition [HWV-5 DUE]</td>
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<tr>
<td>23-Nov</td>
<td>Wed</td>
<td>THANKSGIVING</td>
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<tr>
<td>28-Nov</td>
<td>Mon</td>
<td>Recognition [HWV-6 OUT]</td>
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<tr>
<td>30-Nov</td>
<td>Wed</td>
<td>Recognition</td>
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<tr>
<td>5-Dec</td>
<td>Mon</td>
<td>Recognition</td>
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<tr>
<td>7-Dec</td>
<td>Wed</td>
<td>TBA [HWV-6 DUE]</td>
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Filtering
Edge Detection
Edge Detection
Interest points and descriptors (SIFT,..)
Radiometry/Shading
Color
Color
Tracking/Motion
Multi-Camera Geometry: Stereo
Multi-Camera Geometry: Stereo

Tree at 5.6m

Tree at 14.5m

Shrub at 2.8m
Multi-Camera Geometry
AutoStitch iPhone

Automatic Image Stitching for the iPhone

AutoStitch iPhone is a fully automatic image stitcher for the iPhone. This application unleashes the power of your iPhone’s camera to create wide-angle views and panoramas with any arrangement of photos.

AutoStitch uses the most advanced stitching technology available today, but it’s very simple to use. To see how it works on the iPhone, see our usage instructions.

AutoStitch iPhone brings together years of research and development experience into an amazing application that is available now on your iPhone at a very low price.
Segmentation
Segmentation
Recognition
• This is becoming real:
  – **Lincoln** Microsoft Research
  – **Point & Find, Nokia**
• Canon, Sony, Fuji, …
• Interested about applications? See:
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