Midterm Review

- Thursday, November 3
- 7:15 – 9:15 p.m. in room 1361 Chemistry Bldg
- Closed book
- One 8.5” x 11” sheet of notes on both sides allowed (typed or handwritten)
- Bring a calculator (no phones)
- Emphasizes main ideas as covered in lecture slides
- Readings give more details and therefore are supplementary material

Major Topics

- Digital Cameras and Photography
  - aperture, shutter speed, focal length, f-number, reciprocity, EV, ISO, depth of field, exposure, shutter priority, aperture priority, pinhole camera image formation, field of view, thin lens formula, center of projection, optical center, focal point of lens, defocus blur, circle of confusion, photographer’s tradeoffs, demosaicing, histogram equalization

Major Topics

- Image Filters and Feature Detection
  - image correlation (cross-correlation), linear filtering, point operations, local operations, box filter, sharpening filter, unsharp masking, convolution, properties of linear filters, Gaussian filter, shift invariance, isotropic, cascading Gaussian filters, separability, median filter, bilateral filter, edge detection, gradient, Laplacian, filters for computing gradient and Laplacian, Laplacian-of-Gaussian, Difference of Gaussians, Gaussian pyramid, Laplacian pyramid, Harris corner detector, SIFT feature point detector, non-maximum suppression, SIFT feature point descriptor, invariance properties of detectors
### Major Topics

**Texture Synthesis and Inpainting**
- Markov Random Field (MRF) model of texture, stationarity, Efros and Leung algorithm, sum of squared difference (SSD) measure of matching two windows, dependency on order of filling, Gaussian pyramids: definition and how to construct, Image Quilting algorithm, finding minimal error boundary using dynamic programming, texture transfer

**Image Inpainting and Resizing**
- Seam carving algorithm, dynamic programming, Criminisi image completion algorithm, Hays and Efros image completion algorithm

**Making Panoramas**
- When can two images be aligned and why, homogeneous coordinates, converting between homogeneous and Cartesian coordinates, using homogeneous coordinates to do 2D transformations, homography, projective transformation, affine transformation, similarity transformation, panorama algorithm, feature-based alignment, solving for homography matrix, warping methods, bilinear pixel interpolation, blending methods (averaging, weighted averaging, gradient-domain), RANSAC algorithm