Advanced Digital Image Processing and Computer Vision

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Objectives of this course

- Advanced level selected topics on Computer Vision and Image Processing.
- Assumption: Foundation on 1st Level DIP course, Linear Algebra and Programming.
  - Self-reading
  - A first level assignment will be floated within a week and you have to submit by two weeks. This is a part of TA evaluation.
- Major themes: Multi-view camera geometry, Color Image Processing, Image segmentation through optimization of objective functions, Depth Image Processing.

Objectives of this course

- A few more (one or two topics) depending upon the time and interests out of the following sets:
  - Non-linear Image Processing,
  - Compressed Domain Analysis,
  - Compressive Sensing,
  - Content Based Image Retrieval,
  - Remote Sensing Image Processing,
  - Deep Learning Networks for Image Processing.

Syllabus

- Projective Geometry
  - Homography
  - Feature Descriptors and Detectors.
  - Feature Correspondences
- Camera Geometry
  - Single View, Stereo, Multi-view
- Color Image Processing
  - Color Fundamentals, Enhancement, Color Constancy
- Image Segmentation
  - Gaussian Mixture Models, Active Contours, Mean-shift algorithm, Graph cut optimization techniques, Post-segmentation optimal labeling.
- Depth Image Processing
  - Edges, Curvature, Surface Primitives, Registration
- Additional topics (to be decided)

Text and reference books

- Multiple View Geometry in Computer Vision: R. Hartley and A. Zisserman, Cambridge University Press.
- Computer Vision: Algorithms & Applications, R. Szeleski, Springer.
- Computer vision: A modern approach: Forsyth and Ponce, Pearson (Indian Reprint).

Assignments and evaluation

- Implementation using MATLAB / OpenCV, etc.
- Three to Four in numbers:
  - The first one on fundamentals.
  - Others on solving a few interesting problems.
- Moodle based submission.
- Penalty for copy cases: -10 for each irrespective of the role of students.
- Distribution: MS:30, ES: 50 and TA: 20
- Bonus marks: 5 for attending all classes (absence in any form with or without medical certificate, etc., not to be entertained for awarding this additional marks).
- Grading would be computed without considering the bonus marks first. Then the bonus marks, if added, may or may not improve a grade.

Thank You