Course Content


Objectives

To teach the fundamentals of 3D computer vision, which tries to make computers see and interpret the world around us by constructing 3D models from 2D (or 3D) images.

Recommended or Required Reading

Textbook

Optional Readings
Assessment Methods and Criteria

<table>
<thead>
<tr>
<th></th>
<th>Percentage (%)</th>
<th>Number of assessment methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm</td>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>Assignment</td>
<td>35</td>
<td>10</td>
</tr>
<tr>
<td>Group Project</td>
<td>35</td>
<td>1</td>
</tr>
</tbody>
</table>

Course Outline

- Introduction
- Pointwise Image Processing, Image Intensity Transformations, Histograms
- Geometric/Coordinate Transforms
- Image Neighborhood Operations, Spatial Filtering
- Edge Detection
- Feature Extraction
- Camera Models and Calibration
- Motion Estimation and Optic Flow
- Stereo Vision
- Structure from Motion
- Object Detection and Recognition

Learning Outcomes

Upon successful completion of EE 417 Computer Vision, students are expected to be able to:

- Discuss the main problems of computer vision, its uses and applications
- Design and implement various image transforms: point-wise transforms, neighborhood operation-based spatial filters, and geometric transforms over images
- Design and implement several feature extraction algorithms including edges and corners
- Design and implement line and circle detection using Hough transform
- Calibrate real cameras and determine both intrinsic and extrinsic parameters,
- Formulate and solve 2D optic flow problem
- Establish correct correspondence for stereo images using a correlation based matching technique
- Estimate the essential/fundamental matrix and determine extrinsic parameters (rotation and translation) of a stereo vision system
- Reconstruct 3D structure from 2D images using estimated extrinsic parameters
- Identify or recognize objects from images

Course Policies

- Cheating is absolutely subject to a disciplinary action and a null grade.
- Make-up only for official excuses.