CSCI 5563: 3D Computer Vision

Hyun Soo Park
Computer Vision: Understanding Image

- Who is she?
- How does she strike a pose?
- Is she smiling?
- Where was the camera?
- How far is she?
- Where was the light?
3D Computer Vision: Understanding Geometry of Image

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3D Computer Vision: Understanding Geometry of Image

Depth

Normal
3D Computer Vision Area

![Bar chart showing the distribution of submissions and ACs across different computer vision topics.](chart_image)
3D Computer Vision Area

- Deep Learning
- Recognition...
- Image and...
- Face, Gesture...
- Segmentation...
- 3D from...
- Representation...
- Vision +...
- Motion and...
- Action...
- Scene Analysis...
- Vision...
- Medical...
- Datasets and...
- Computational...
- Video Analytics
- Robotics +...
- Optimization...
- Computer...
- Statistical...
- Vision +...
- Biometrics
- Others
- Various...
- Document...
- Physics-based...
- RGBD sensors...

Submissions vs. ACs

Unconstrained head-pose tracking
3D Computer Vision Area

The Confetti Sequence
(20 selected views out of 480 views)
3D Computer Vision Area
Movie

Raw Bullet Time Footage
THE MAKING OF

CHEMICAL BROTHERS ‘WIDE OPEN’
VR/AR

Facebook Reality Lab
Multiview image streams
WHAT WILL BE COVERED?
Topic I: Camera Geometry

- Camera model
- Projection matrix
- Projective geometry
Topic II: Transformations

- Image transformation
- Homography
- Spatial rotation
Topic III: Learning based Geometry

- Deep learning
- Depth prediction
- Surface normal prediction
Topic IV: Epipolar Geometry

- Epipolar geometry
- Fundamental matrix
- Pose estimation
- Triangulation
- Bundle adjustment
Topic V: Depth Fusion

- Functional scene representation
- Iterative closest point algorithm
- Depth fusion
WHAT WILL NOT BE COVERED?
WHAT WILL NOT BE COVERED?

- Basic Machine Learning knowledge
- Python programming
- Linear algebra / Calculus
- Basic computer vision knowledge (take 5561)
EVALUATION

• 5 programming assignments (15% each)
  • Late submission: 20% off from each extra late day
• Project (up to two students) (25%)
  • Project proposal presentation 5%
  • Written project proposal 5% (3 pages)
  • Final project presentation 10%
  • Written final report 5% (6 pages)

No make-up assignment
COURSE WEBSITE

https://www-users.cs.umn.edu/~hspark/csci5563_S2021/csci5563.html

Spring 2021 CSCI 5563
3D Computer Vision

Information

Syllabus
Instructor: Hyun Soo Park (hspark at umn.edu)
Office hour: Wed 2:00pm-3:00pm (Zoom)

TA: Jingfan Guo (guo20109 at umn.edu), Tien Do (doi0x104 at umn.edu)
Office hour: Mon/Thu/Thr 2:00pm-8:00pm (Zoom)

Teaching mode: online

Textbooks: Not required but the following books will be frequently referred:
+ "Multiple View Geometry in Computer Vision", Hartley and Zisserman

Important Dates

HW #1 due: Feb 5 midnight

• Syllabus
• Schedule
• Lecture slide
• Homework