CS635: Final Project

Out: March 6, 2023
Due: April 22nd or 29th, 2023

Objective

The goal of the final project assignment is to allow you to use your imagination to design, implement and experience your own system. The previous assignments have helped you to incrementally build up systems. For your project, you may either build upon the previous assignments and extend the system in a particular direction or implement a new system. You may use below list as a starting point for your project proposal. Nevertheless, you may also present a completely new project proposal. All project proposals are pending my approval.

Suggestion A: Design a self-calibrating portable structured-light system

Consider a smartphone, a pico-projector, and a camera: can you quickly calibrate the camera to the projector. The challenges include

1. how to make automatic and very robust? What calibration pattern would you use? Can you exploit epipolar geometry?
2. can you make calibration “fast”, so that the camera and/or projector can move and re-calibration can occur

Your imagination can go wild to create this tool. GPU/DL is an option here as well.

Suggestion B: Depth from Defocus

It is possible to obtain “per-pixel depth” from a set of defocused camera images. This project is to implement a depth from defocus algorithm. Challenges include:

1. understanding depth from defocus and then implementing it efficiently
2. consider then applying the pose-free formulation to perform a 3D reconstruction and/or use of GPU/DL.
Suggestion C: Single Image Reconstruction

From a single image obtain an object. Best is to focus on some particular object-type and some particular methodology. Use of GPU/DL encouraged.

Suggestion D: Radon Transform

Experiment with the Radon Transform as one way to reconstruct 2D or 3D objects from 1D or 2D slices. Use of GPU/DL encouraged.

Suggestion E: Make your own project

This is of course a great option! See instructor for approval.

Workload:

1. Present during week of March 6-10 background information on your project topic (~20 minutes plus 5 for questions) (you are graded on this)
2. Present a public demo at the end of the semester (you are graded on this)

Let me know if you have questions!