

CS635 Final Project Ideas (Spring 2010)

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 capture 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. Each project will be performed by small teams of 1 to 2 people. 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.

Option A: Thin Articulated Object Reconstruction



Focus on obtaining a 3D reconstruction of a “stick” figure-like object. Thin (articulated) objects are difficult to capture (e.g., structured-light gives low-resolution, laser gives few points, etc.). One of several challenges can be addressed:

1. how do you precisely capture the geometry? Can you propose a new adaptive (structured-light? stereo?) method?
2. do you capture and fit the data to a model (i.e., assume sticks are cylinders and fit to them)?

One overall option would be base the formulation on our recently proposed camera-pose-free method [Aliaga et al., ACM TOG 2009] or self-calibrating photogeometric method [Aliaga et al., PAMI 2009].

Option B: 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 programming is an option here as well.

Option C: Depth from Defocus



It is possible to obtain “per-pixel depth” from a set of defocused camera images: with such and with [Aliaga et al. 2009, ACM TOG], you could perform 3D reconstructions. 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 aforementioned pose-free formulation to perform a 3D reconstruction.

Option D: Make your own project

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