REU - Week 3 & 4

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June 10th, 2010

Last Week

- Depth from defocus
- Lots of reading
  - “Depth from Diffusion” by Zhou, Cossairt, & Nayar
  - “Shape from Defocus via Diffusion” by Favaro, Soatto, Burger, & Osher
  - “3D Shape Estimation and Image Restoration” by Favaro & Soatto
  - More powerpoints and papers on DfDefocus and related programming
- Began test programming
- Began reading existing code

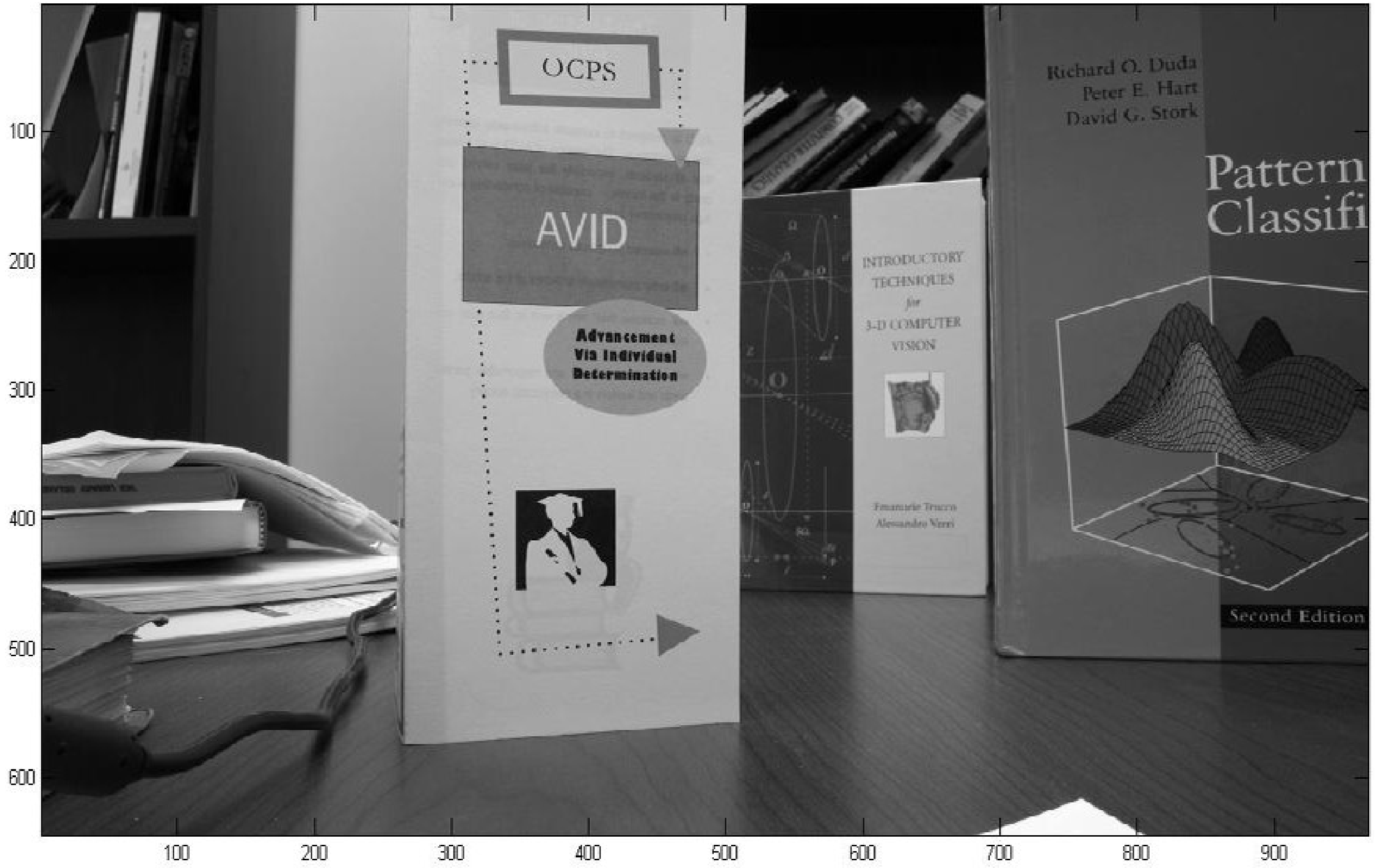
This Week

- More reading
  - Papers and code
- Finished test programming
  - Basic, intuitive implementation of depth from defocus
  - More on that next
- Brain storming
  - What are the limitations?
  - How to work around them?

My Test

- Two images
  - One with deep depth of field
  - One with shallow depth of field
- Use a set of convolutions to estimate depth locally
- Essentially, reduces the problem to a grid of approximate coplanar patches (parallel to sensor)
- Decent results, but slow (at least in MATLAB)
- No image segmentation used, so depth only measured at edges

Deep DOF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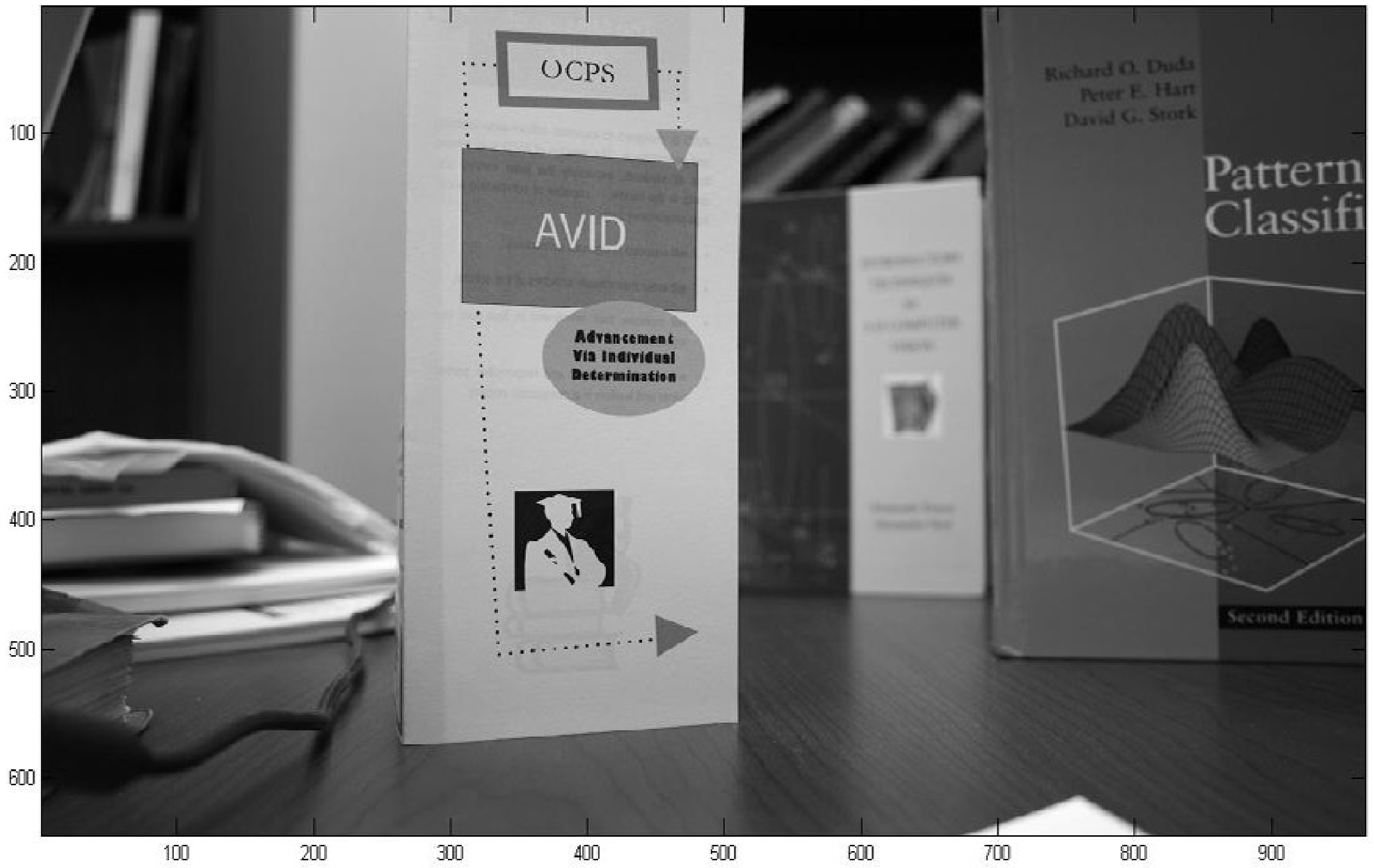
OCPS
AVID
Advancement
Via Individual
Determination
INTRODUCTORY
TECHNIQUES
for
3-D COMPUTER
VISION
Emanuele Trucco
Alessandro Verri
Richard O. Duda
Peter E. Hart
David G. Stork
Pattern
Classifi
Second Edition

Shallow DOF


OCPS
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Second Edition
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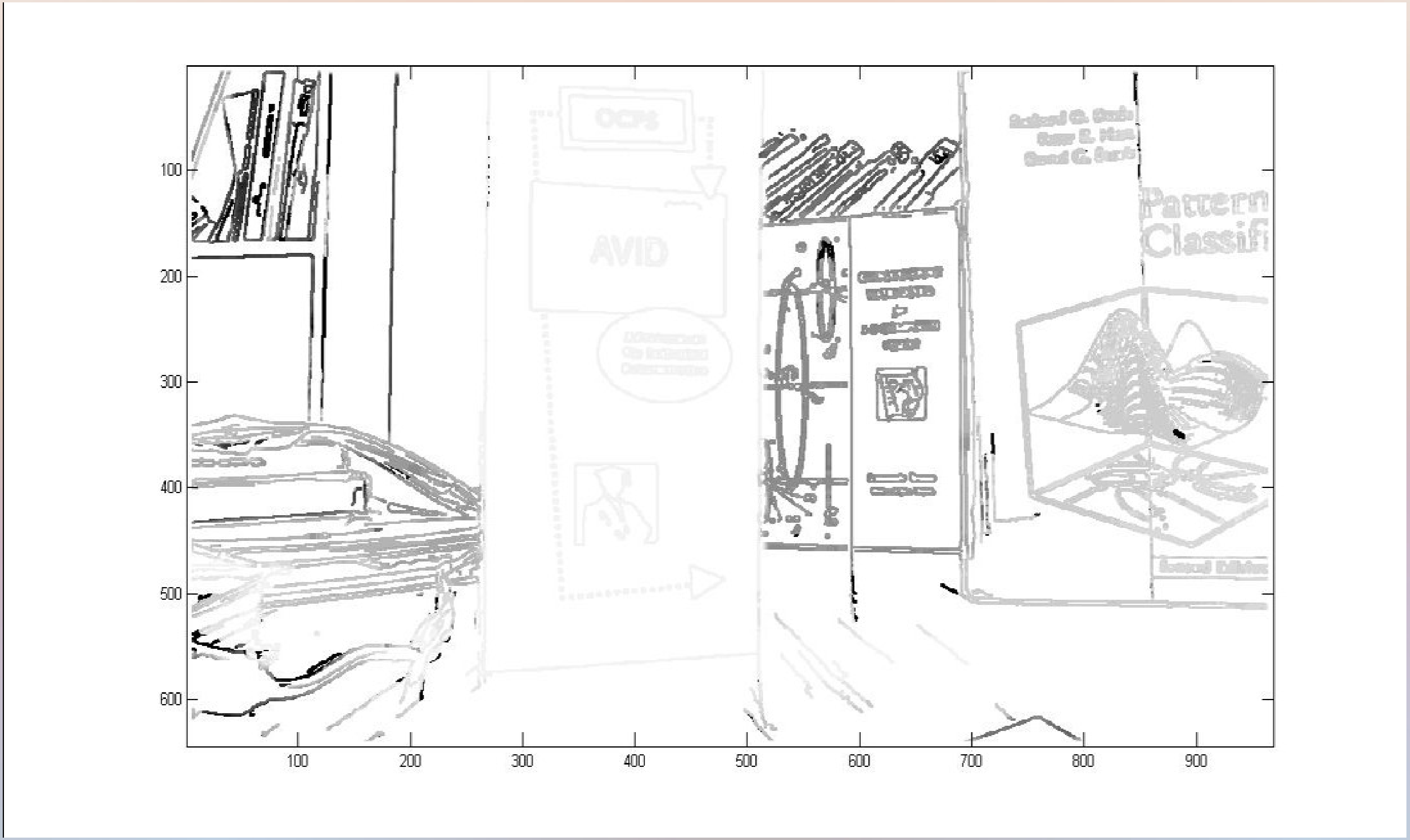
Depthmap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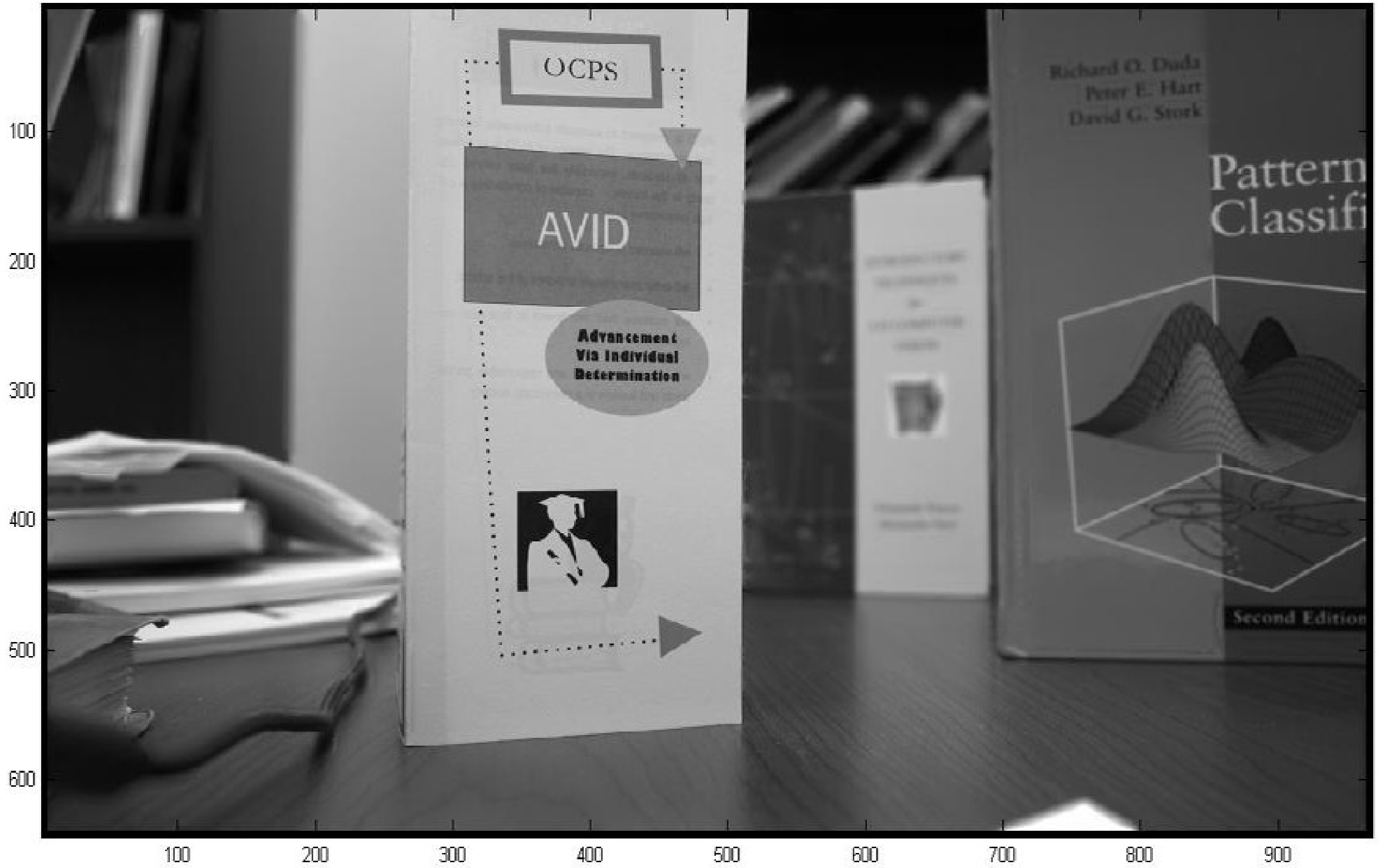
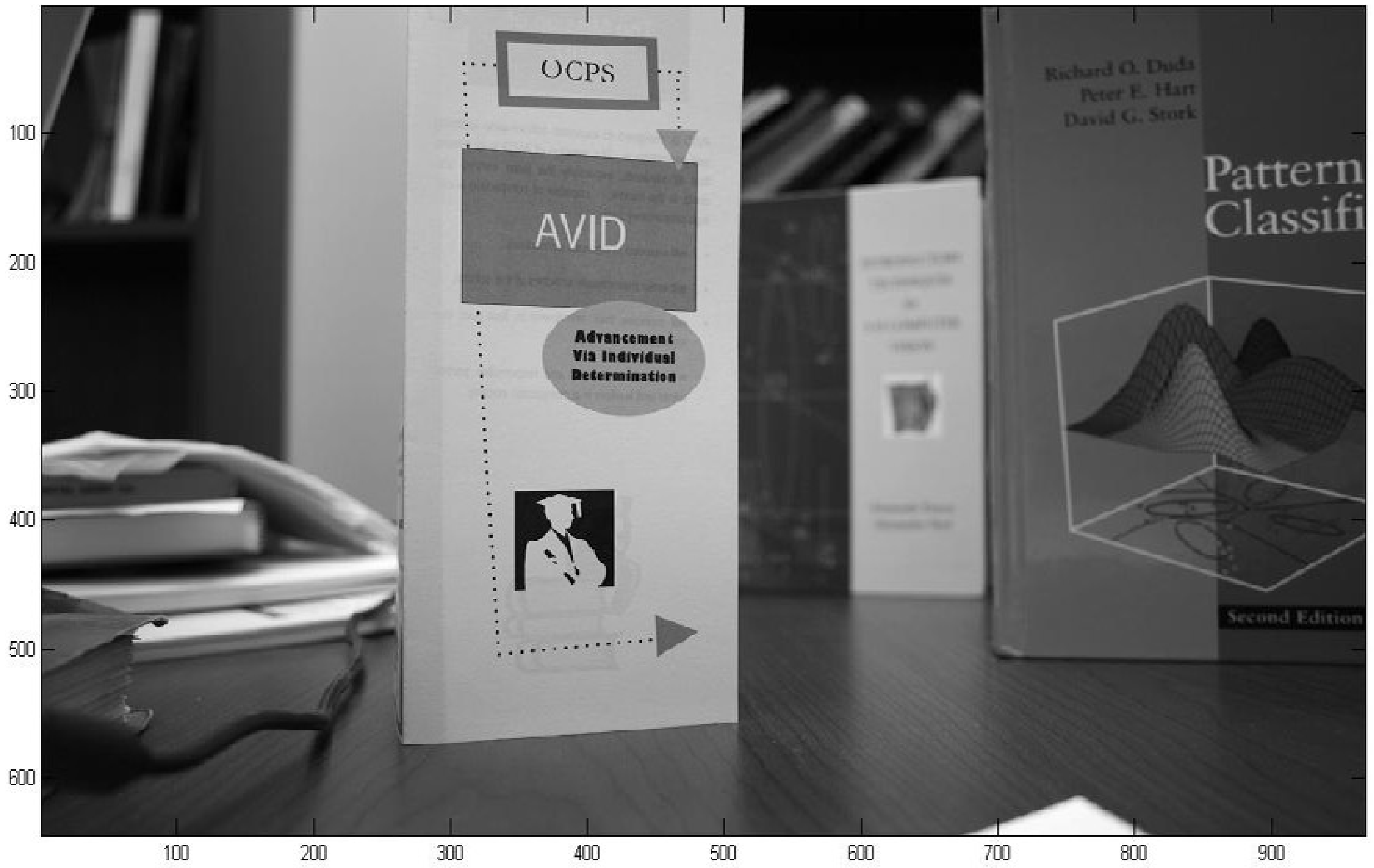
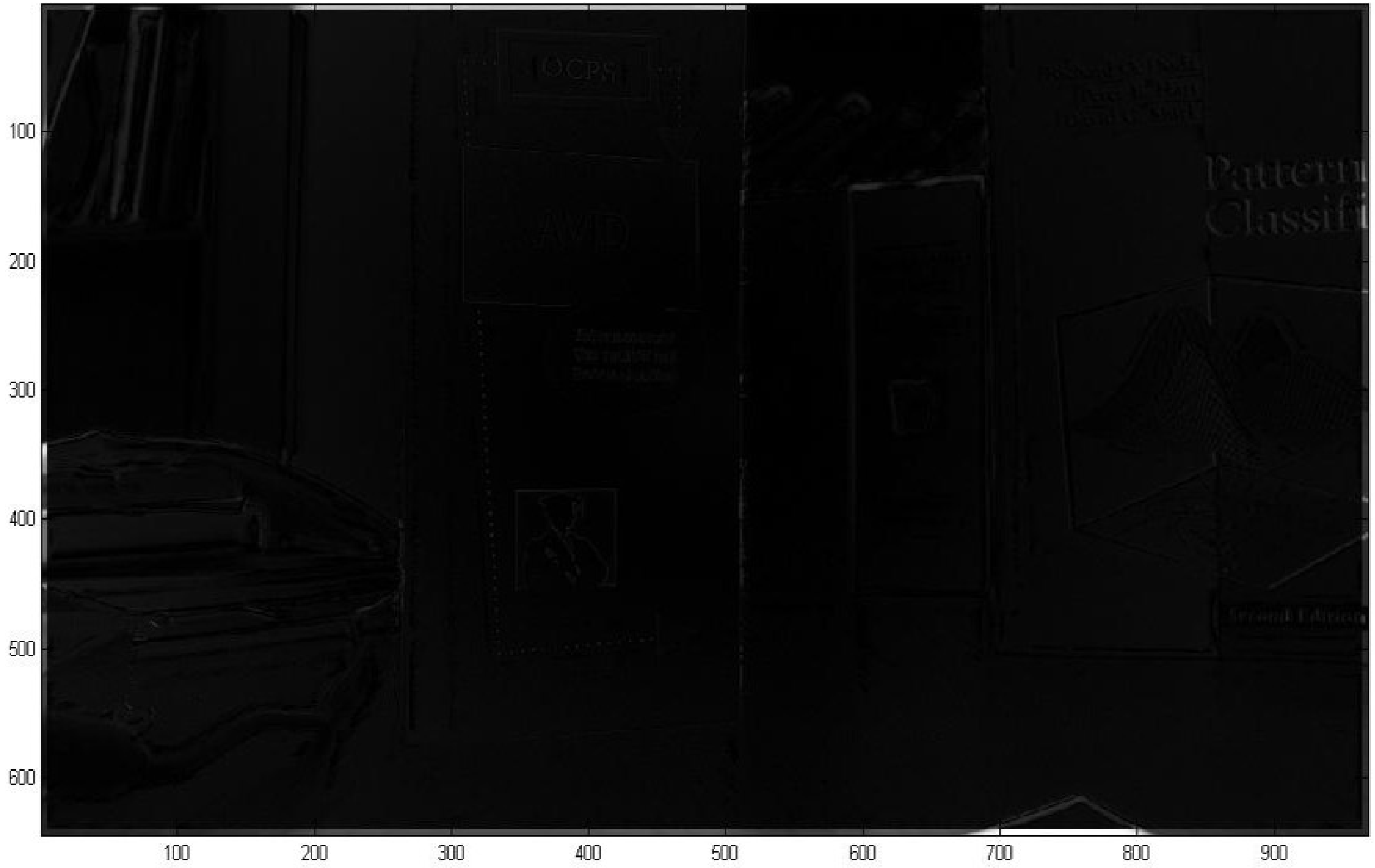
Reconstruction



Shallow DOF Original



Error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Pattern
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The Problem

- The way I got my results was by looking at a neighborhood around each pixel
- Inspecting such a small scale reduces oblique surfaces to a series of coplanar approximations
- Brute force approach
  - Throw everything at it and see what sticks

Our Goal

- We want to find a way to deal with oblique edges without reducing the problem
- Find a way to determine the appropriate filters needed dynamically
  - Ex: oblique surfaces would need asymmetrical filters because the amount of blur varies across them
- Global optimization with fewer assumptions