Faculty of Engineering

EE5731 Visual Computing

Assignment 2: Depth Estimation From Stereo and Video

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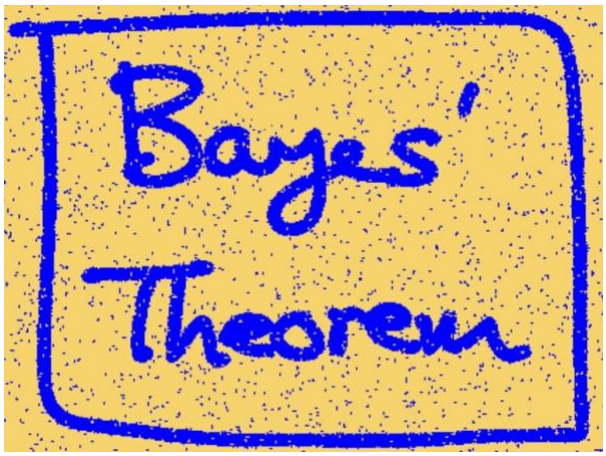
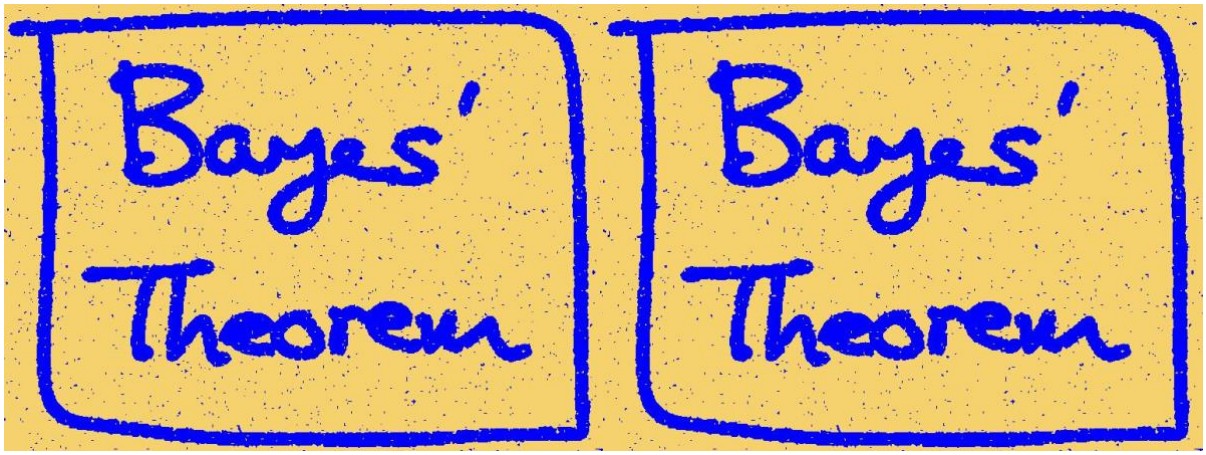
Part 1: Noise Removal

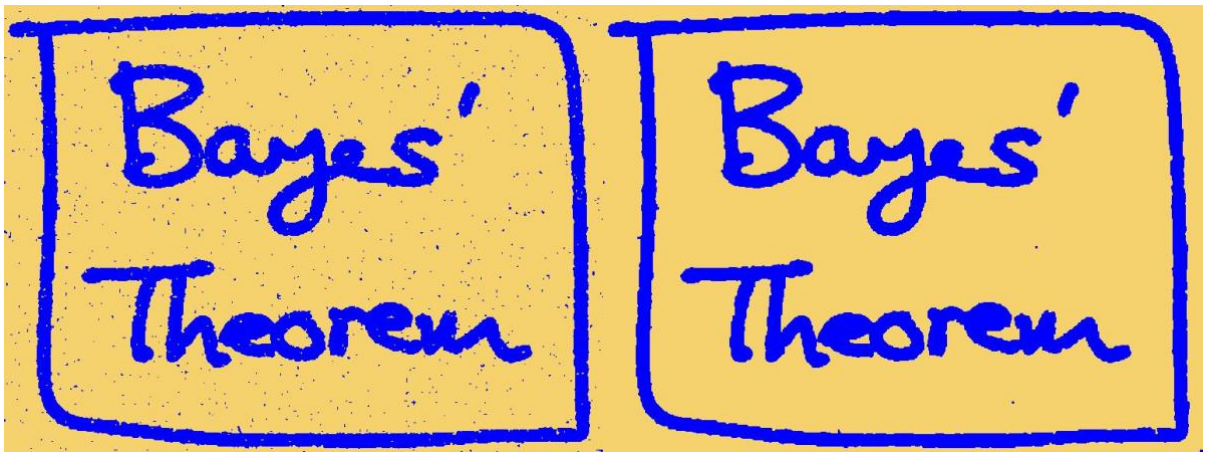
Original Image:



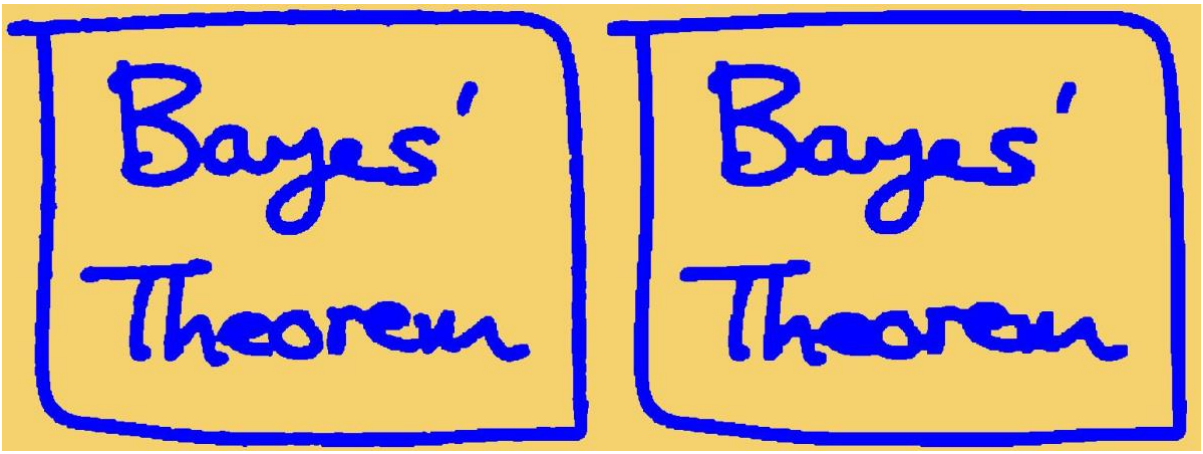
Noise removal images with different values of lambda:



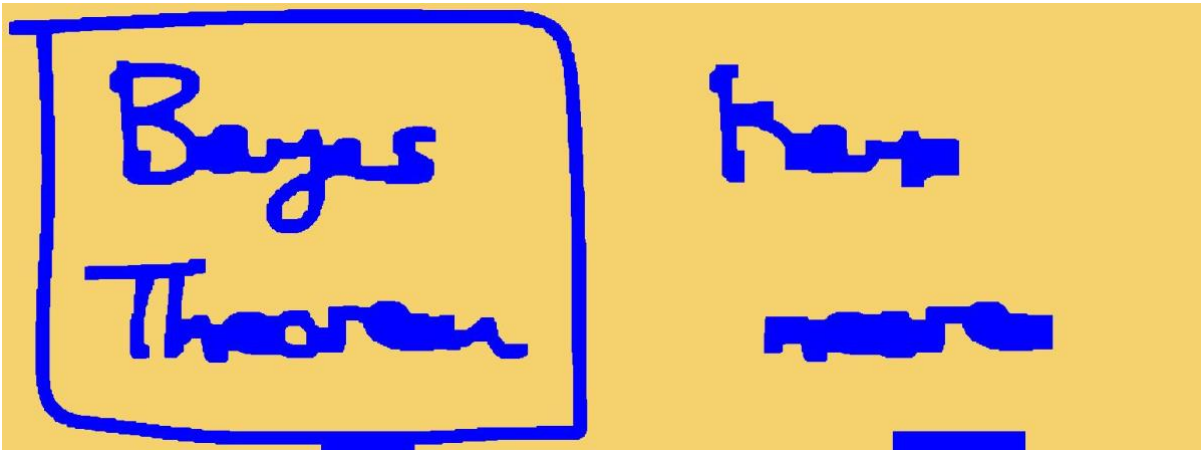
Lambda = 1 Lambda = 5



Lambda = 10 Lambda = 50



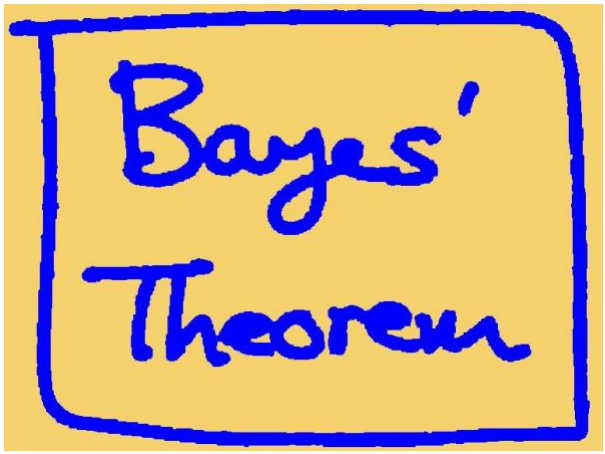
Lambda = 100 Lambda = 500



Lambda = 1000 Lambda = 1500

As we can see that when the value of lambda increases, more and more blue pixel noise will be converted to surrounding yellow pixel. The denoising effect becomes stronger and stronger. However, when the lambda increases to a too large value, the image becomes more blur.

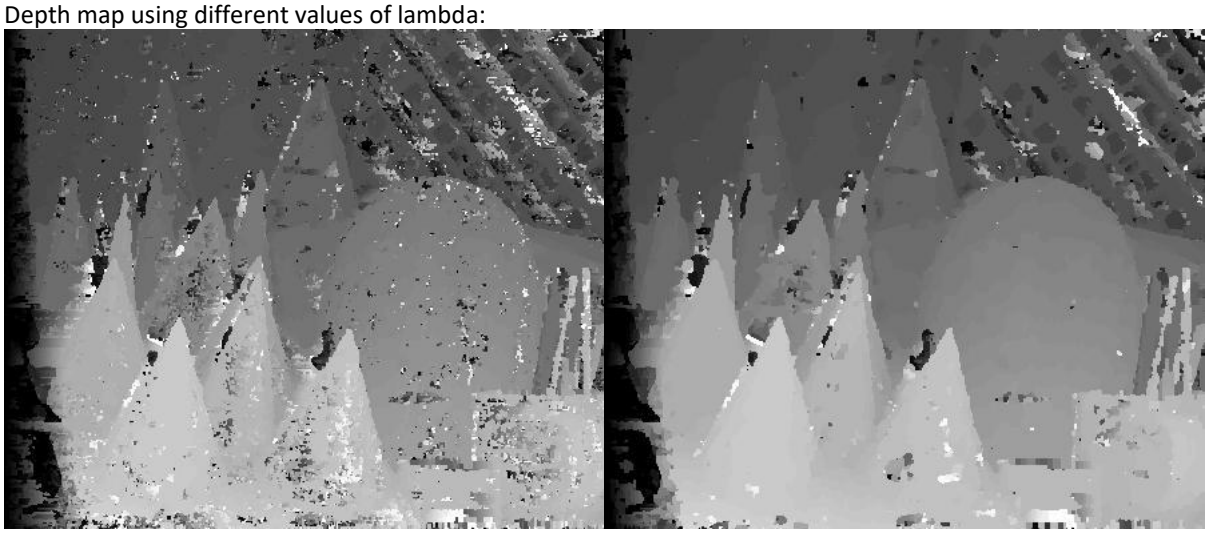
The best result is as below when ***lambda = 100***:



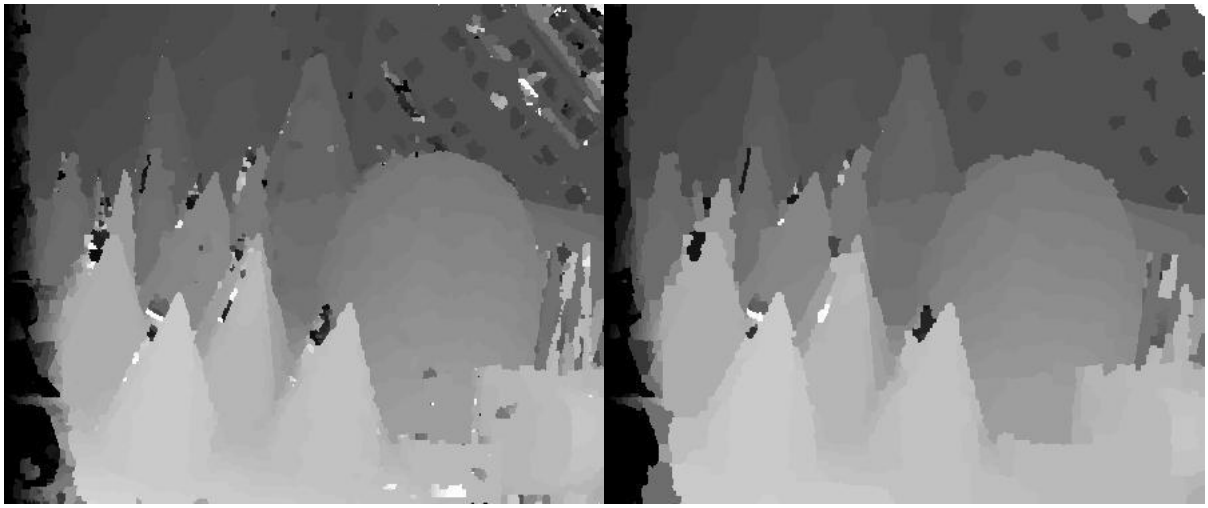
Part 2: Depth from Rectified Stereo Images

A pair of rectified images:

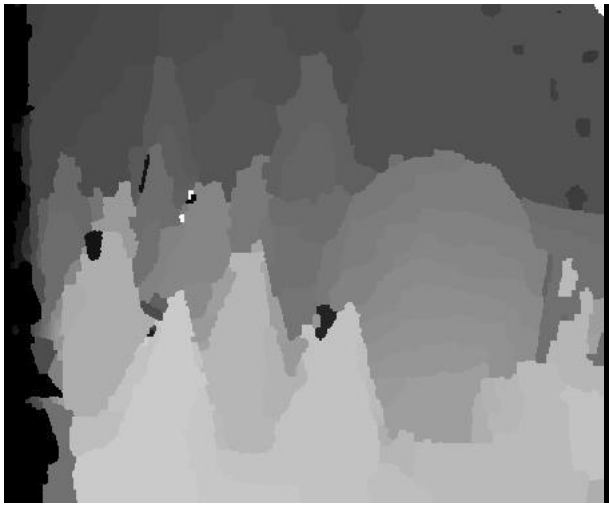
Depth map using different values of lambda:



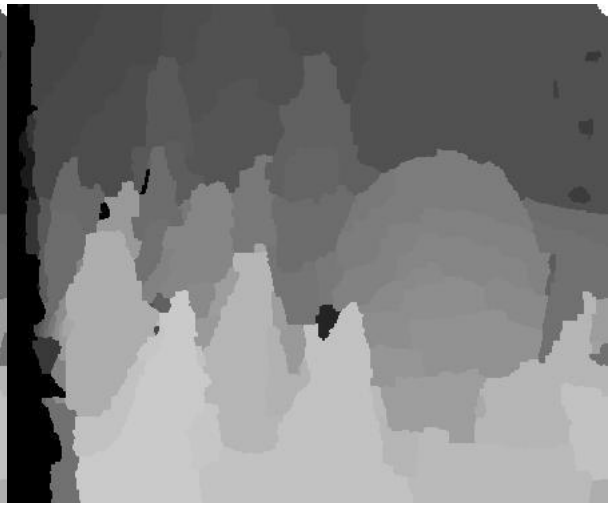
Lambda = 0.0003 Lambda = 0.0006



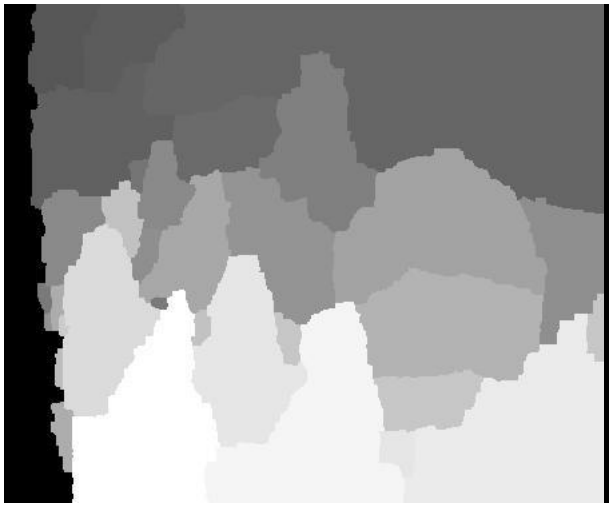
Lambda = 0.0009 Lambda = 0.003



Lambda = 0.006



Lambda = 0.009



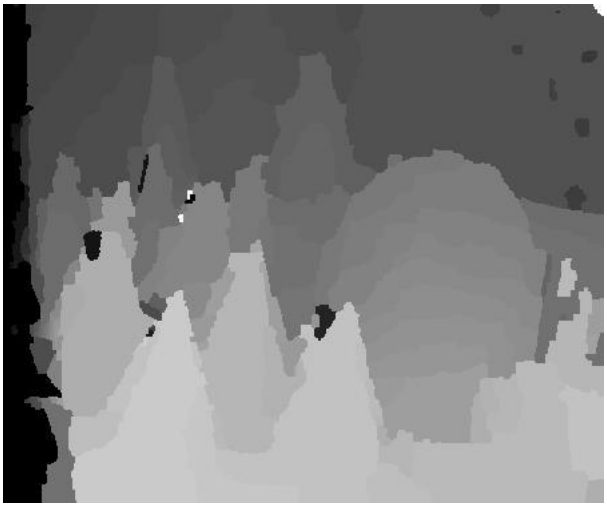
Lambda = 0.03

Lambda = 0.06

Lambda = 0.09

As we can see that when the value of lambda increases, the depth map becomes more smooth. When the value increases too large, the depth map becomes more blur.

The best result is as below when ***lambda = 0.006***:



Part 3: Depth from Stereo

Original a pair of non-rectified images:

According to the paper, set the parameters as below:

disparity = 0.0001:0.0002:0.01 =

[0.0001 0.0003 0.0005 0.0007 0.0009 0.0011 0.0013 0.0015 0.0017 0.0019 0.0021 0.0023
0.0025 0.0027 0.0029 0.0031 0.0033 0.0035 0.0037 0.0039 0.0041 0.0043 0.0045
0.0047 0.0049 0.0051 0.0053 0.0055 0.0057 0.0059 0.0061 0.0063 0.0065 0.0067
0.0069 0.0071 0.0073 0.0075 0.0077 0.0079 0.0081 0.0083 0.0085 0.0087 0.0089
0.0091 0.0093 0.0095 0.0097 0.0099]

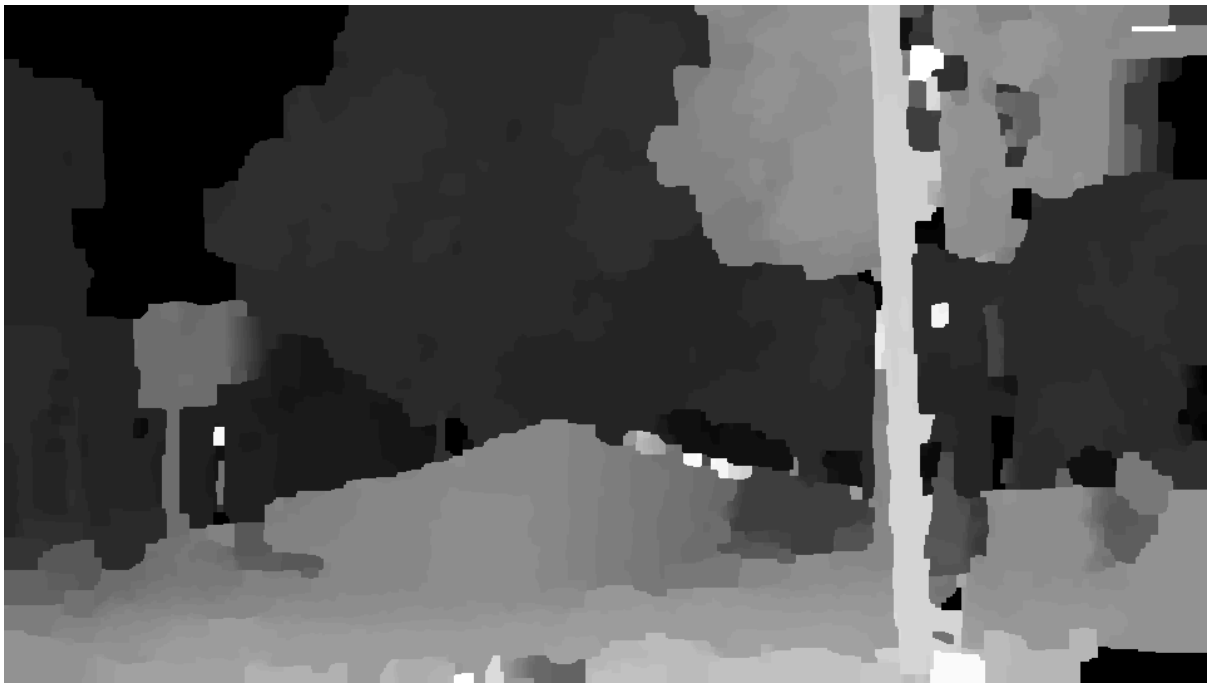
$\omega_s = 20 / (d_{max} - d_{min})$

$\eta = 0.05 * (d_{max} - d_{min})$

$\varepsilon = 50$

$\sigma = 10$

The best depth map result is as below:



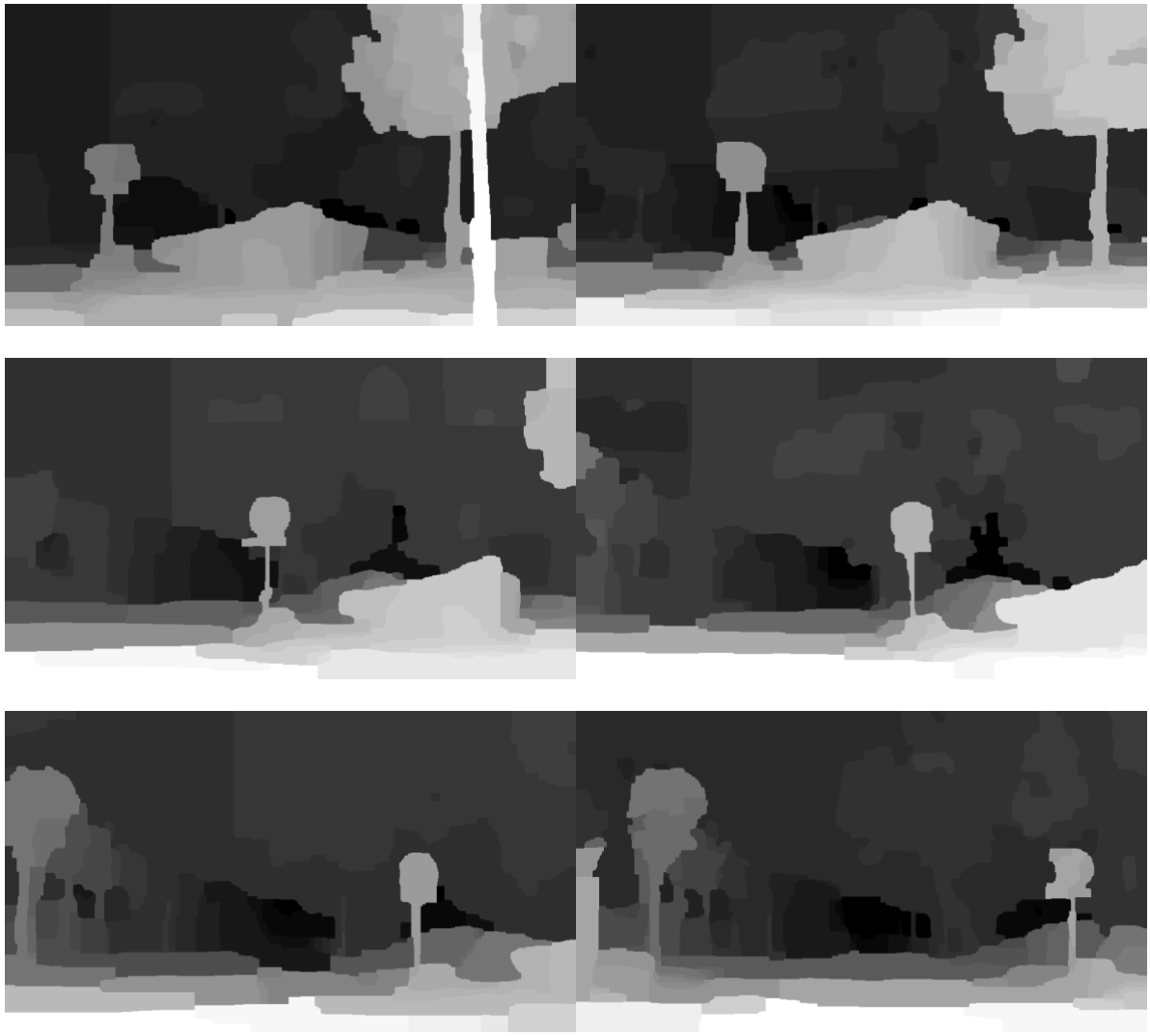
Part 4: Depth from Video – Basic

Set the parameters same as part 3 and set the fps (frame per second) as 5:

disparity = 0.0001:0.0002:0.01 =
[0.0001 0.0003 0.0005 0.0007 0.0009 0.0011 0.0013 0.0015 0.0017 0.0019 0.0021 0.0023
0.0025 0.0027 0.0029 0.0031 0.0033 0.0035 0.0037 0.0039 0.0041 0.0043 0.0045
0.0047 0.0049 0.0051 0.0053 0.0055 0.0057 0.0059 0.0061 0.0063 0.0065 0.0067
0.0069 0.0071 0.0073 0.0075 0.0077 0.0079 0.0081 0.0083 0.0085 0.0087 0.0089
0.0091 0.0093 0.0095 0.0097 0.0099]

$\omega_s = 20 / (d_{max} - d_{min})$
$\eta = 0.05 * (d_{max} - d_{min})$
$\varepsilon = 50$
$\sigma = 10$
fps = 5

Some example depth map:



Reference:

Function EDGE4CONNECTED, (c) 2008 Michael Rubinstein, WDI R&D and IDC