Mobile Robotics

Assignment -4

Multi View Reconstruction

And LM Implementation

Report

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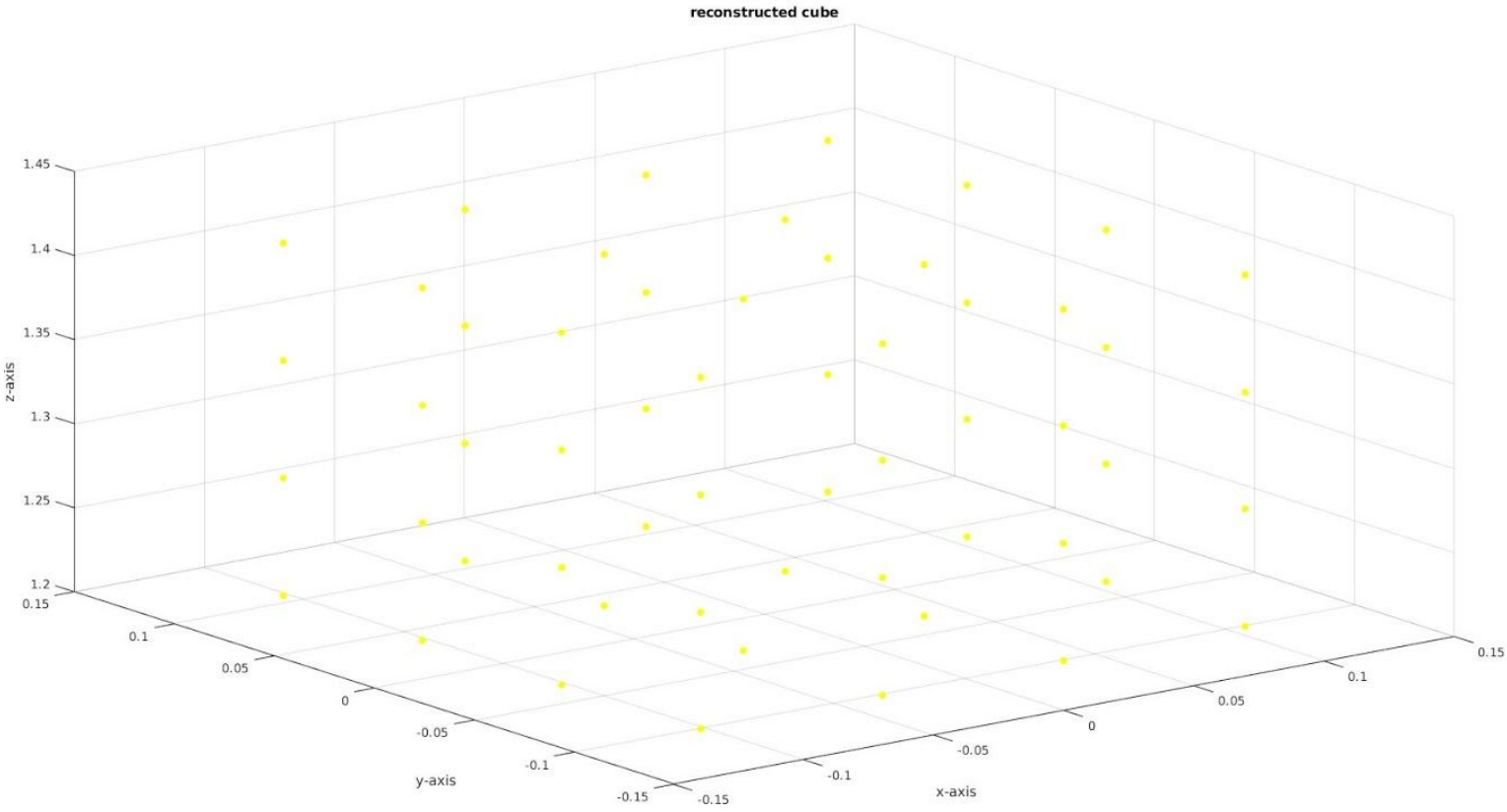
20161236

The 20161236 folder consists of 2 sub folders ‘CodeLM’ and ‘Reconstruct codes’. The Reconstruct codes folder consists of the reconstruction code ‘main_recon.m’ and the matlab files consisting of the projection matrices and the image points in various camera frames stored as ‘cube_imgs.mat’ and ‘projMatrices.mat’.

The CodeLM folder consists of 3 functions and the ‘testLevenbergMarquardt.m’ , ‘testGaussNewton.m’ scripts which predict the Gaussians.

OUTPUT PLOTS

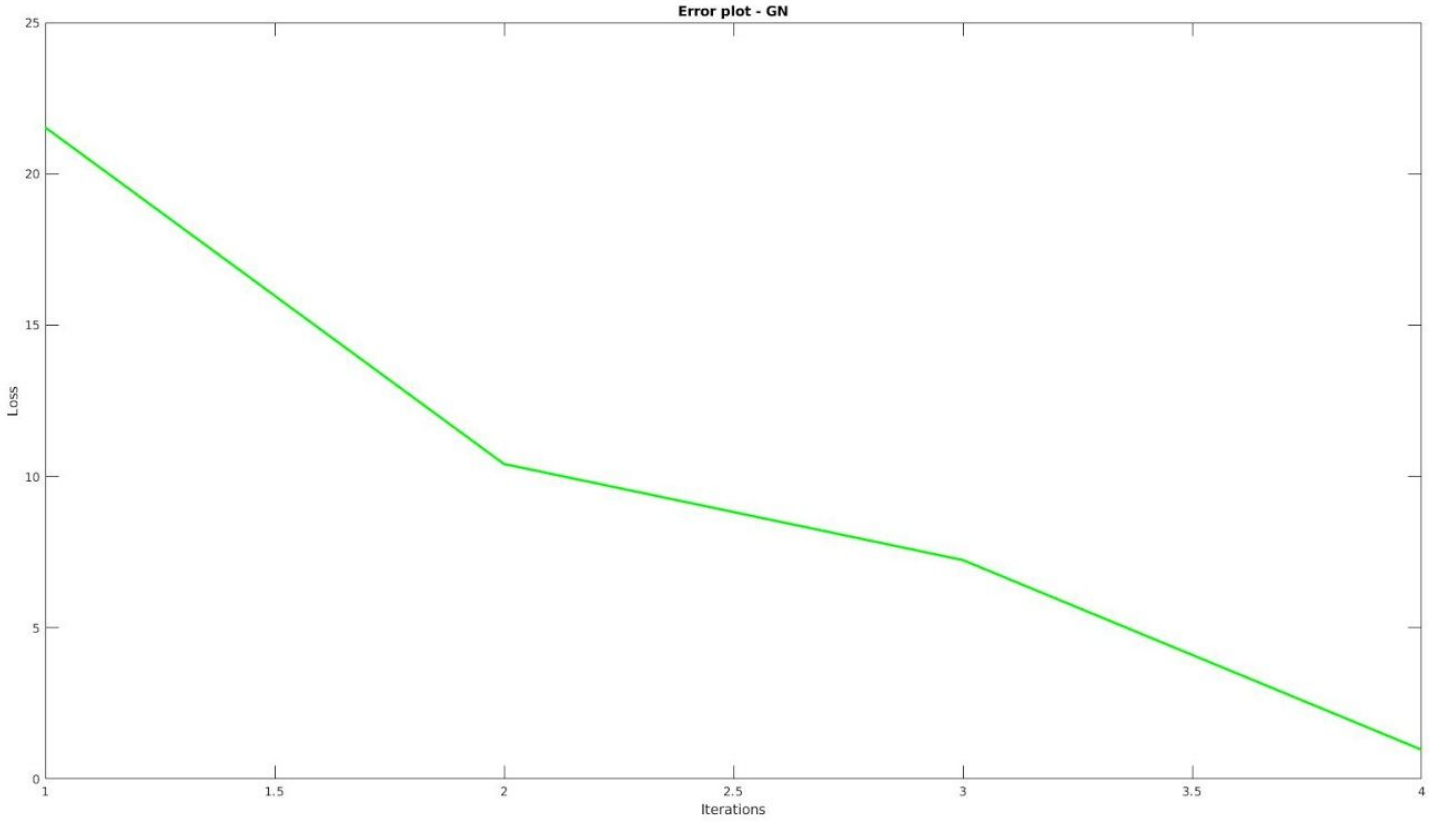


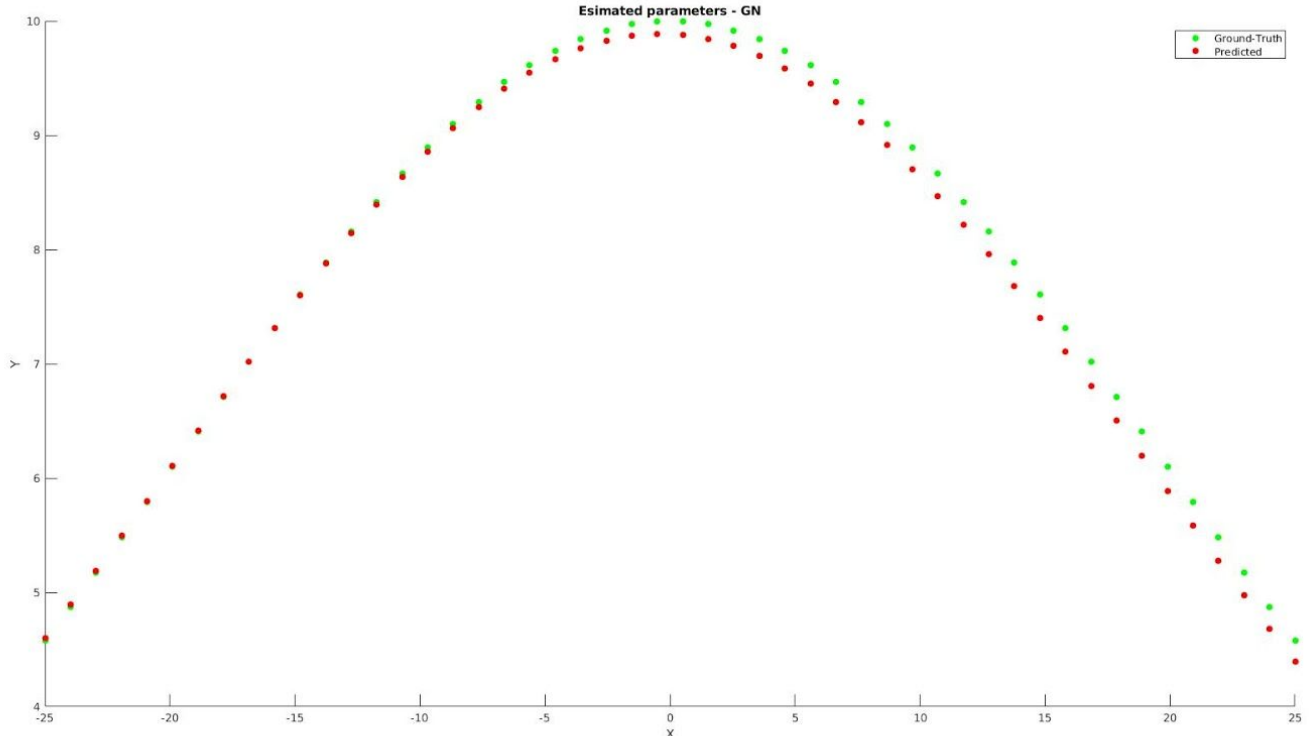
The reconstructed Cube

The cube is reconstructed using the 56 image points in 8 camera views.

The LM and Gaussian Outputs

Gaussian Outputs

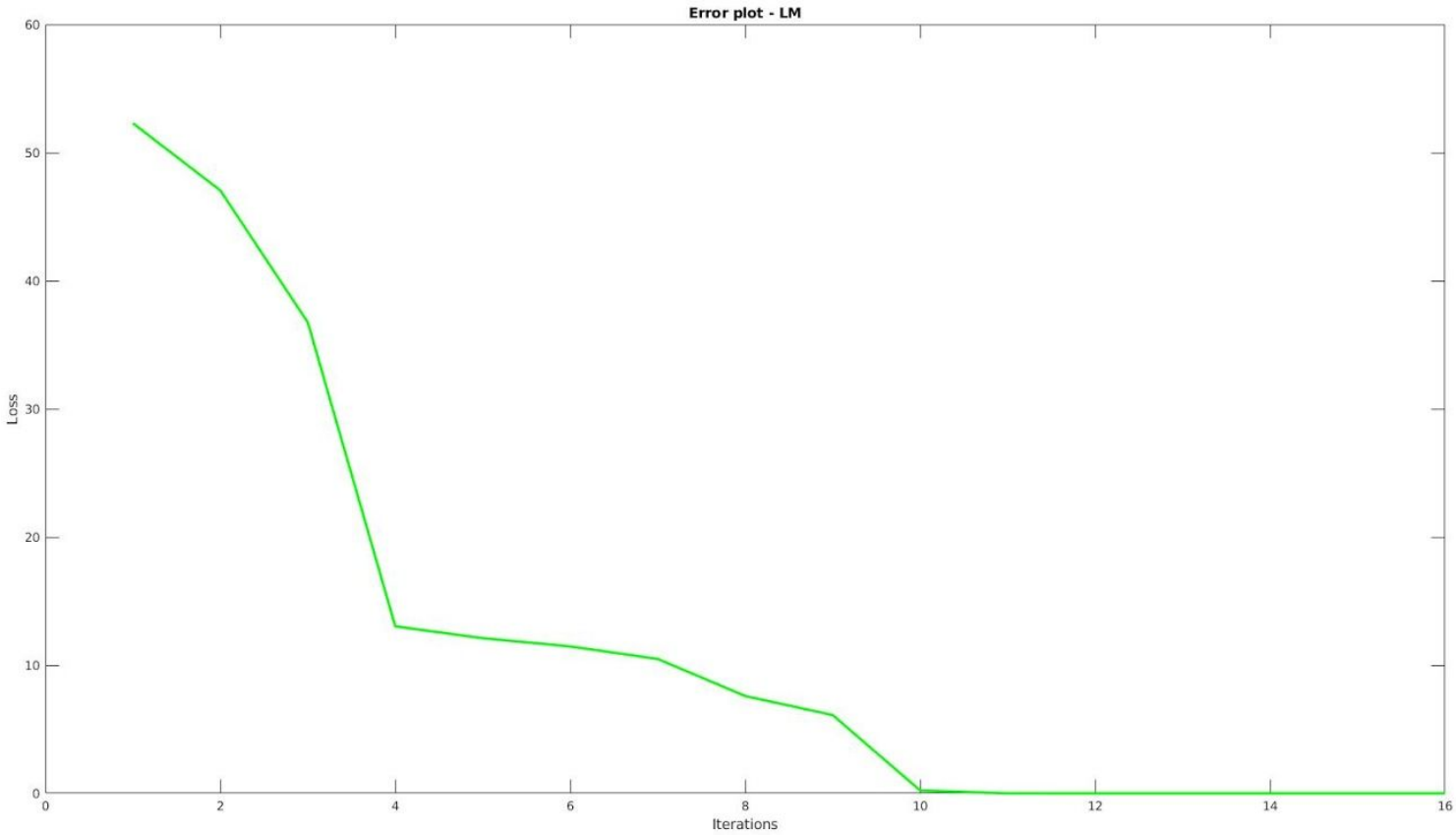


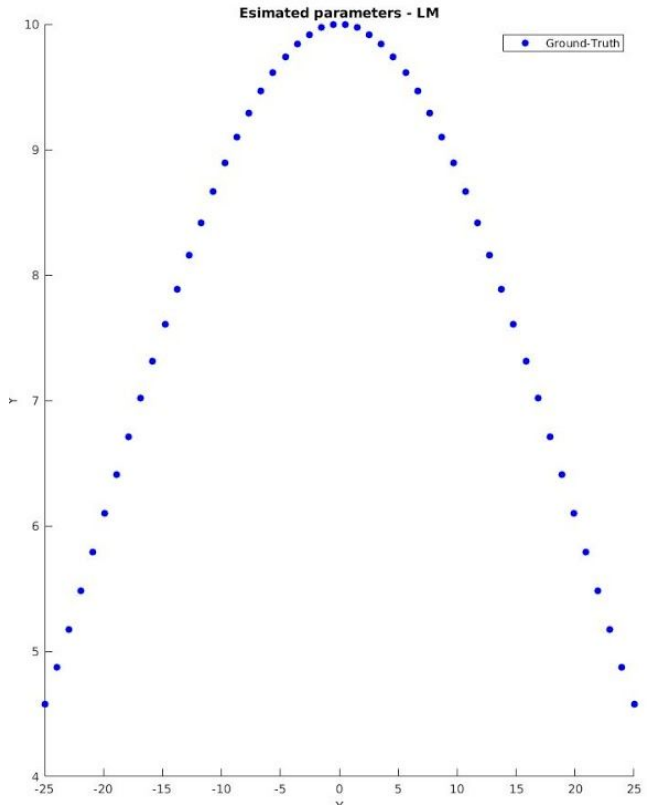


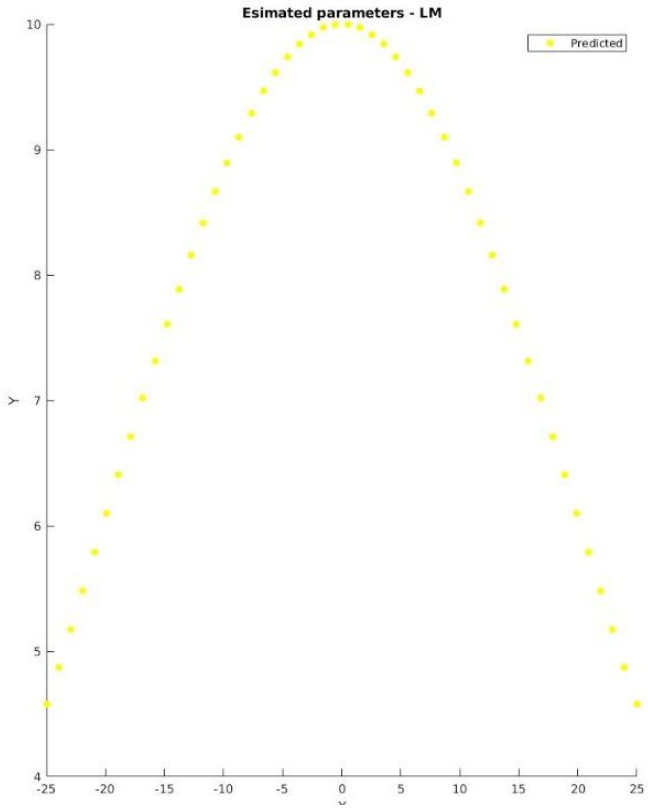
Command Window

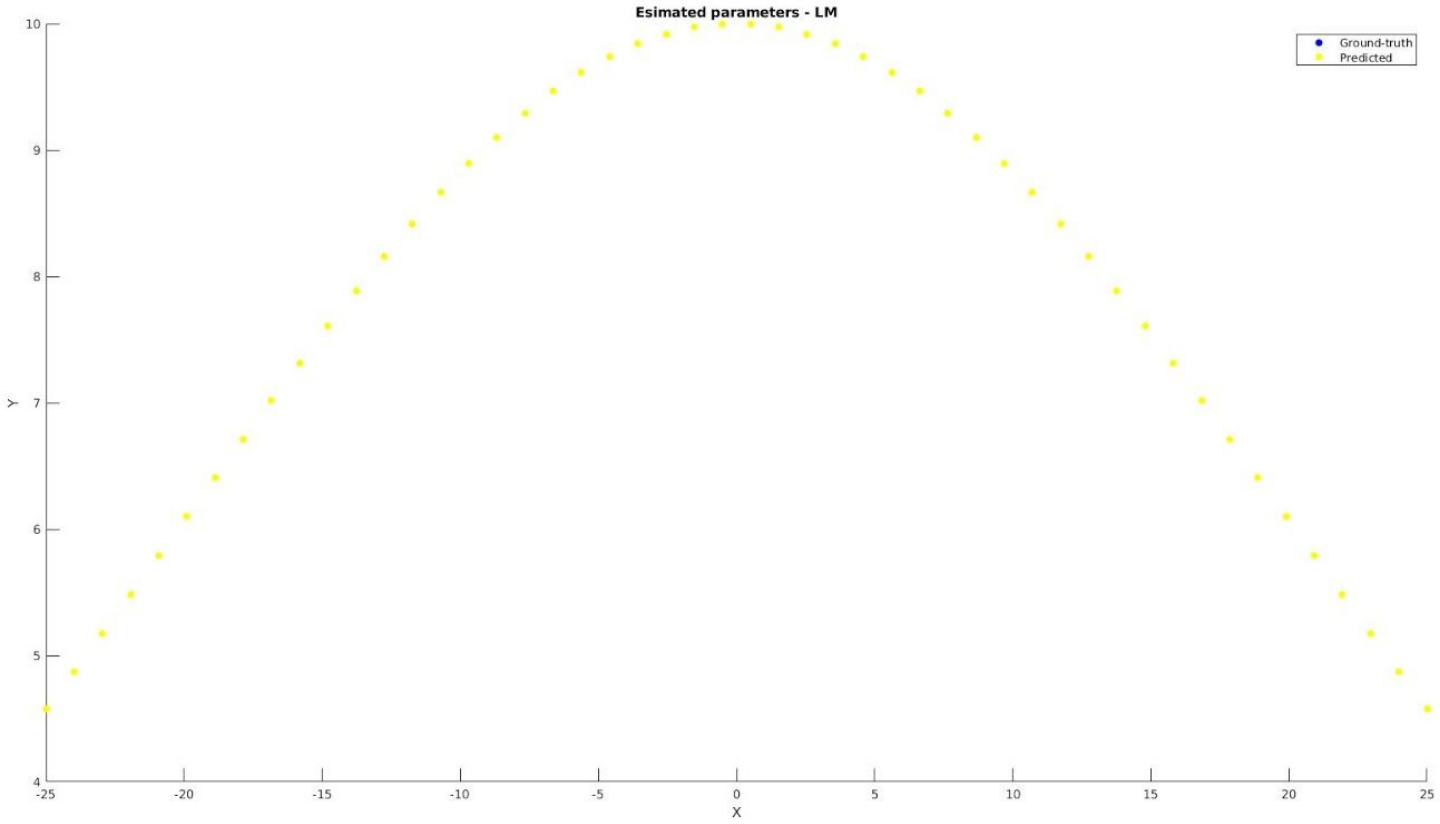
```
Number of total iterations: 50
Number of successful steps: 15
Number of unsuccessful steps: 7
Estimated parameters of the Gaussian: 10
Estimated parameters of the Gaussian: -8.251020e-16
Estimated parameters of the Gaussian: 20
True parameters of the Gaussian: 10 0 20
Difference in estimated and true parameters: 30
>> testGaussNewton
Number of total iterations: 3
Number of successful steps: 0
Number of unsuccessful steps: 0
Estimated parameters of the Gaussian:
ans =

    9.8853   -0.3620   19.9072

True parameters of the Gaussian:
ans =

    10     0    20

Difference in estimated and true parameters:
ans =

    0.5694

fx >>
```

LM Outputs


Error plot - LM
Loss
Iterations
0
10
20
30
40
50
60
0
2
4
6
8
10
12
14
16


Esimated parameters - LM
Ground-Truth
Y
4
5
6
7
8
9
10
-25
-20
-15
-10
-5
0
5
10
15
20
25


Esimated parameters - LM
Predicted
Y
4
5
6
7
8
9
10
-25
-20
-15
-10
-5
0
5
10
15
20
25



Command Window

```
>> testLevenbergMarquardt
Number of total iterations: 50
Number of successful steps: 15
Number of unsuccessful steps: 7
Estimated parameters of the Gaussian: 10
Estimated parameters of the Gaussian: -8.251020e-16
Estimated parameters of the Gaussian: 20
True parameters of the Gaussian: 10 0 20
Difference in estimated and true parameters: 8.251020e-16
>>
```

It can be seen from the plots that the predicted Gaussian Coincided with the ground truth in The LM case, while deviates slightly in the Newton Gaussian Case.