DCS Calibration Robustness Report

jing.tong@RCV

2015.12.11

1. Introduction

This report is a introduction about the robustness of DCS calibration algorithm. We test the relationship of main and sub image pixel error(deltaY) to calibration parameters(extrinsic parameters). The next sections describe these relationship in details.

The test envirnoment is as following:

- Test platform version: MIRAGEPLUS01A-S00A_CKT_L88EN_200_150925
- Test app version: 0929
- Test phone ID: phone2, phone5, phone13
- Test pictures: take picture use tripod and script

We take pictures at 60cm(1 picture), 75cm(1 picture), 100cm(3 pictures), 130cm(4 pictures), 160cm(4 pictures) and 200cm(5 pictures), 18 pictures totally. All the data in the following figures are the average of the 18 pictures.

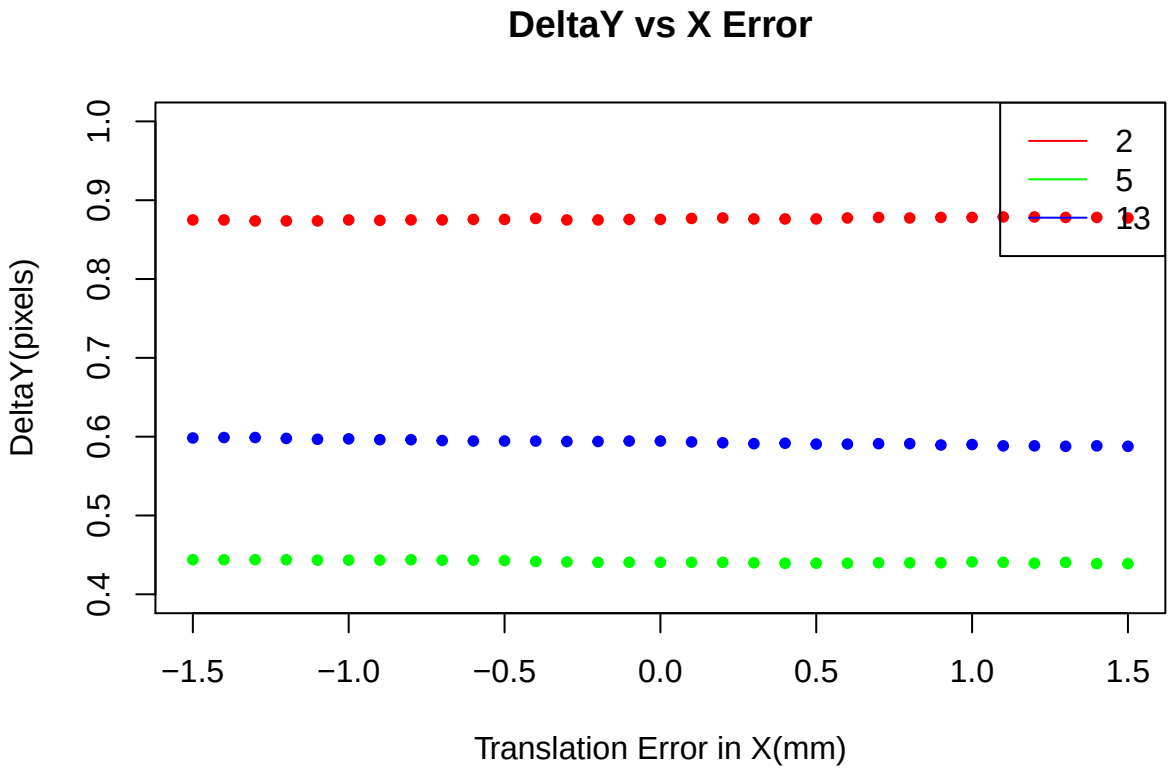
2. The DeltaY In Pixels

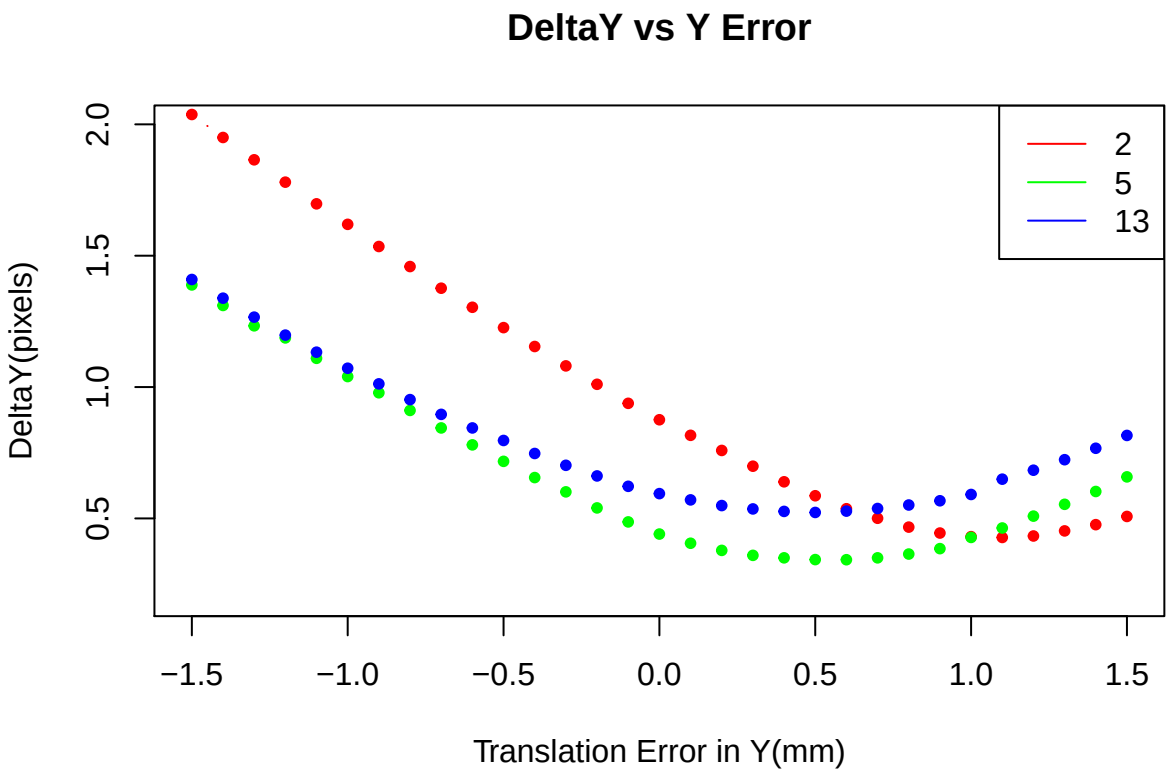
2.1 The Relationship Between DeltaY and Translation Error

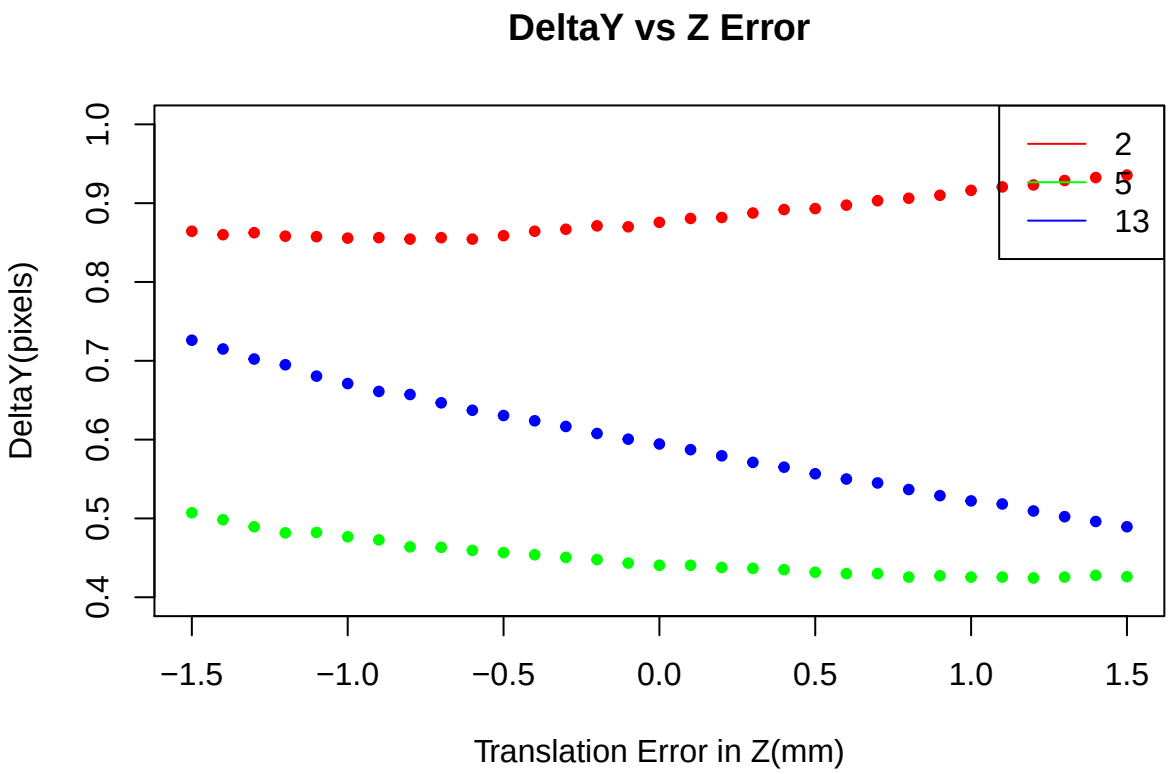
This section describe the relationship between deltaY and translation error in three direction.

We do experiment to test translation error in direction x, y, z deviate +/- 1.5mm from calibration parameter, the step value is 0.1mm every time.

The following figure is the relationship between deltaY and translation error in three direction.




DeltaY vs Y Error
DeltaY(pixels)
0.5
1.0
1.5
2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
Translation Error in Y(mm)
2
5
13



Theoretically speaking, the min deltaY should appear at the original calibration value(x coordinate 0), and the deltaY value gradually bigger when the translation error become bigger and bigger. If the deltaY is not change a lot, it is indicated that the translation direction is not such a huge impact on deltaY.

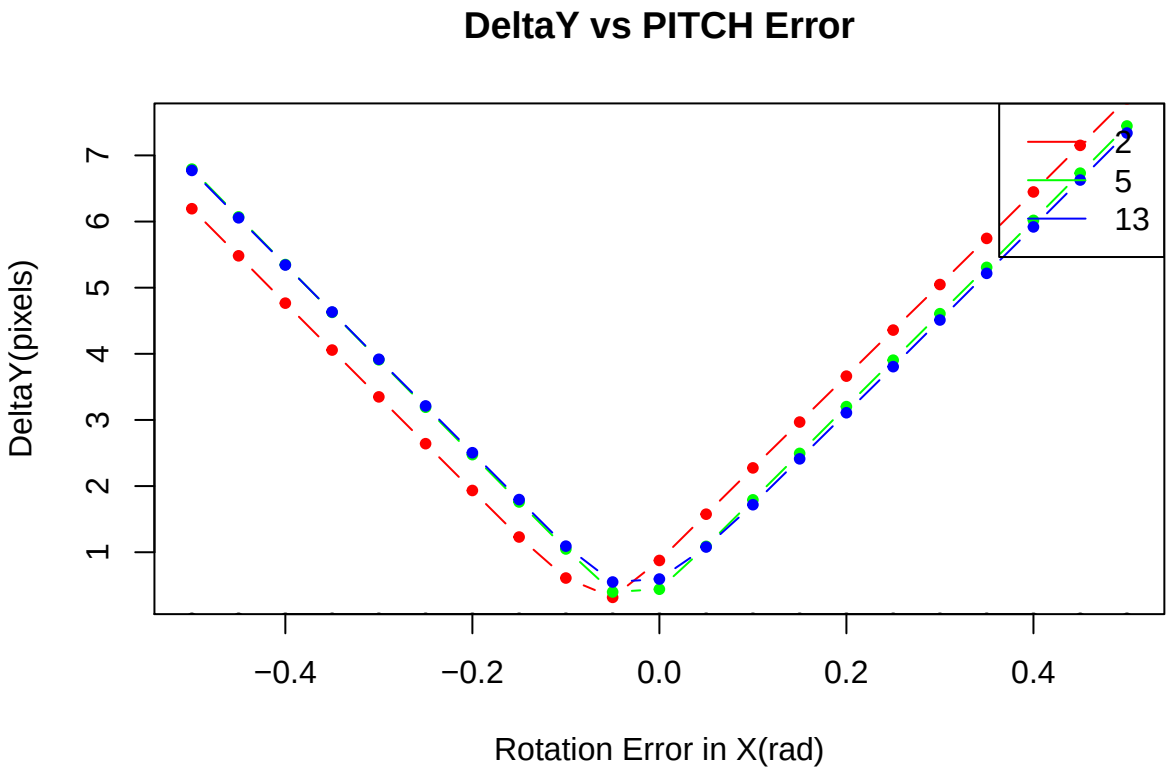
If the min deltaY is not at the original calibration value, it is indicated that the calibration parameter is not the optimal value.

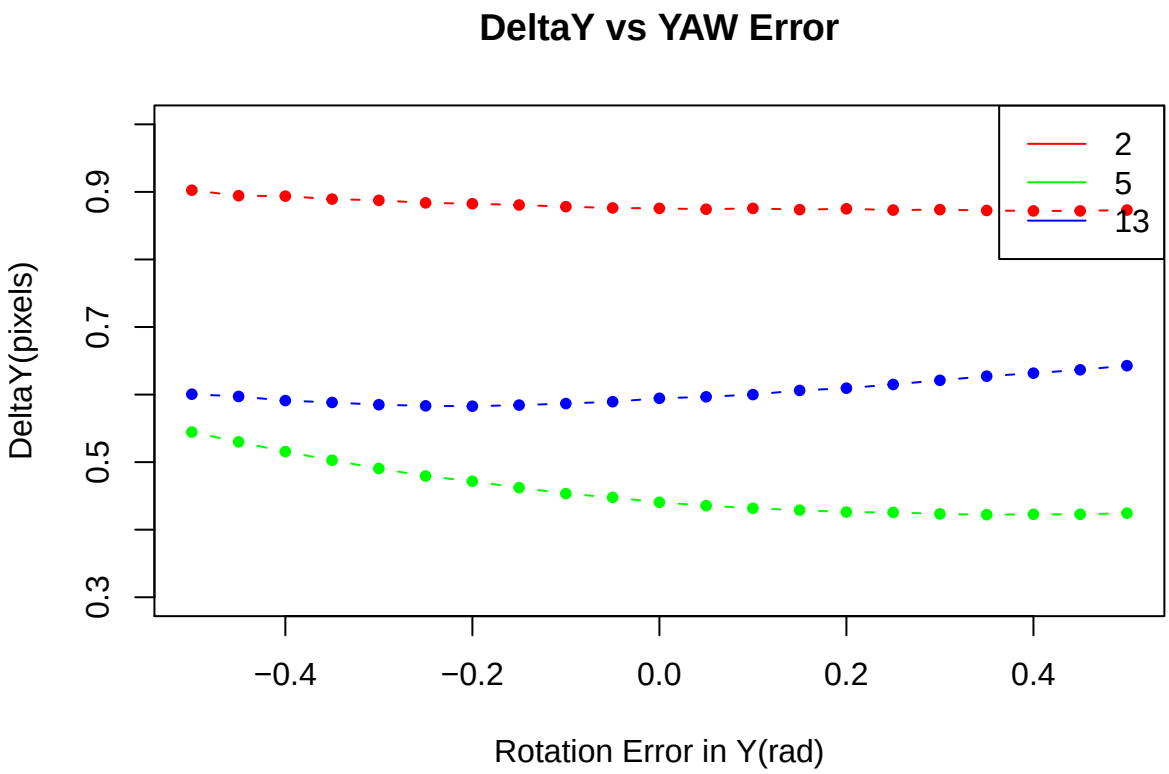
2.2 The Relationship Between DeltaY and Rotation Error

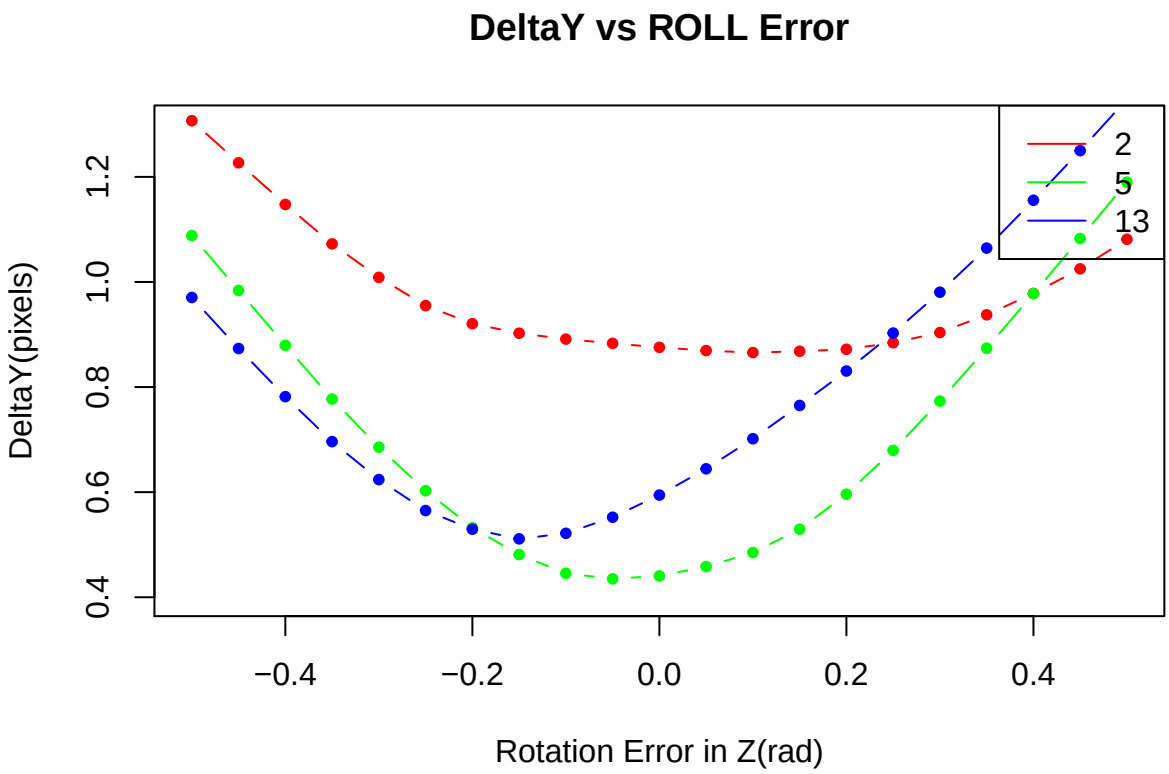
This section describe the relationship between deltaY and rotation error in three direction.

We do experiment to test rotation error in direction pitch, yaw, roll deviate +/- 0.5rad from calibration parameter, the step value is 0.1rad every time.

The following figure is the relationship between deltaY and rotation error in three direction.




DeltaY vs YAW Error
DeltaY(pixels)
0.3
0.5
0.7
0.9
−0.4
−0.2
0.0
0.2
0.4
Rotation Error in Y(rad)
2
5
13



Theoretically speaking, the min deltaY should appear at the original calibration value(x coordinate 0), and the deltaY value gradually bigger when the rotation error become bigger and bigger. If the deltaY is not change a lot, it is indicated that the rotation direction is not such a huge impact on deltaY.

If the min deltaY is not at the original calibration value, it is indicated that the calibration parameter is not the optimal value.

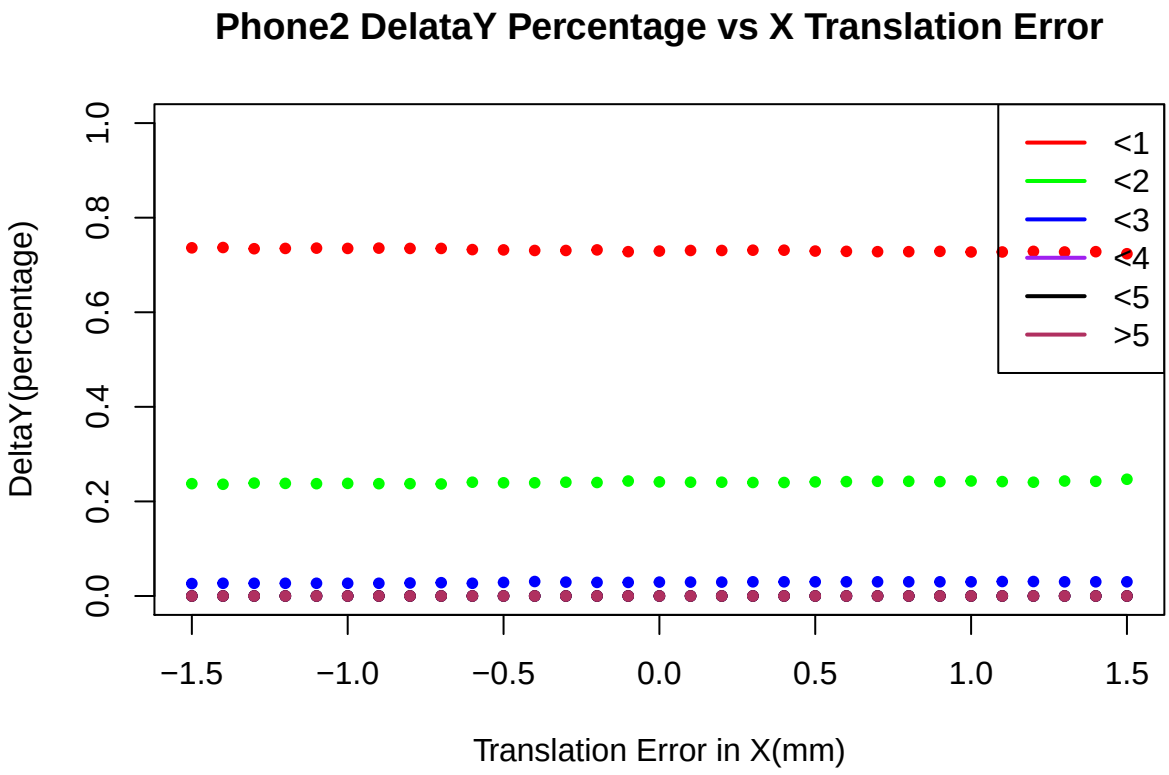
3. The DeltaY Distribution

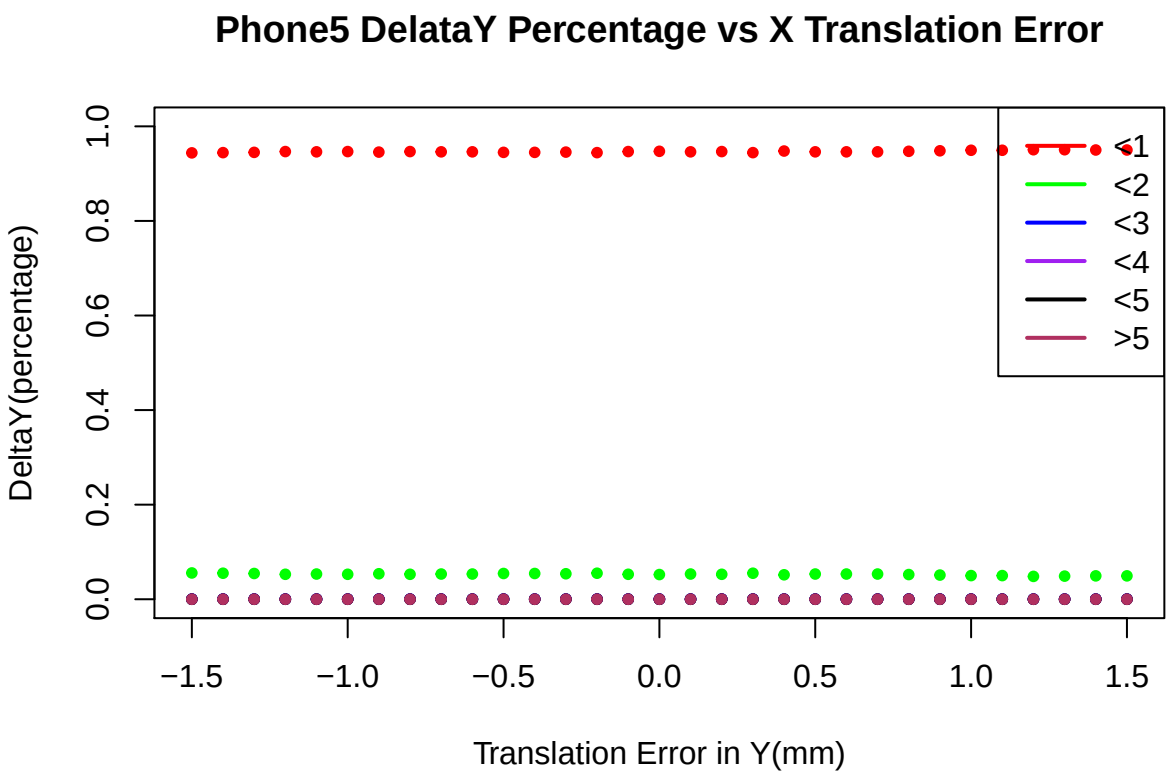
3.1 The Relationship Between DeltaY Percentage and Translation Error

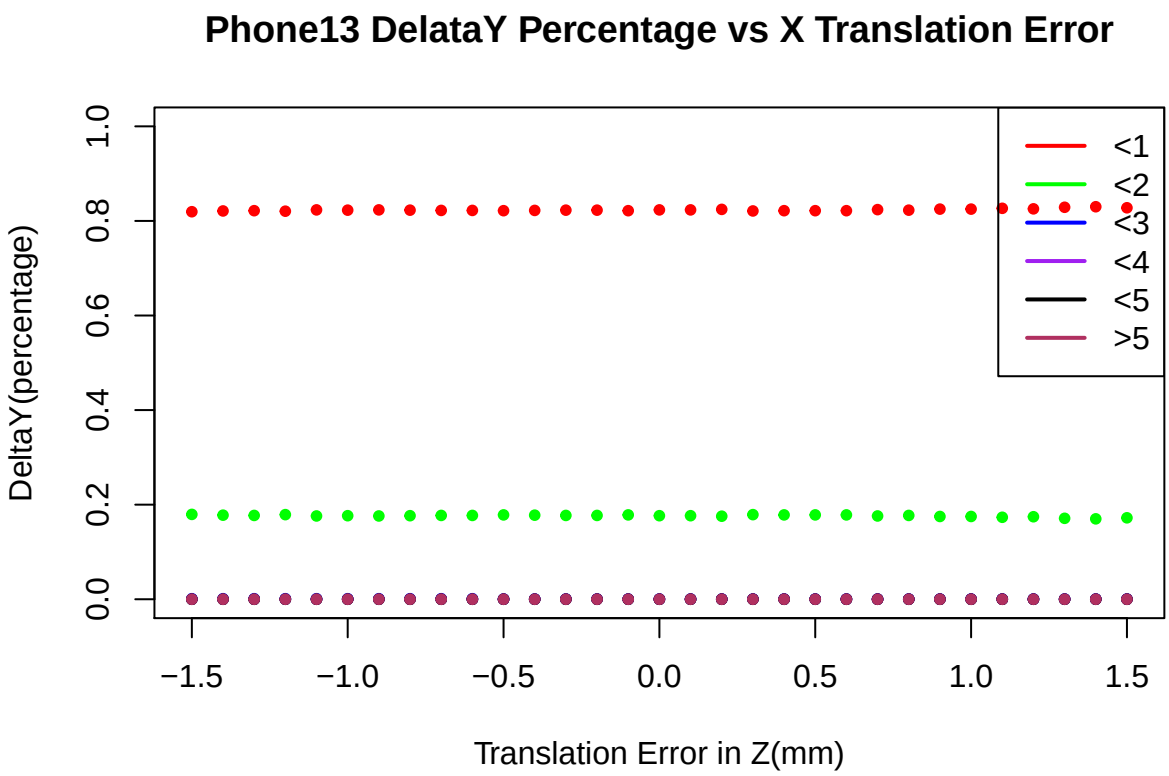
This section describe the relationship between deltaY percentage and translation error in three direction.

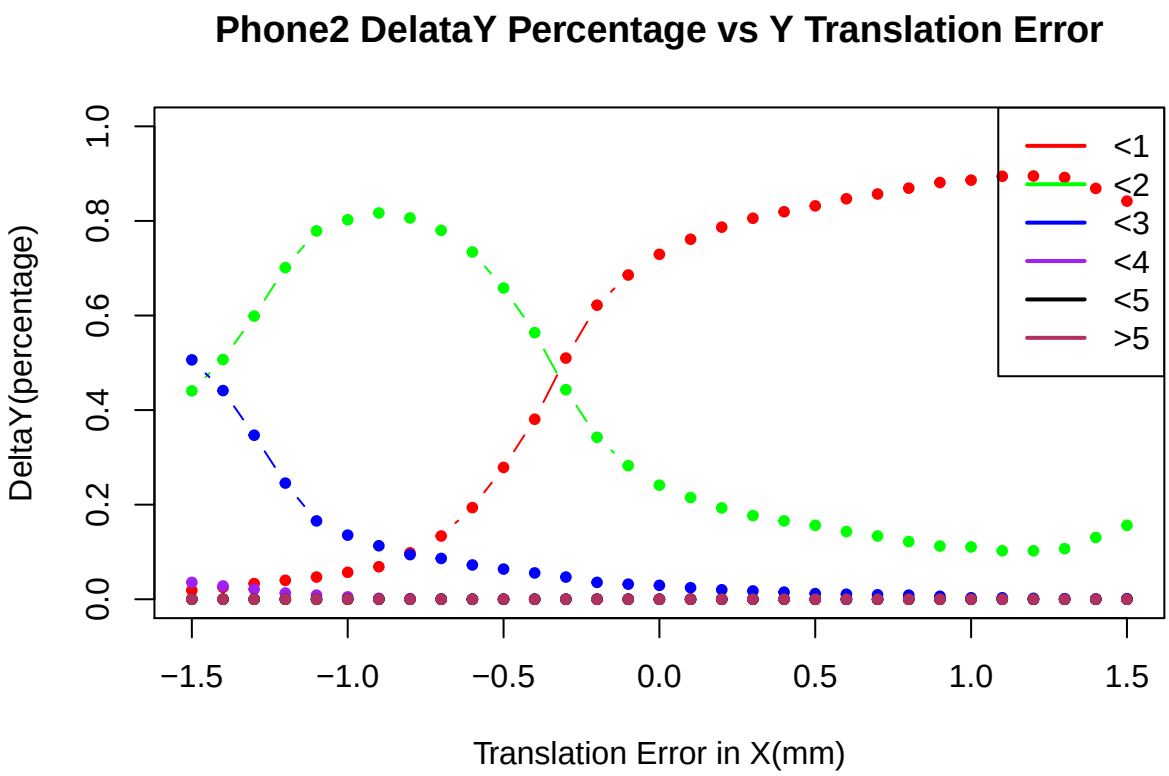
We do statistics for the percentage of deltaY in less than one pixel, two pixels, three pixels, four pixels, five pixels, and more than five pixels.

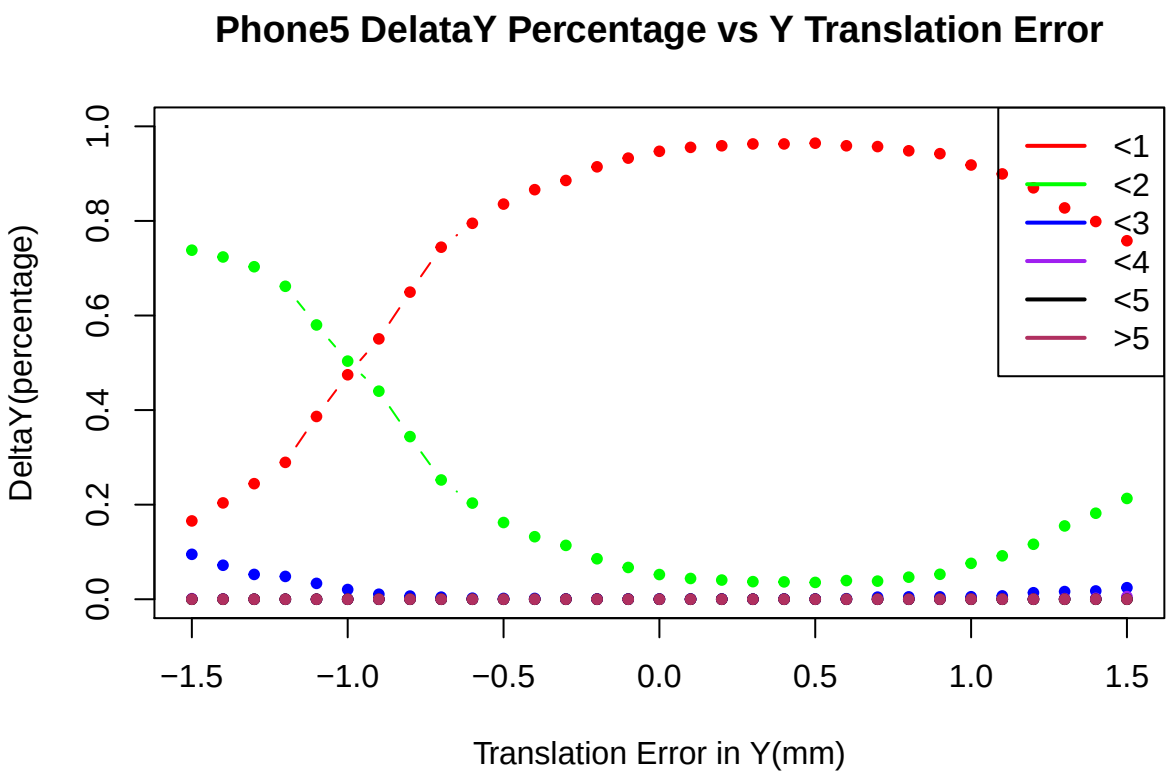
The following figures is the relationship between deltaY percentage and translation error for the three test phones.

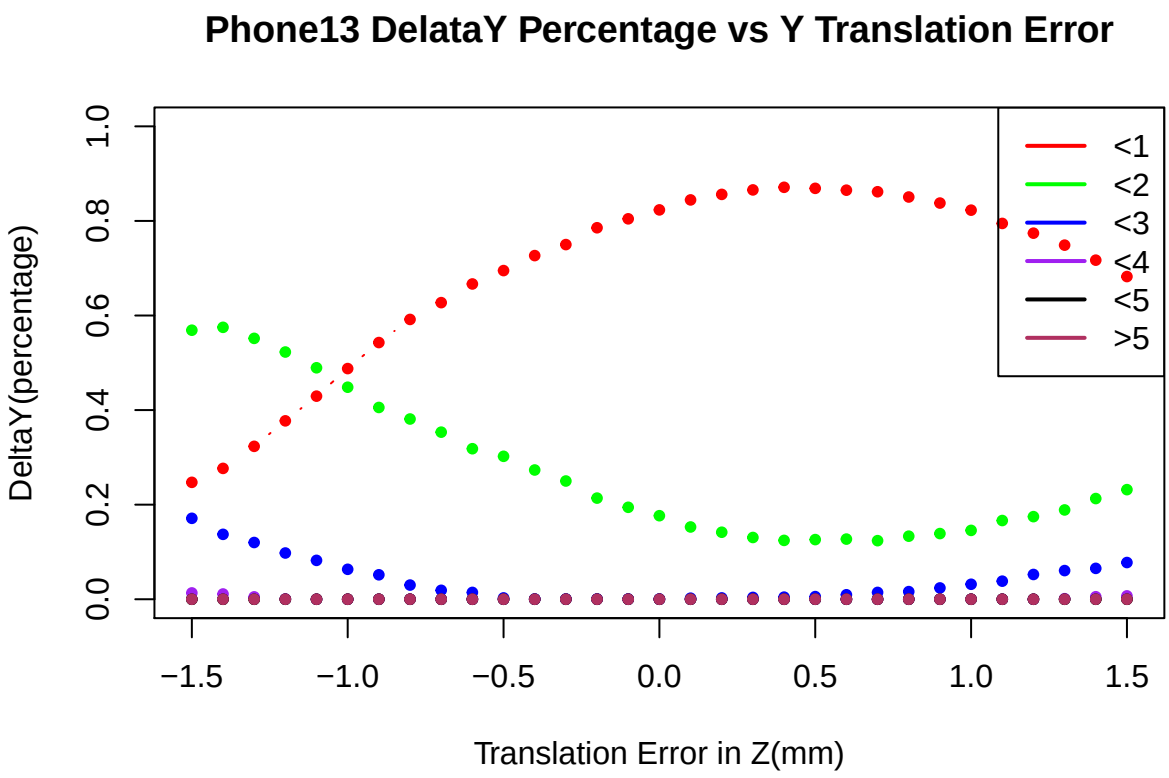


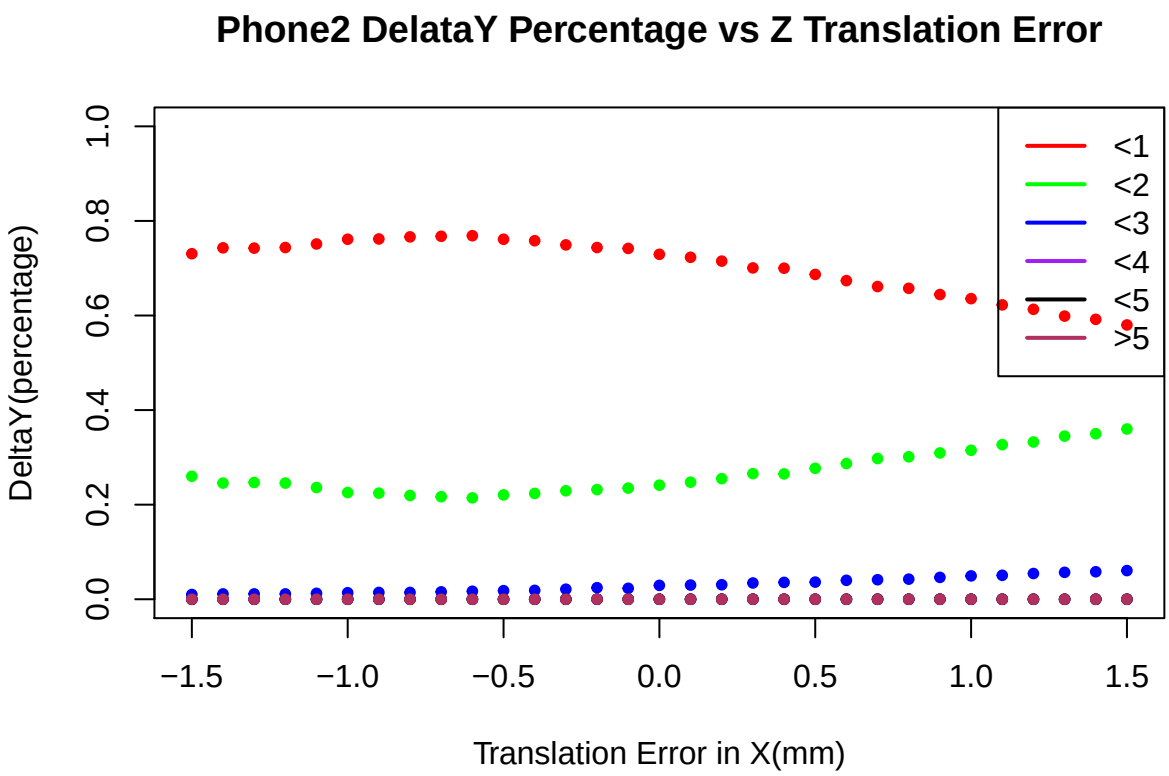

Phone5 DelataY Percentage vs X Translation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
Translation Error in Y(mm)
<1
<2
<3
<4
<5
>5

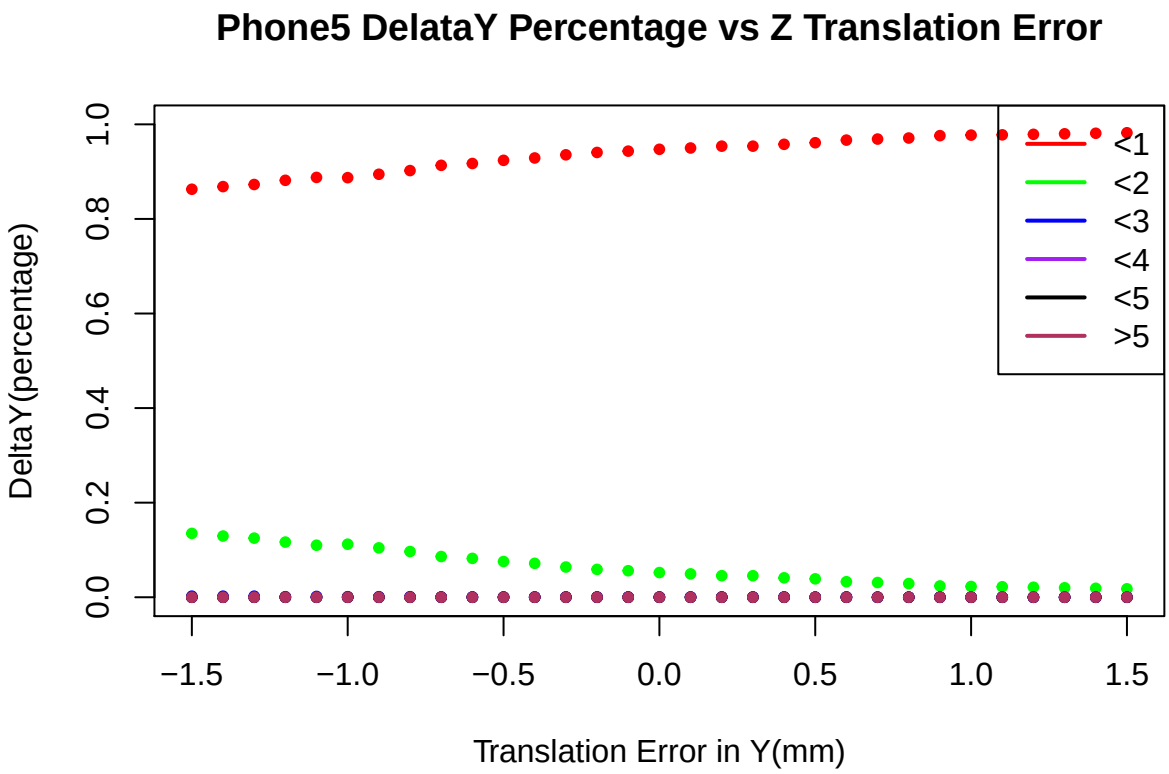

Phone13 DelataY Percentage vs X Translation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
Translation Error in Z(mm)
<1
<2
<3
<4
<5
>5

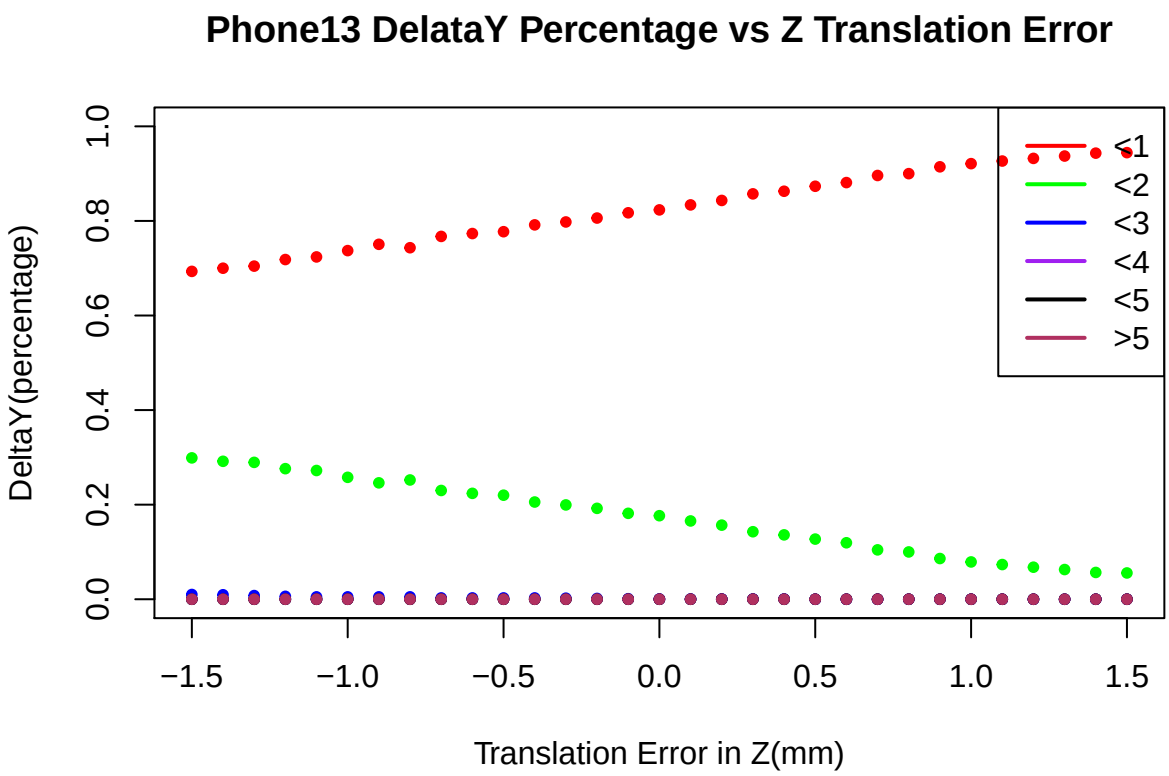

Phone2 DelataY Percentage vs Y Translation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
Translation Error in X(mm)
<1
<2
<3
<4
<5
>5


Phone5 DelataY Percentage vs Y Translation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
Translation Error in Y(mm)
<1
<2
<3
<4
<5
>5


Phone13 DelataY Percentage vs Y Translation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
Translation Error in Z(mm)
<1
<2
<3
<4
<5
>5


Phone2 DelataY Percentage vs Z Translation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
Translation Error in X(mm)
<1
<2
<3
<4
<5
>5


Phone5 DelataY Percentage vs Z Translation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
Translation Error in Y(mm)
<1
<2
<3
<4
<5
>5

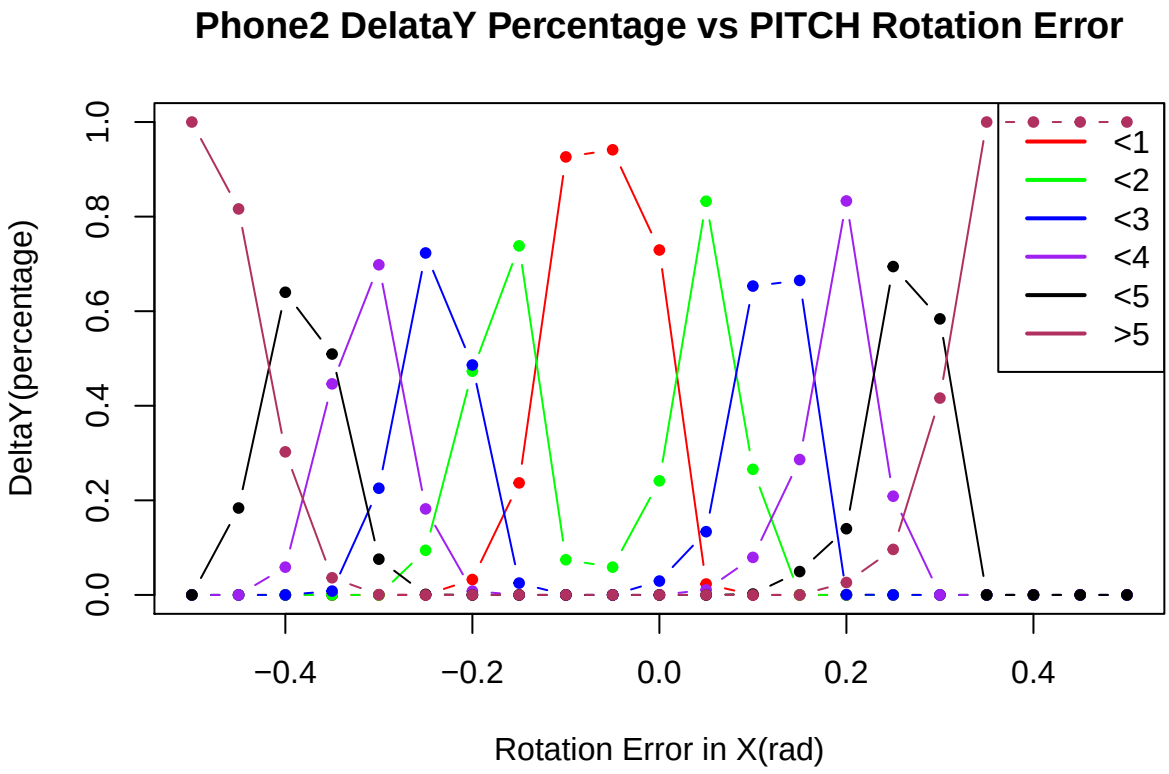

Phone13 DelataY Percentage vs Z Translation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
Translation Error in Z(mm)
<1
<2
<3
<4
<5
>5

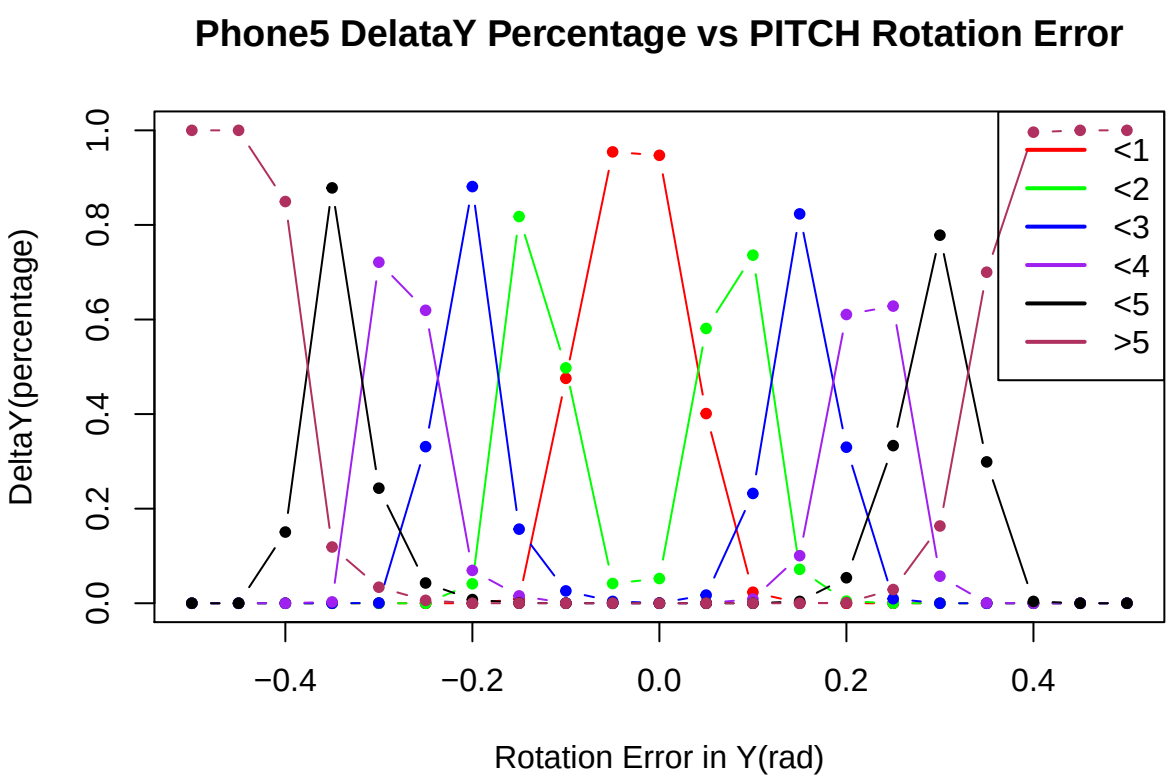
3.2 The Relationship Between DeltaY Percentage and Rotation Error

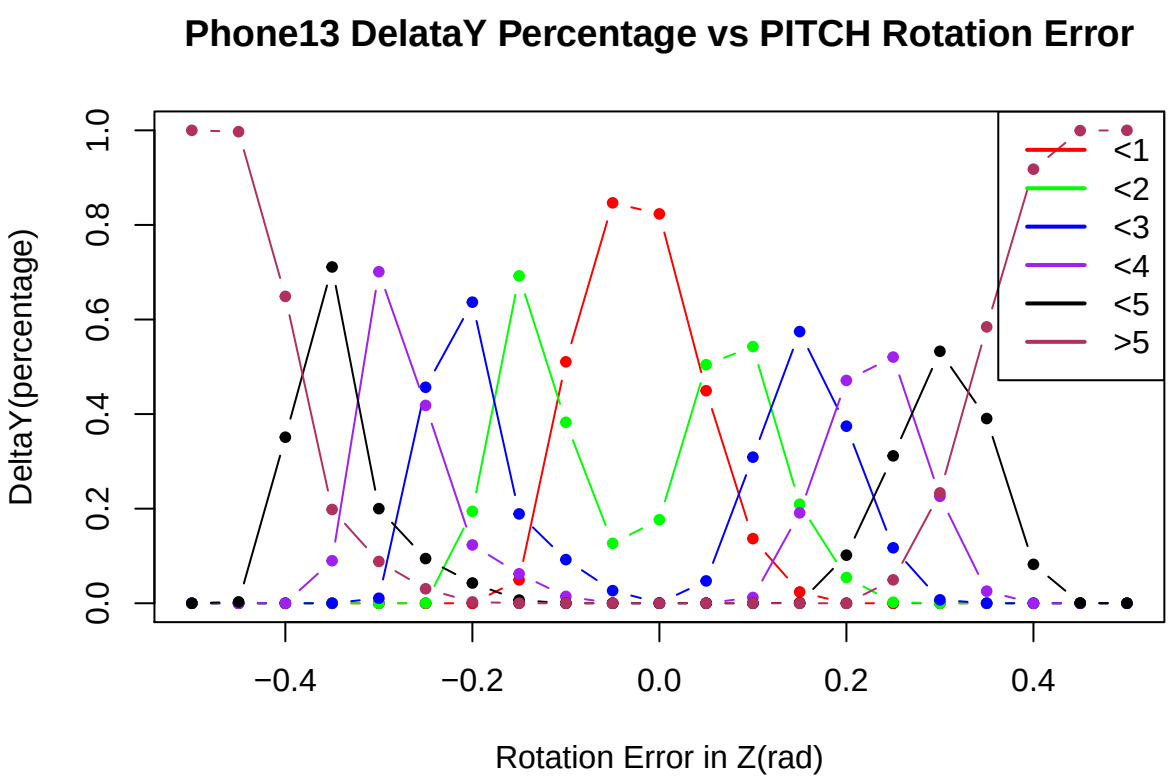
This section describe the relationship between deltaY percentage and rotation error in three direction.

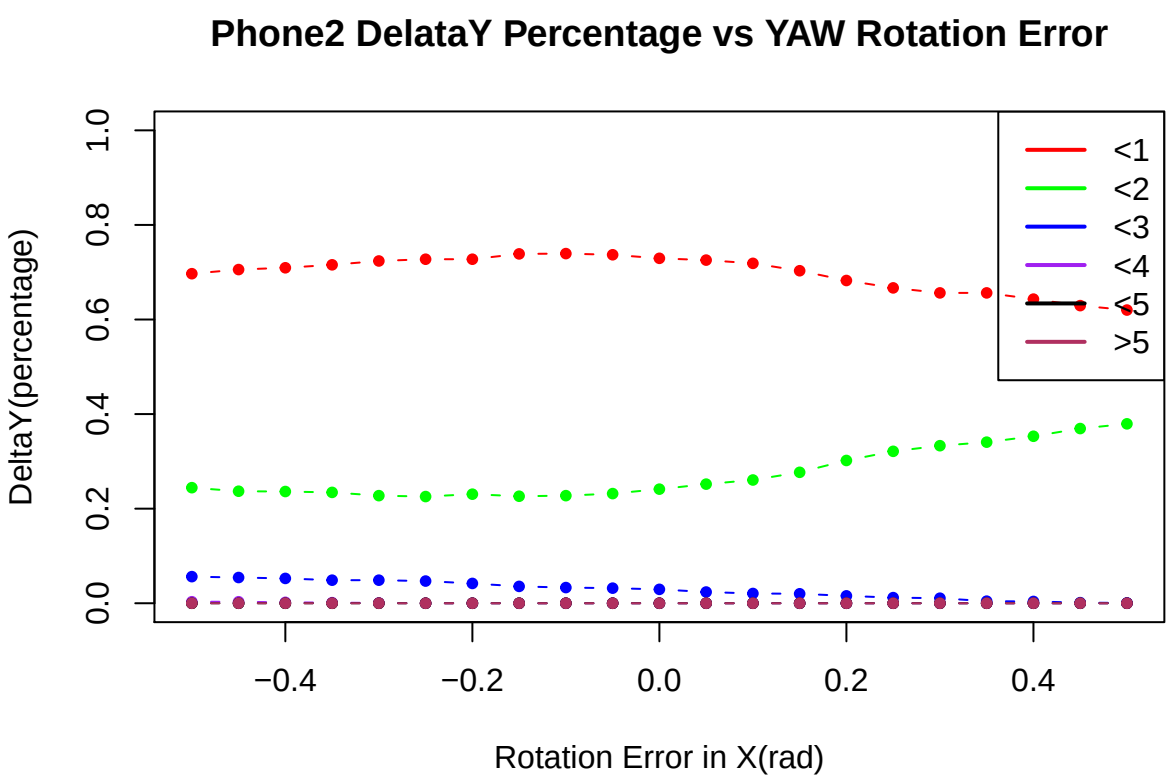
We do statistics for the percentage of deltaY in less than one pixel, two pixels, three pixels, four pixels, five pixels, and more than five pixels.

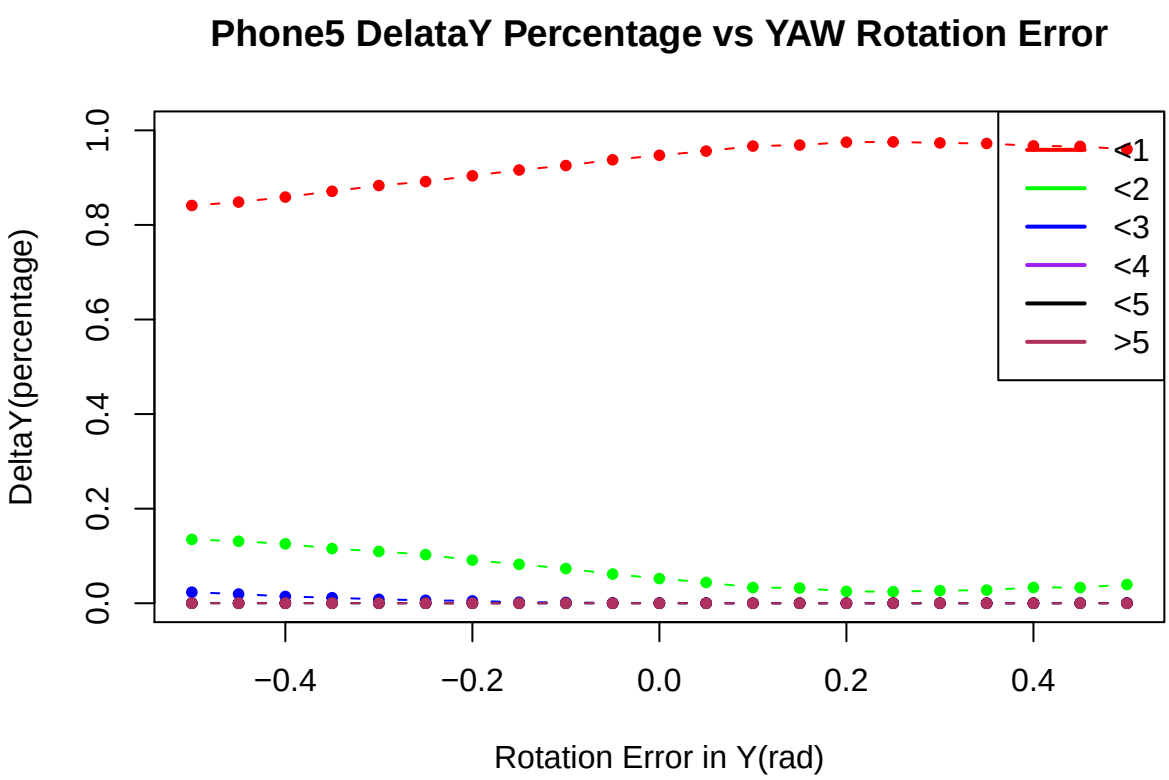
The following figures is the relationship between deltaY percentage and rotation error for the three test phones.

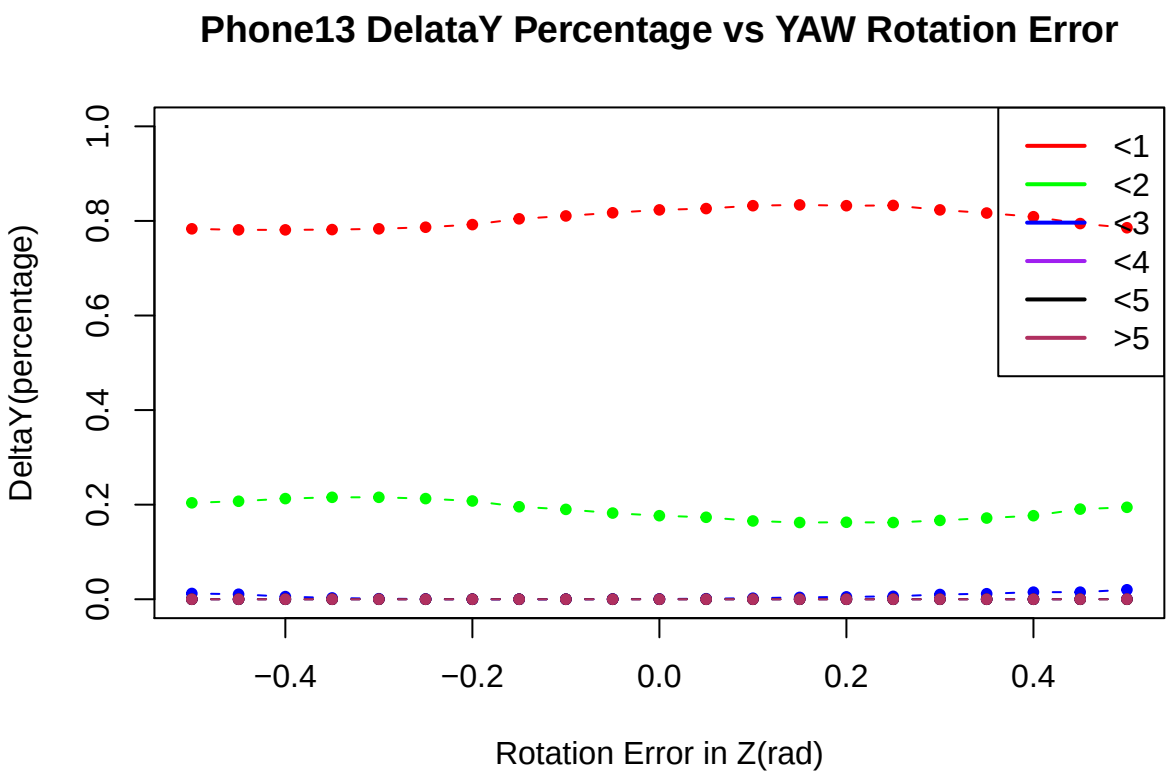


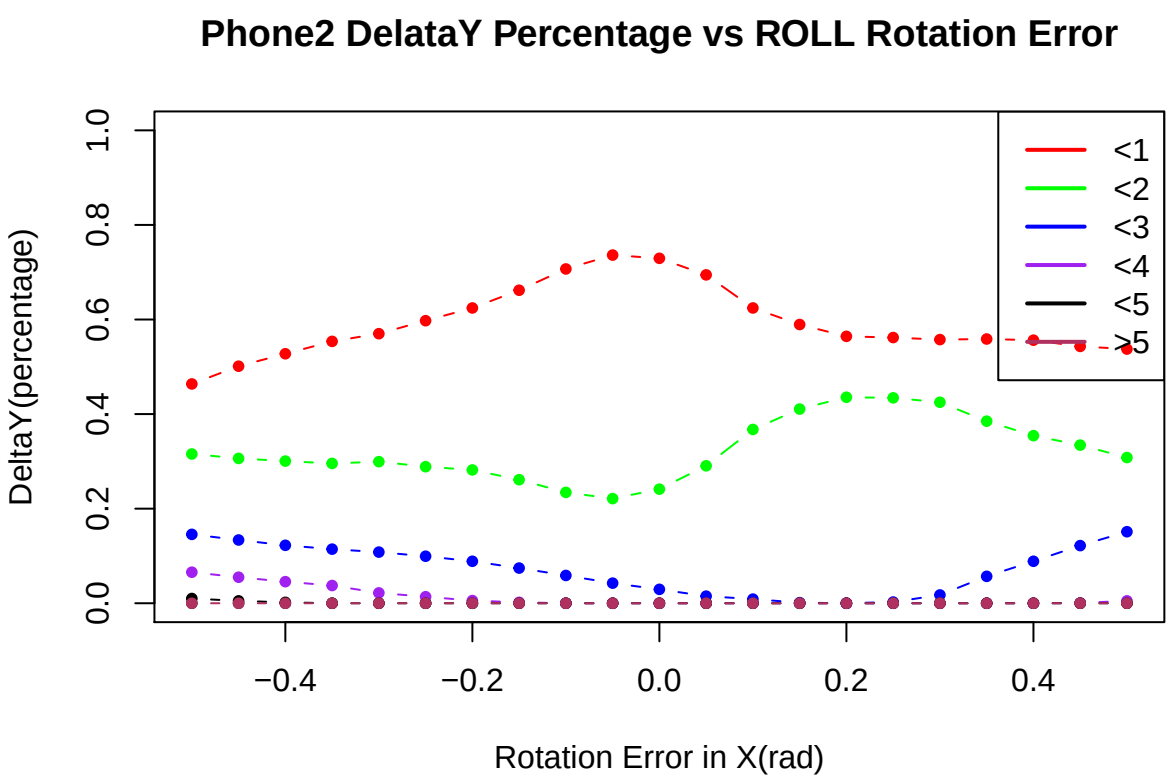

Phone5 DelataY Percentage vs PITCH Rotation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−0.4
−0.2
0.0
0.2
0.4
Rotation Error in Y(rad)
<1
<2
<3
<4
<5
>5

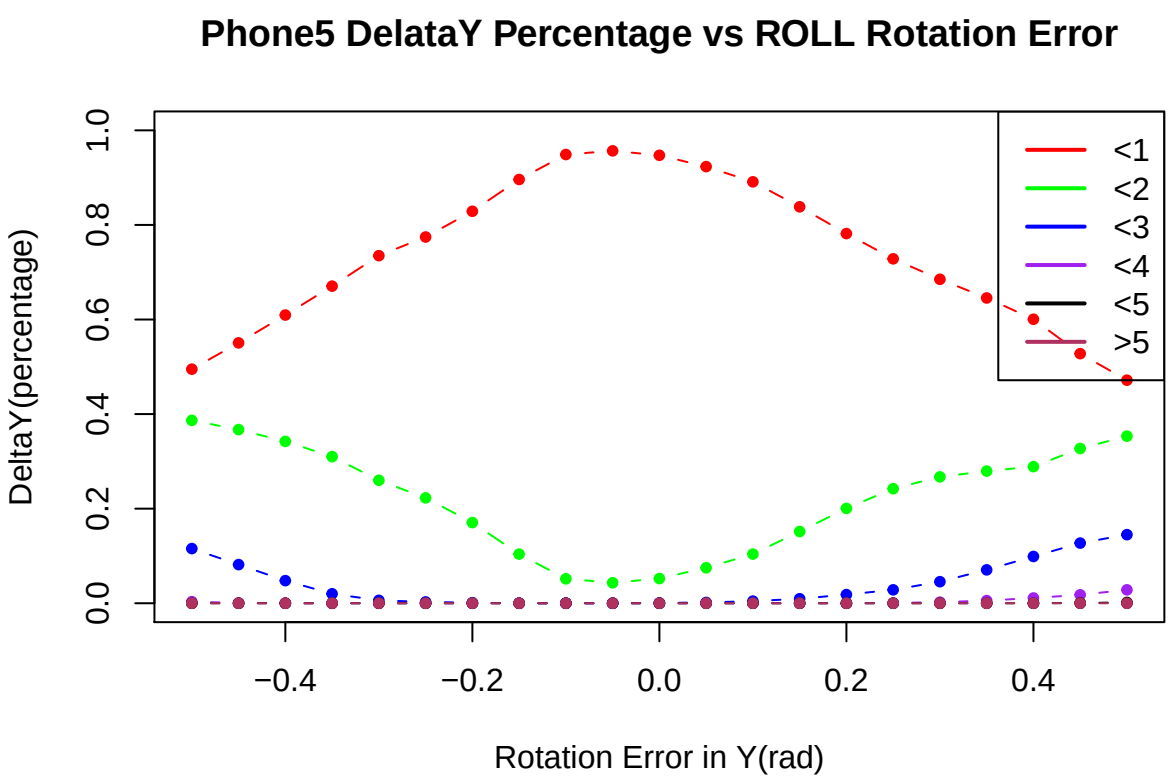

Phone13 DelataY Percentage vs PITCH Rotation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−0.4
−0.2
0.0
0.2
0.4
Rotation Error in Z(rad)
<1
<2
<3
<4
<5
>5

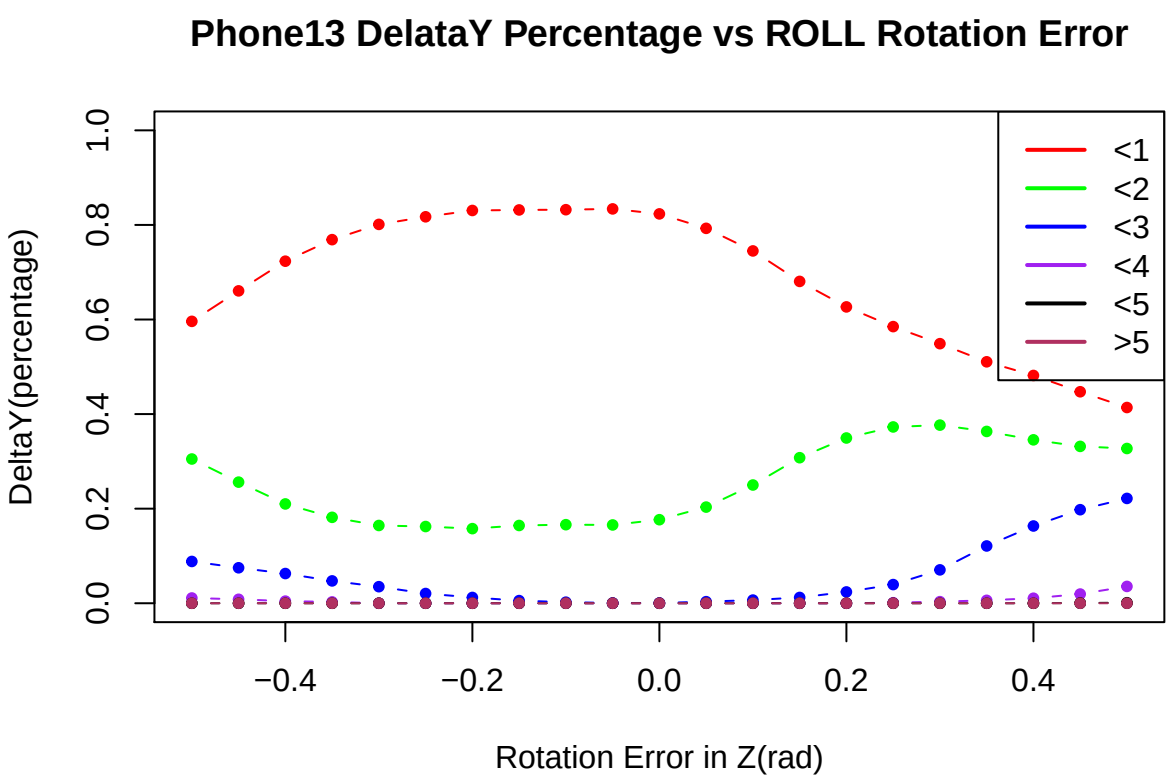

Phone2 DelataY Percentage vs YAW Rotation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−0.4
−0.2
0.0
0.2
0.4
Rotation Error in X(rad)
<1
<2
<3
<4
<5
>5


Phone5 DelataY Percentage vs YAW Rotation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−0.4
−0.2
0.0
0.2
0.4
Rotation Error in Y(rad)
<1
<2
<3
<4
<5
>5


Phone13 DelataY Percentage vs YAW Rotation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−0.4
−0.2
0.0
0.2
0.4
Rotation Error in Z(rad)
<1
<2
<3
<4
<5
>5


Phone2 DelataY Percentage vs ROLL Rotation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−0.4
−0.2
0.0
0.2
0.4
Rotation Error in X(rad)
<1
<2
<3
<4
<5
>5


Phone5 DelataY Percentage vs ROLL Rotation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−0.4
−0.2
0.0
0.2
0.4
Rotation Error in Y(rad)
<1
<2
<3
<4
<5
>5


Phone13 DelataY Percentage vs ROLL Rotation Error
DeltaY(percentage)
0.0
0.2
0.4
0.6
0.8
1.0
−0.4
−0.2
0.0
0.2
0.4
Rotation Error in Z(rad)
<1
<2
<3
<4
<5
>5