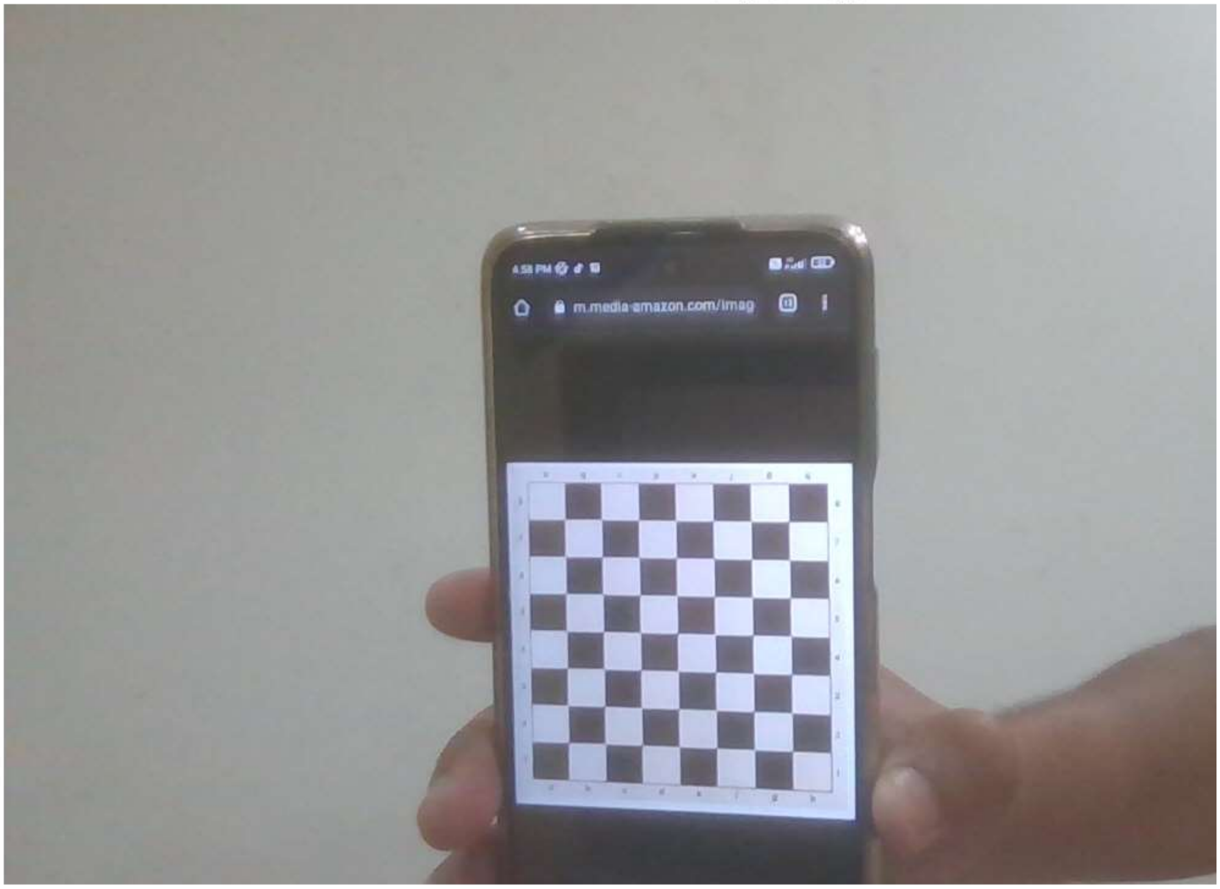
Camera Parameter Estimation

```
checkerboardPatterns = imageDatastore("C:\Users\laksh\Desktop\CheckBoard_Pattern", "FileExtensions",'.jpg');
imageFileNames = checkerboardPatterns.Files;

for i= 1:size(imageFileNames)
    img = imread(imageFileNames{i});
%     %To Check the readed image
    if i == 1
    figure, imshow(img), title("Original Image");
    end
end
```

Original Image



```
% class(checkerboardPatterns.Files)

% Detect checkerboards in images

% size(imageFileNames) is 32 so we are doing for 10 images only
[imagePoints, boardSize, imagesUsed] = detectCheckerboardPoints(imageFileNames(1:11));
```

```
Warning: The checkerboard must be asymmetric: one side should be even, and the other should be odd. Otherwise, the orien
incorrectly.
```

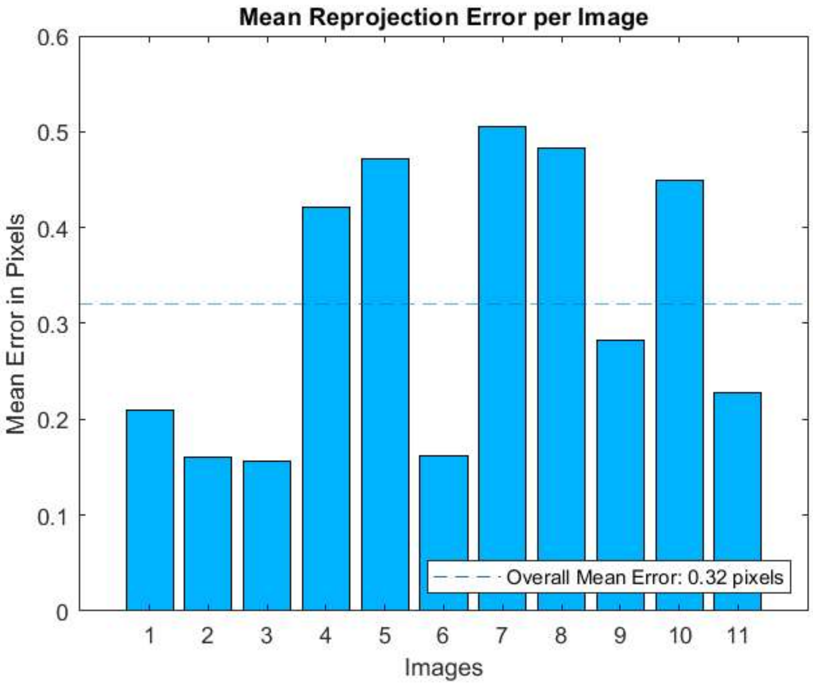
```
imageFileNames = imageFileNames(imagesUsed);
```

```
% Read the first image to obtain image size
originalImage = imread(imageFileNames{1});
```

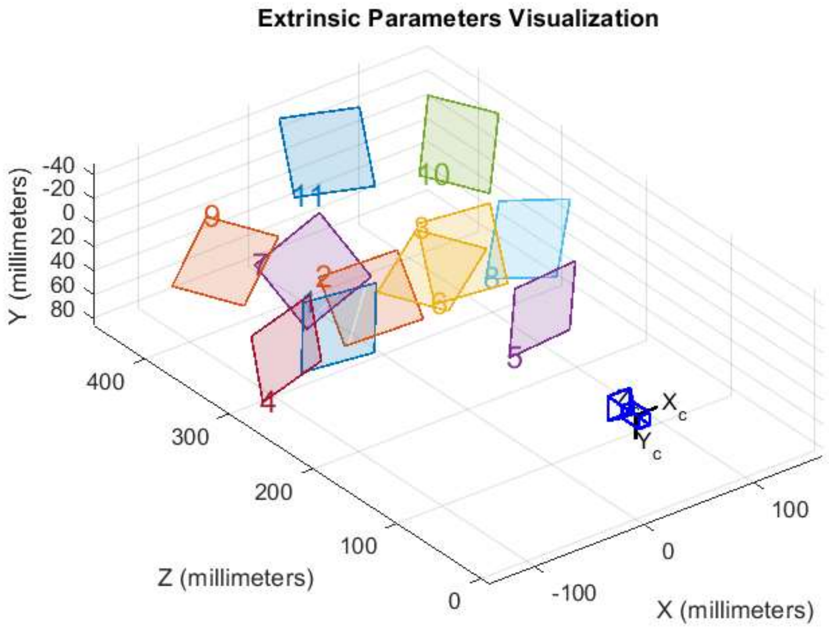
```
[mrows, ncols, ~] = size(originalImage);
```

```
% Generate world coordinates of the corners of the squares
squareSize = 10;  % in units of 'millimeters'
worldPoints = generateCheckerboardPoints(boardSize, squareSize);

% Calibrate the camera
[cameraParams, imagesUsed, estimationErrors] = estimateCameraParameters(imagePoints, worldPoints, ...
    'EstimateSkew', false, 'EstimateTangentialDistortion', false, ...
    'NumRadialDistortionCoefficients', 2, 'WorldUnits', 'millimeters', ...
    'InitialIntrinsicMatrix', [], 'InitialRadialDistortion', [], ...
    'ImageSize', [mrows, ncols]);
```

```
% View reprojection errors
h1=figure; showReprojectionErrors(cameraParams);
```



```

% Visualize pattern locations
h2=figure; showExtrinsics(cameraParams, 'CameraCentric');
```



```
% Display parameter estimation errors
displayErrors(estimationErrors, cameraParams);
```

```
                        Standard Errors of Estimated Camera Parameters
                        ----------------------------------------------


Intrinsics
----------
Focal length (pixels):   [  968.5903 +/- 8.0028      956.8234 +/- 7.9712  ]
Principal point (pixels):[  657.6326 +/- 3.7318      339.9859 +/- 2.9612  ]
Radial distortion:       [    0.0828 +/- 0.0093       -0.2015 +/- 0.0208  ]

Extrinsics
----------
Rotation vectors:
                         [    0.0531 +/- 0.0040        0.1585 +/- 0.0032       -0.0076 +/- 0.0007  ]
                         [   -0.1347 +/- 0.0035        0.5283 +/- 0.0038       -0.2926 +/- 0.0009  ]
                         [    0.2507 +/- 0.0038        0.3538 +/- 0.0045        0.4165 +/- 0.0008  ]
```

```
% % For example, you can use the calibration data to remove effects of lens distortion.
% undistortedImage = undistortImage(originalImage, cameraParams);

% Im = [originalImage undistortedImage];
% image(Im)
% axis image off
```