

## **REPORT**

# **521H3: Image Processing**

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## **Introduction**

This report contains some comments on the real photographs that has been provided in Photos.zip and i have solved 100% of the images i have added in the resultSection as well as i have included a table of results for all images in the given format. I have solve the assignment task in submission\_file\_muk.m file i have added details in the functionality description section.

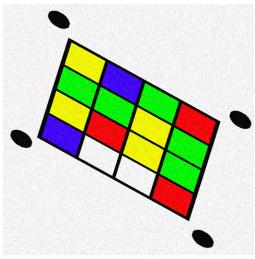
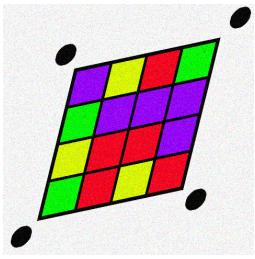
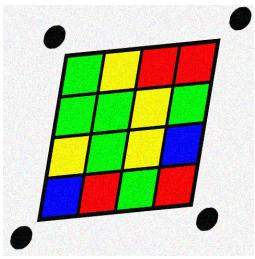
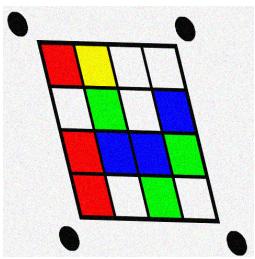
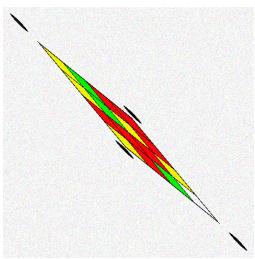
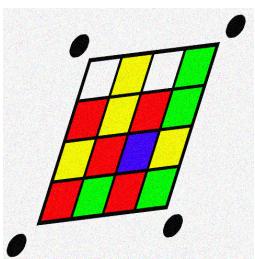
## **Result:**

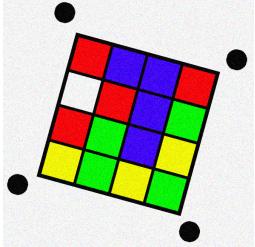
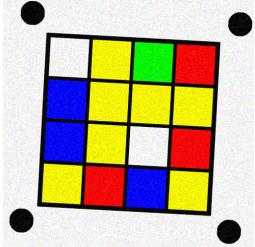
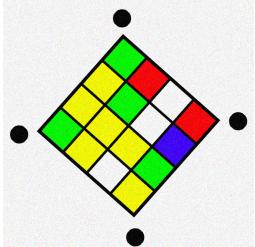
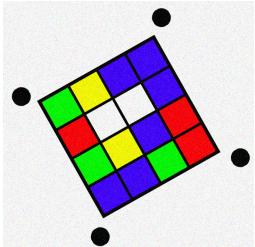
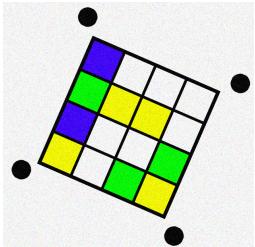
Mean score is 100.00

**Table 1: Results Table**

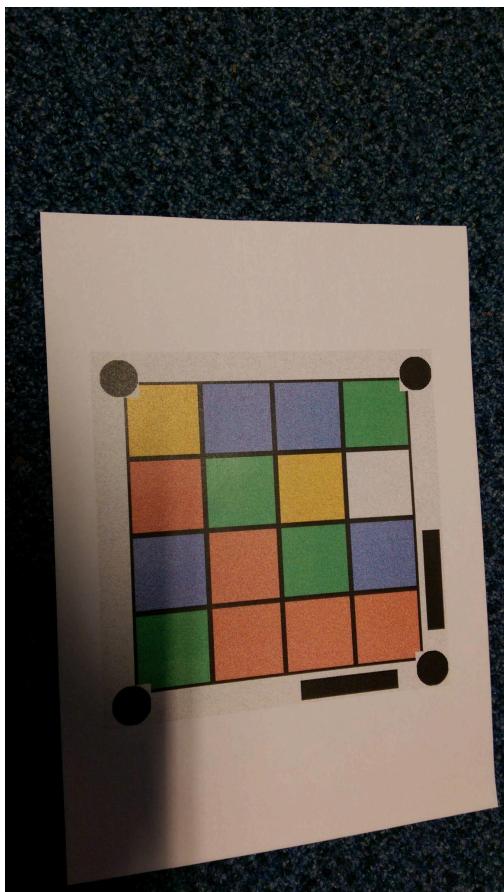
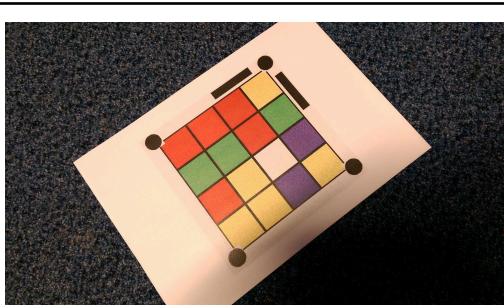
	Image	Output	Success	Notes
noise_1.png		<pre> {'blue' }   {'white' }   {'red' }   {'green' } {'white' }   {'blue' }   {'red' }   {'blue' } {'blue' }   {'red' }   {'blue' }   {'yellow'} {'green' }   {'yellow'}   {'green' }   {'green' } </pre>	passed	null
noise_2.png		<pre> {'green' }   {'yellow'}   {'green' }   {'blue' } {'red' }   {'white' }   {'blue' }   {'blue' } {'red' }   {'blue' }   {'red' }   {'blue' } {'yellow'}   {'blue' }   {'red' }   {'white' } </pre>	passed	null
noise_3.png		<pre> {'green' }   {'green' }   {'red' }   {'red' } {'green' }   {'red' }   {'blue' }   {'red' } {'blue' }   {'red' }   {'red' }   {'white' } {'blue' }   {'red' }   {'white' }   {'white' } </pre>	passed	null
noise_4.png		<pre> {'green' }   {'yellow'}   {'green' }   {'green' } {'white' }   {'yellow'}   {'red' }   {'red' } {'blue' }   {'yellow'}   {'blue' }   {'blue' } {'white' }   {'blue' }   {'red' }   {'white' } </pre>	passed	null
noise_5.png		<pre> {'white' }   {'red' }   {'white' }   {'yellow' } {'red' }   {'yellow'}   {'white' }   {'yellow' } {'green' }   {'red' }   {'green' }   {'red' } {'red' }   {'yellow'}   {'blue' }   {'white' } </pre>	passed	null

org_1.png		<pre> ['yellow']  {'white'}  {'blue'}  {'red'} {'white'}  {'green'}  {'yellow'}  {'white'} {'green'}  {'blue'}  {'red'}  {'red'} {'yellow'}  {'yellow'}  {'yellow'}  {'blue'} </pre>	passed	null
org_2.png		<pre> {'blue'}  {'yellow'}  {'blue'}  {'blue'} {'white'}  {'red'}  {'white'}  {'yellow'} {'green'}  {'yellow'}  {'green'}  {'yellow'} {'yellow'}  {'blue'}  {'green'}  {'red'} </pre>	passed	null
org_3.png		<pre> ['green']  {'yellow'}  {'red'} {'blue'}  {'yellow'}  {'blue'} {'white'}  {'blue'}  {'green'} {'white'}  {'blue'}  {'blue'} </pre>	passed	null
org_4.png		<pre> ['green']  {'yellow'}  {'blue'} {'red'}  {'blue'}  {'white'} {'green'}  {'yellow'}  {'yellow'} {'blue'}  {'blue'}  {'blue'} </pre>	passed	null
org_5.png		<pre> ['yellow']  {'blue'}  {'red'} {'red'}  {'blue'}  {'green'} {'yellow'}  {'yellow'}  {'red'} {'yellow'}  {'white'}  {'green'} </pre>	passed	null
proj_1.png		<pre> ['yellow']  {'white'}  {'red'} {'blue'}  {'white'}  {'red'} {'red'}  {'red'}  {'yellow'} </pre>	passed	null

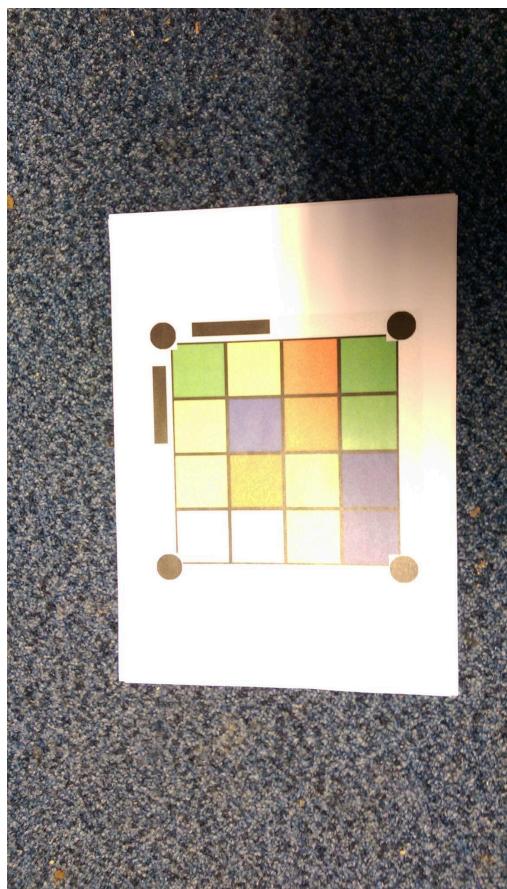
proj_2. png		<pre>{'yellow'}  {'blue'}  {'green'}  {'red'} {'green'}  {'green'}  {'yellow'}  {'green'} {'yellow'}  {'red'}   {'yellow'}  {'green'} {'blue'}   {'white'}  {'white'}   {'red'}</pre>	passed	null
proj_3. png		<pre>{'blue'}   {'yellow'}  {'red'}   {'green'} {'green'}  {'blue'}   {'blue'}   {'blue'} {'yellow'}  {'red'}   {'red'}   {'blue'} {'green'}  {'red'}   {'yellow'}  {'red'}</pre>	passed	null
proj_4. png		<pre>{'green'}  {'yellow'}  {'red'}   {'red'} {'green'}  {'green'}   {'yellow'}  {'green'} {'yellow'}  {'green'}  {'yellow'}  {'blue'} {'blue'}   {'red'}   {'green'}  {'red'}</pre>	passed	null
proj_5. png		<pre>{'red'}   {'yellow'}  {'white'}  {'white'} {'white'}  {'green'}   {'white'}  {'blue'} {'red'}   {'blue'}   {'blue'}   {'green'} {'red'}   {'white'}  {'green'}  {'white'}</pre>	passed	null
proj_6. png		<pre>{'yellow'}  {'green'}  {'red'}   {'red'} {'yellow'}  {'green'}  {'yellow'}  {'red'} {'red'}   {'red'}   {'red'}   {'yellow'} {'yellow'}  {'red'}   {'green'}  {'white'}</pre>	passed	null
proj_7. png		<pre>{'white'}  {'yellow'}  {'white'}  {'green'} {'red'}   {'yellow'}  {'red'}   {'green'} {'yellow'}  {'red'}   {'blue'}  {'yellow'} {'red'}   {'green'}  {'red'}   {'green'}</pre>	passed	null

rot_1.png		[{"red"}, {"blue"}, {"blue"}, {"white"}, {"red"}, {"green"}, {"red"}, {"green"}, {"yellow"}]	passed	null
rot_2.png		[{"white"}, {"yellow"}, {"green"}, {"blue"}, {"yellow"}, {"yellow"}, {"blue"}, {"yellow"}, {"yellow"}]	passed	null
rot_3.png		[{"green"}, {"red"}, {"white"}, {"yellow"}, {"green"}, {"white"}, {"yellow"}, {"yellow"}, {"yellow"}]	passed	null
rot_4.png		[{"green"}, {"yellow"}, {"blue"}, {"red"}, {"white"}, {"white"}, {"green"}, {"yellow"}, {"blue"}]	passed	null
rot_5.png		[{"blue"}, {"white"}, {"white"}, {"green"}, {"yellow"}, {"yellow"}, {"blue"}, {"white"}, {"green"}]	passed	null

## Real-world photo analysis

filename	image	remarks
<b>IMAG 0032</b>		<pre> {'yellow'}    {'blue' }    {'blue' } {'green' } {'red' }     {'green'}    {'yellow'}  {'white' } {'blue' }    {'red' }     {'green' }  {'blue' } {'green' }   {'red' }     {'red' }   {'red' } </pre> <p>To remove distortion from this image  <b>Estimategeometrictransform</b> and <b>undistortImage</b> function can be used from matlab.  We can also use radial distortion correction etc.</p>
<b>IMAG 0033</b>		<pre> {'red' }    {'red' }    {'red' }  {'yellow' } {'green' }   {'green'}   {'red'}   {'green' } {'red' }    {'yellow' }  {'white' }  {'blue' } {'yellow'}  {'yellow' }  {'blue' }  {'yellow' } </pre> <p>Clockwise rotation can be used.</p>

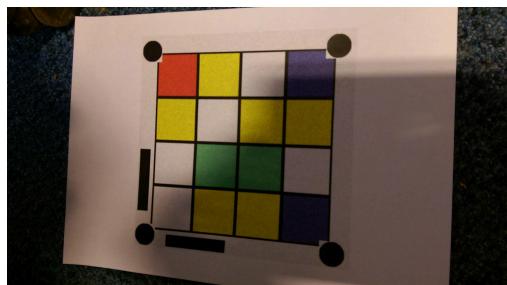
**IMAG  
0034**



```
{'green' }   {'yellow' }   {'red' }   {'green' }
{'yellow' }   {'blue' }    {'red' }   {'green' }
{'yellow' }   {'red' }    {'white' }  {'blue' }
{'white' }   {'white' }   {'white' }  {'blue' }
```

To improve this image contrast and reduce the overexposure effect due to light we can reduce saturation and use power law function to pixel intensities.

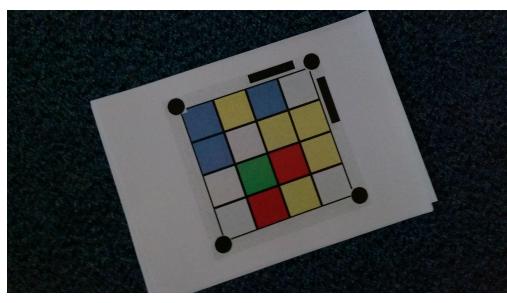
**IMAG  
0035**



```
{'red' }    {'yellow' }   {'white' }  {'blue' }
{'yellow' }   {'white' }    {'yellow' }  {'yellow' }
{'white' }   {'green' }    {'green' }   {'white' }
{'white' }   {'yellow' }   {'yellow' }  {'blue' }
```

Rotation to take the image right place and there might be some dark shadow of some objects , so shadow removal technique like thresholding, morphological operations can be performed.

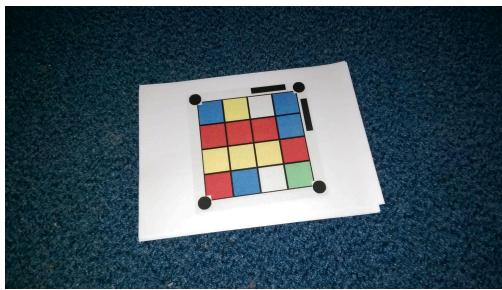
**IMAG  
0036**



```
{'blue' }   {'yellow' }   {'blue' }   {'white' }
{'blue' }   {'white' }    {'yellow' }  {'yellow' }
{'white' }   {'green' }    {'red' }    {'yellow' }
{'white' }   {'red' }     {'yellow' }  {'white' }
```

This image looks under inadequate lights.Gamma Correction, histogram stretching can be used.

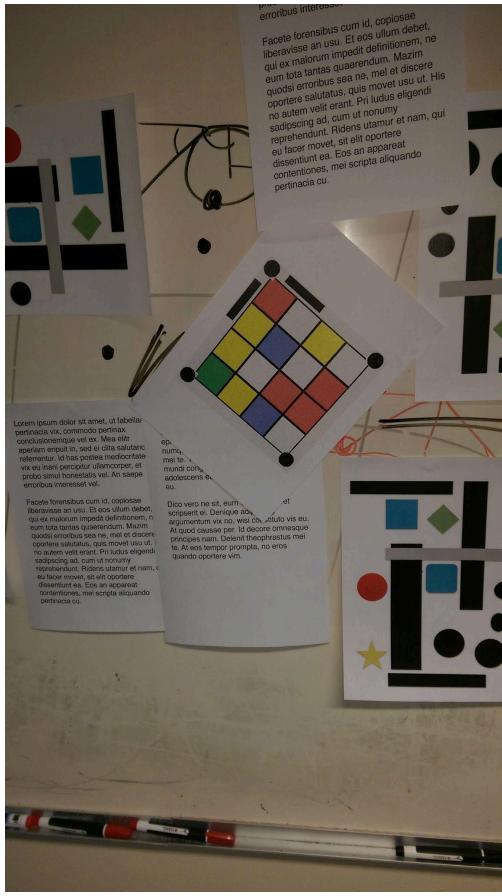
**IMAG  
0037**



```
{'blue' }   {'yellow' }   {'white' }   {'blue' }
{'red' }    {'red'}      {'red'}      {'blue' }
{'yellow'}  {'yellow' }  {'yellow' }  {'red'}
{'red'}    {'blue' }    {'white' }   {'green'}
```

As this rgb colour looks more white/brighter, gamma correction or hist equalisation can be used to adjust the contrast.

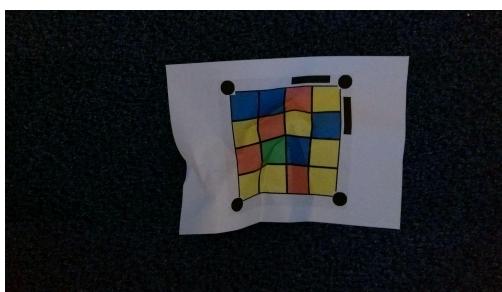
**IMAG  
0038**



```
{'green' }   {'yellow' }   {'yellow' }   {'red' }
{'yellow' }  {'white'}    {'blue' }    {'white' }
{'blue'}     {'red' }     {'white'}    {'yellow' }
{'white'}    {'red'}     {'red'}     {'white' }
```

Rotate clockwise 45 degree angle on X-axis and have to apply colour correction.

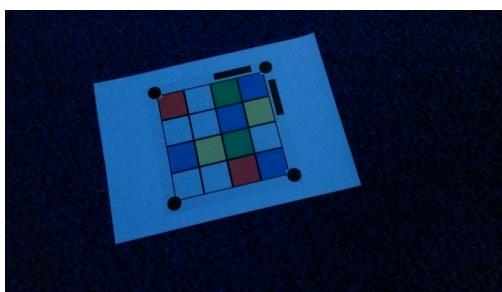
**IMAG  
0041**



```
{'blue'}    {'blue'}    {'red'}    {'yellow'}  
'yellow'}   {'red'}    {'yellow'}  {'blue'}  
{'red'}     {'green'}   {'blue'}    {'yellow'}  
{'yellow'}   {'yellow'}  {'red'}    {'yellow'}
```

This image contains wrap that seems like it has been crumpled so we can utilise 3d-projection transformation techniques here.

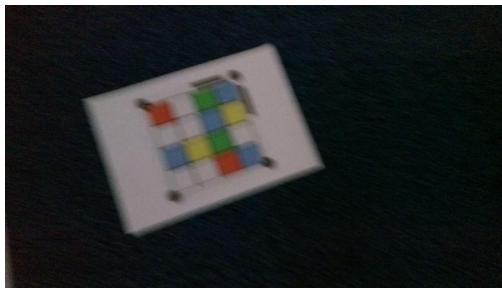
**IMAG  
0042**



```
{'red' }   {'white' }   {'green'}  {'blue'}  
{'white' }  {'white' }   {'blue'}   {'yellow'}  
{'blue'}   {'yellow'}    {'green'}   {'white' }  
{'white' }  {'white' }   {'red' }   {'blue' }
```

I need to rotate a bit clockwise to utilise imrotate 1 degree or like this smaller amount rotation.

**IMAG  
0044**



```
{'red' }   {'white' }   {'green'}  {'blue'}  
{'white' }  {'white' }   {'blue'}   {'yellow'}  
{'blue'}   {'yellow'}    {'green'}   {'white' }  
{'white' }  {'white' }   {'red' }   {'blue' }
```

As this image is blurred I need to utilize a sharpening filter to enhance the sharpness.

## **Functionality Description:**

### **submissionfile:**

Inside of findcolor detect function i have performed

- Image correction(correcting distortion)
- image colour detection(which detects and returns the colour are present in each image it returning the detected colours for further use)
- Function image
  - Read and prepare the image and ensure converting to a double precision formatt using im2double
- Function circle coordinates
  - Detects the largest blackcircles from input images and returned coordinates.
  - To return the coordinates of the four largest blk circles
  - It use rgb to gray to convert image into grayscale
  - Where, using graythresh create binary images of grayscale image then
  - It inverts binary image and identify dark circles using inv\_bin\_img
  - Then it connect components and extract coordinates
  - Sort and adjust coordinates and return.
- Function correctImage i use to
  - correct distortions in the image
  - To improve the quality of the image
  - To enhance the contrast
  - And to suppresses glare
- In my image processing another function called getColors did the colour Analysison input image and return dominant colour.

**Thank You SIR**