Fun with sampling, registration, and quantization

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Contents

Reset envrioment

```
clear all;
close all;
```

Read in images

```
sky_full_im = imread('sky.jpg');
bricks_full_im = imread('bricks.jpg');
```

Sampling and Resizing

Here we resize the sky image with antialising off and on.

```
sky_128_aliased=imresize(sky_full_im, [128 128], 'Antialiasing',false);
sky_128 = imresize(sky_full_im, [128 128]);
```

Here we show the aliased sky image

```
figure;
imshow(sky_128_aliased);
```

And now wae shoe the anti-aliased sky image

```
figure;
imshow(sky_128);
```

In the case of the above images it is hard to see the effects of aliasing on both images

Here we resize the bricks image with antialsing off and on.

```
bricks_128_aliased=imresize(bricks_full_im, [128 128], 'Antialiasing',false);
bricks_128 = imresize(bricks_full_im, [128 128]);
```

Here we show the aliased sky image

```
figure;
imshow(bricks_128_aliased);
```

And now wae shoe the anti-aliased sky image

```
figure;
imshow(bricks_128);
```

With the above images we can see that with the antialising off we see aliasing in the bricks. Turning it on results in a better picture.

Resizing the images using nearest neighboor interpolation. Aliased Image first then antialiased.

```
figure;
sky_512_aliased_nearest=imresize(sky_128_aliased,[512 512], 'method', 'nearest');
imshow(sky_512_aliased_nearest)
sky_512_nearest=imresize(sky_128,[512 512], 'method', 'nearest');
figure;
imshow(sky_512_nearest)
bricks_512_aliased_nearest=imresize(bricks_128_aliased,[512 512], 'method', 'nearest');
figure;
imshow(bricks_512_aliased_nearest)
bricks_512_nearest=imresize(bricks_128,[512 512], 'method', 'nearest');
figure;
imshow(bricks_512_nearest)
```

Interpolation with bilinear

```
sky_512_aliased_linear=imresize(sky_128_aliased,[512 512], 'method', 'bilinear');
figure;
imshow(sky_512_aliased_linear)
sky_512_linear=imresize(sky_128,[512 512], 'method', 'bilinear');
figure;
imshow(sky_512_linear)
bricks_512_aliased_linear=imresize(bricks_128_aliased,[512 512], 'method', 'bilinear');
figure;
imshow(bricks_512_aliased_linear)
bricks_512_linear=imresize(bricks_128,[512 512], 'method', 'bilinear');
figure;
imshow(bricks_512_linear)
```

Interpolation with bicubic

```
sky_512_aliased_cubic=imresize(sky_128_aliased,[512 512], 'method', 'bicubic');
figure;
imshow(sky_512_aliased_cubic)
sky_512_cubic=imresize(sky_128,[512 512], 'method', 'bicubic');
figure;
imshow(sky_512_cubic)
bricks_512_aliased_cubic=imresize(bricks_128_aliased,[512 512], 'method', 'bicubic');
figure;
imshow(bricks_512_aliased_cubic)
bricks_512_cubic=imresize(bricks_128,[512 512], 'method', 'bicubic');
figure;
imshow(bricks_512_cubic)
```

Quantization

From this point further I will only be using the anti-aliased image Starting with the Sky image

```
sky_128_q = bitset(sky_128,1, 0);
figure;
imshow(sky_128_q)
title('Quantized@7');
for n=2:7
    sky_128_q = bitset(sky_128_q,n, 0);
    figure;
    imshow(sky_128_q);
    title(strcat('Quantized@', num2str(8-n)));
end
```

Quantized@7

Quantized@6

Quantized@5

Quantized@4

Quantized@3

Quantized@2

Quantized@1

I noticed false contouring at quantization level 5.

To correct for this I have added a small amount of noise.

```
sky_128_noise = imnoise(sky_128, 'gaussian',0,0.0001);
sky_128_q = bitset(sky_128_noise,1, 0);
figure;
imshow(sky_128_q)
title('Quantized@7');
for n=2:7
    sky_128_q = bitset(sky_128_q,n, 0);
    figure;
    imshow(sky_128_q);
    title(strcat('Quantized@', num2str(8-n)));
end
```

Quantized@7

Quantized@6

Quantized@5

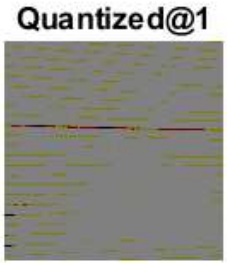
Quantized@4

Quantized@3

Quantized@2

Now with the bricks

```
brick_128_q = bitset(bricks_128,1, 0);
figure;
imshow(brick_128_q)
title('Quantized@7');
for n=2:7
    brick_128_q = bitset(brick_128_q,n, 0);
    figure;
    imshow(brick_128_q);
    title(strcat('Quantized@', num2str(8-n)));
end
```



I noticed false contouring at quantization level 4.

To correct for this I have added a small amount of noise.

```
brick_128_noise = imnoise(bricks_128, 'gaussian',0,0.0001);
brick_128_q = bitset(brick_128_noise,1, 0);
figure;
imshow(brick_128_q)
title('Quantized@7');
for n=2:7
    brick_128_q = bitset(brick_128_q,n, 0);
    figure;
    imshow(brick_128_q);
    title(strcat('Quantized@', num2str(8-n)));
end
```

Quantized@7

Quantized@6

Quantized@5

Quantized@4

Quantized@3

Quantized@2

Quantized@1

Registration and detection

Read in and load the images

```
bg_img = rgb2gray(imread('bg2.jpg'));
fg_img = rgb2gray(imread('fg2.jpg'));

figure;
imshow(bg_img)
title('Background image')
figure;
imshow(fg_img)
title('Foreground image')
```

```
Warning: Image is too big to fit on screen; displaying at 67%
Warning: Image is too big to fit on screen; displaying at 67%
```

Register the Images

```
[optimizer, metric] = imregconfig('Multimodal');

registered = imregister(fg_img, bg_img,'Similarity', optimizer, metric);
figure;
imshowpair(registered, bg_img)
title('Registed Image')
```

```
Warning: Image is too big to fit on screen; displaying at 67%
```

Difference the images

```
d_img = imabsdiff(registered,bg_img);

figure;
imshow(d_img)
title('Differenced Image')
```

```
Warning: Image is too big to fit on screen; displaying at 67%
```

Threshold the image

```
d_img_bw = im2bw(double(d_img)./255, 0.4);
figure;
imshow(d_img_bw)
title('Binary Image')
```

```
Warning: Image is too big to fit on screen; displaying at 67%
```

Published with MATLAB® R2016a