# 数字图像处理　Problem2

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**✥result image from the output .gif:**

***Analysis:***

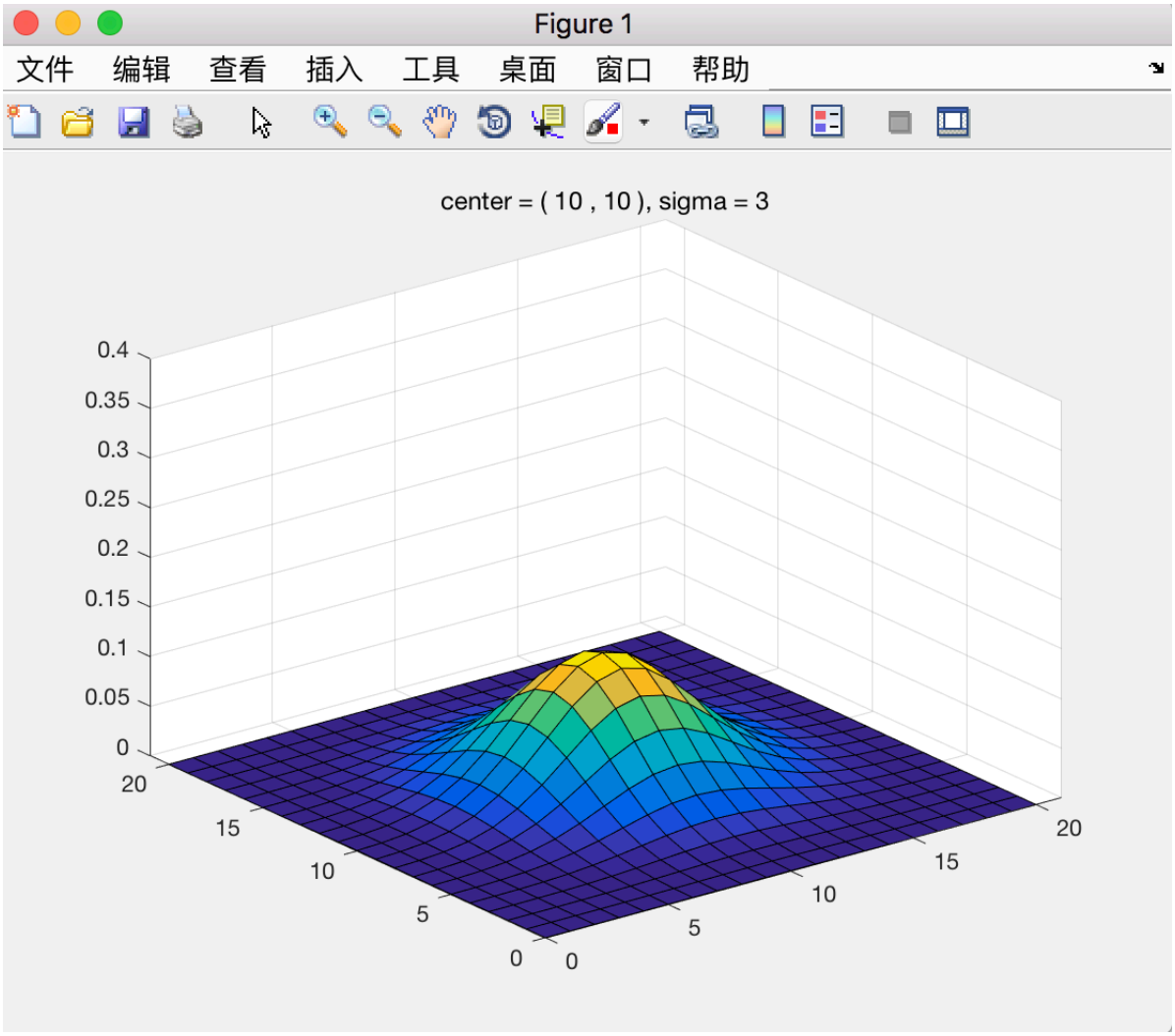
The sigma is changed from 1 to 9; the center is (10,10);

The gaussian expression is

$$f(x,y)=\frac{1}{\sqrt{2\pi}\sigma}e^{-\frac{((x-x_0)^2+(y-y_0)^2)}{2\sigma^2}}$$

$(x_0,y_0)$is the center, $\sigma$ is the sigma, which changed from 1 to 9 in this ***GaussianFunction.gif***

It can be seen form the .gif that as the sigma grows, the gaussian curve flattens out.




**✥code:**

```
clear all
clc
X = 0 : 1 : 20;
Y = 0 : 1 : 20;
figure
filename = 'GaussianFunction.gif';

for sigma = 1:9
    % calculate the value of Z
    Z = zeros(21, 21);
    for row = 1 : 1 : 21
        for col = 1 : 1 : 21
            Z(row, col) = (X(row) - 10) .* (X(row)-10) + (Y(col) - 10) .*
(Y(col) - 10);
        end
    end
    Z = -Z/(2*sigma*sigma);
    Z = exp(Z) / (sqrt(2*pi) * sqrt(sigma*sigma));

    % show the gaussian surface
    surf(X, Y, Z);
    title(sprintf(' center = ( 10 , 10 ), sigma = %d ',sigma));
    axis([0 21 0 21 0 0.1]);

    drawnow
    % get the frame
    frame = getframe(gcf);

    %%To make GIF files, images must be index images
    im = frame2im(frame);
    [A,map] = rgb2ind(im,256);

    %create it at the first time
    if sigma == 1
        imwrite(A,map,filename,'gif','LoopCount',Inf,'DelayTime',0.2);
    else
        %DelayTime is used to set up GIF files to play fast or slow
        imwrite(A,map,filename,'gif','WriteMode','append','DelayTime',0.2);
    end
end
```