

```

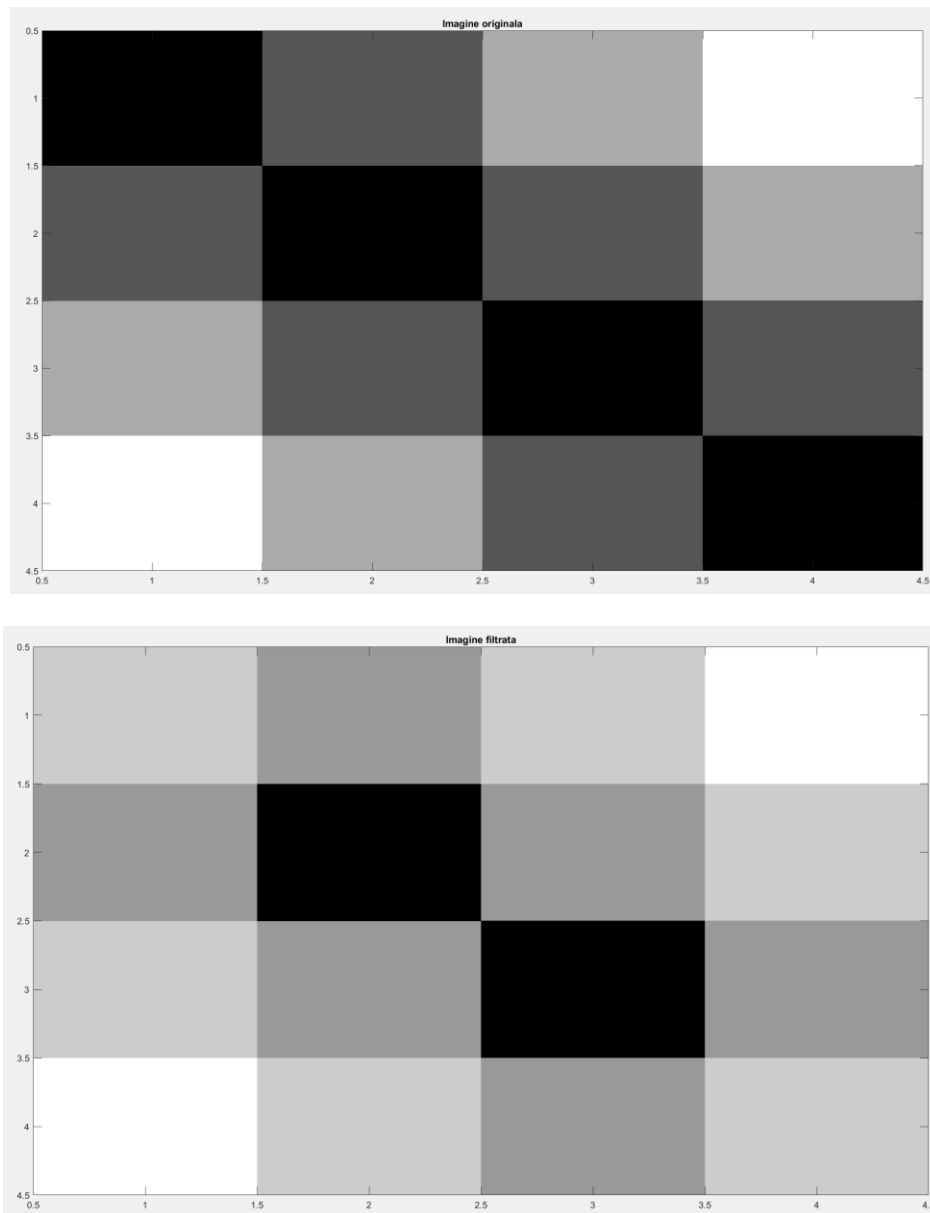
%% Exercițiul 1
% b
A = [ 0 16 32 48;...
      16 0 16 32;...
      32 16 0 16;...
      48 32 16 0];

h = 1/9 * ones(3,3);

figure(1), imagesc(A), colormap gray, title('Imagine originala');

Af = imfilter(A,h,'conv','circular');
figure(2), imagesc(Af), colormap gray, title('Imagine filtrata');

```



```

% c
function C = convolutie(A,h)

    filtru = fliplr(h);

    B = zeros(length(A(1,:))+2,length(A(:,1))+2);
    B(2:length(B(1,:))-1 , 2:length(B(:,1)) - 1) = A;
    B(2:length(B(1,:))-1, length(B(:,length(B(:,1)))))) = A(1:length(A(:,1)),1);
    B(2:length(B(1,:))-1, 1) = A(1:length(A(:,1)),length(A(:,1)));
    B(length(B(1,:)),2:length(B(:,1))-1) = A(1,1:length(A(1,:)));
    B(1,2:length(B(:,1))-1) = A(length(A(1,:)),1:length(A(1,:)));
    B(1,1) = A(length(A(1,:)),length(A(1,:)));
    B(1,length(B(1,:))) = A(length(A(1,:)),1);
    B(length(B(1,:)),1) = A(1,length(A(1,:)));
    B(length(B(1,:)),length(B(1,:))) = A(1,1);

    C = zeros(length(A(1,:)),length(A(:,1)));

    k_l = length(filtru(1,:));
    k_c = length(filtru(:,1));
    b_l = length(B(1,:));
    b_c = length(B(:,1));

    for i = 1:b_l-k_l+1
        for j=1:b_c-k_c+1

            D = B(i:k_l+i-1,j:k_c+j-1).*filtru;
            C(i,j) = sum(D,"all");

        end

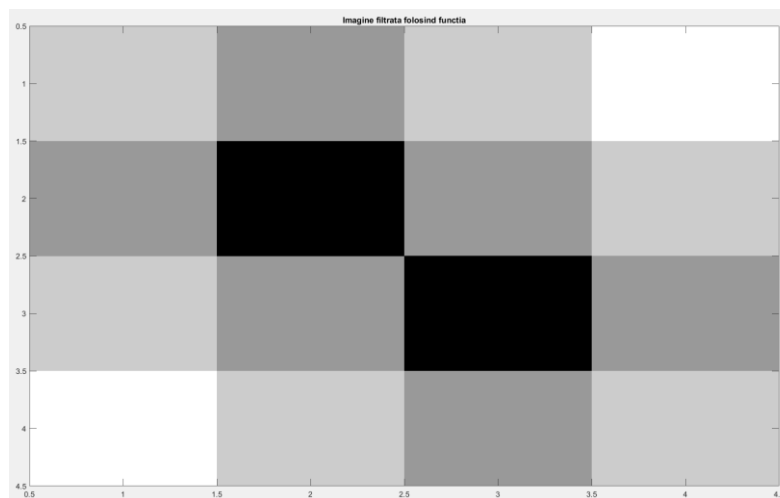
    end

end

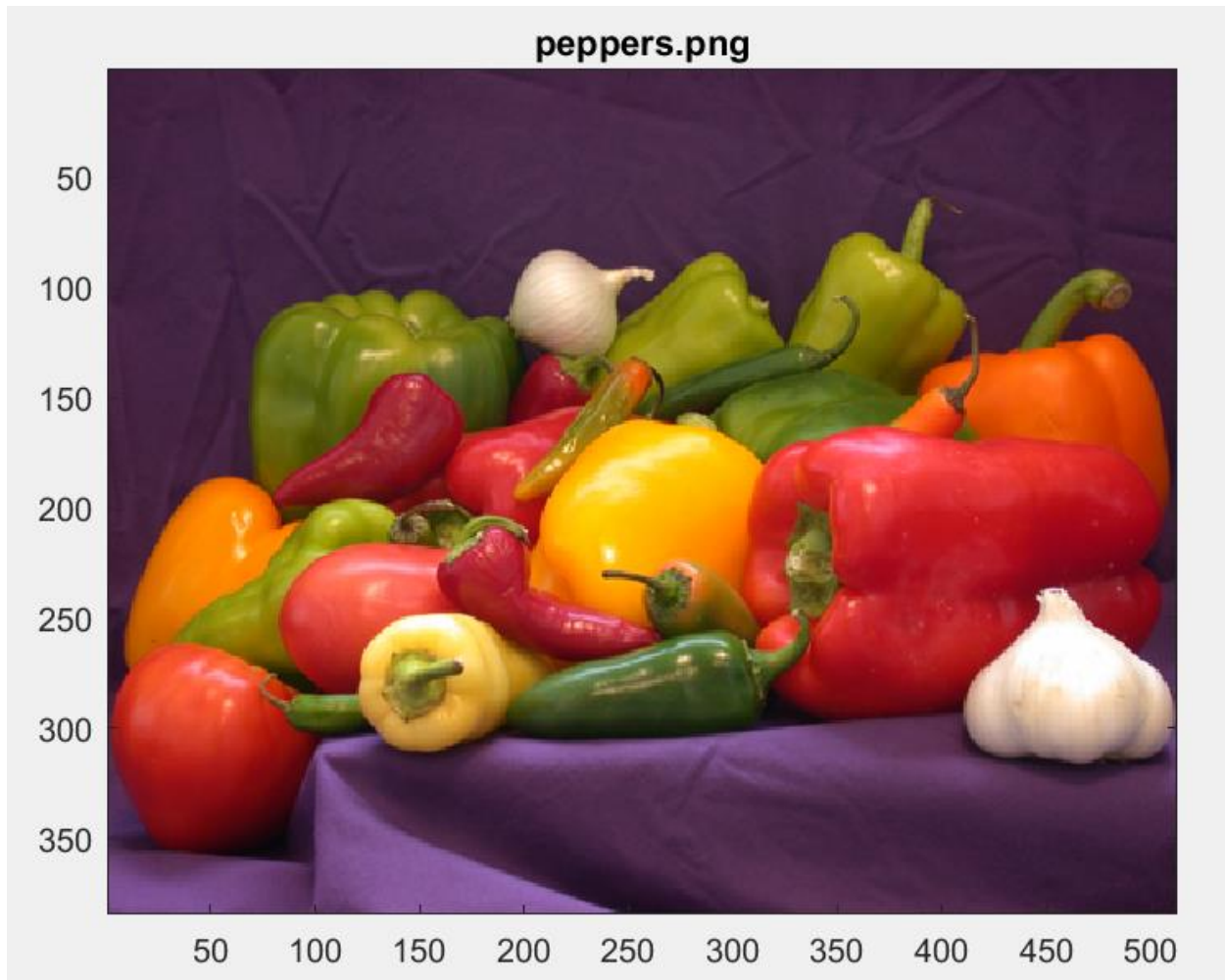
end

B = convolutie(A,h);
figure(3), imagesc(B), colormap gray, title('Imagine filtrata folosind functia');

```

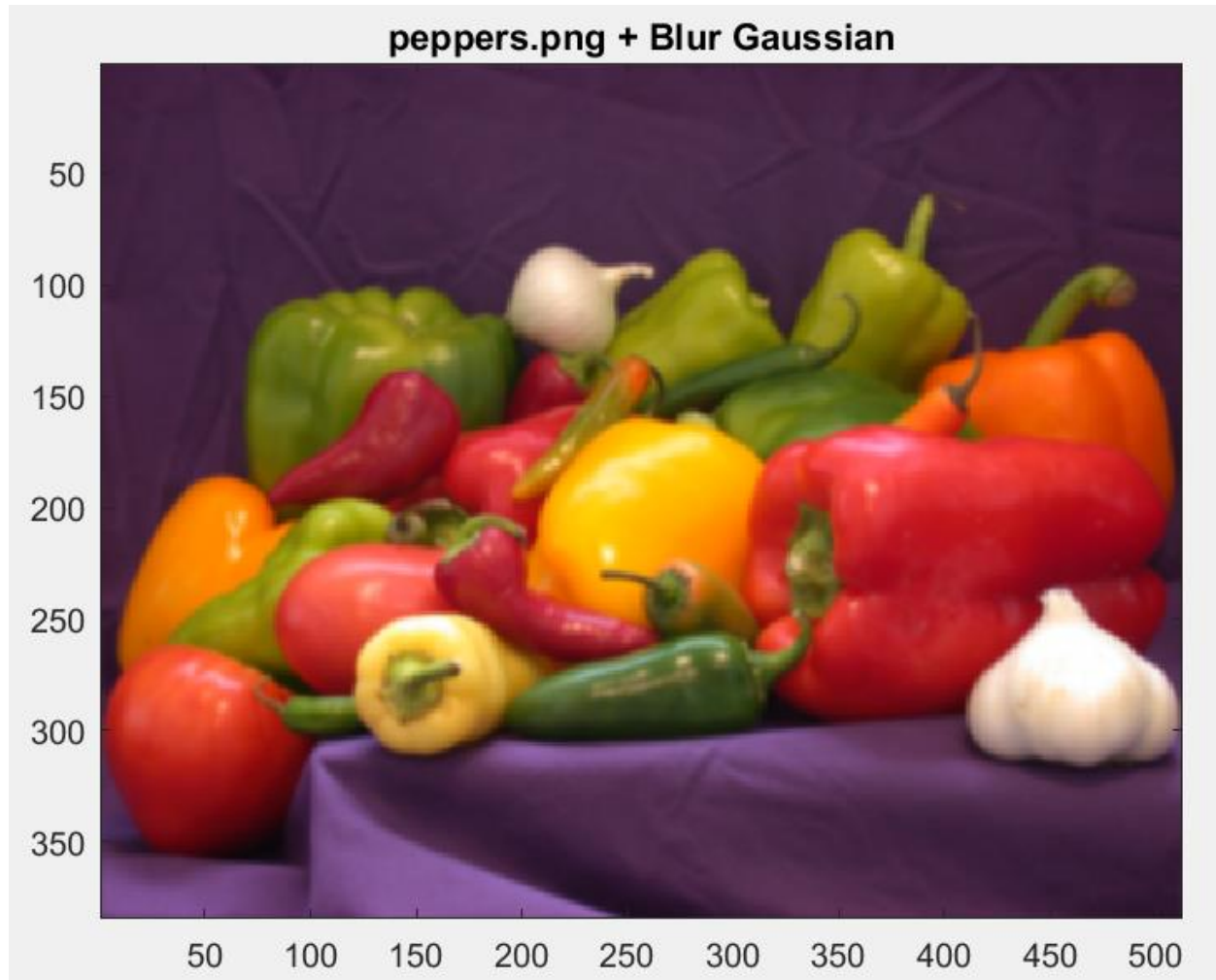


```
%% Exercițiul 2  
% a  
  
image = imread('peppers.png');  
figure(4), imagesc(image), title('peppers.png');
```



```
% b

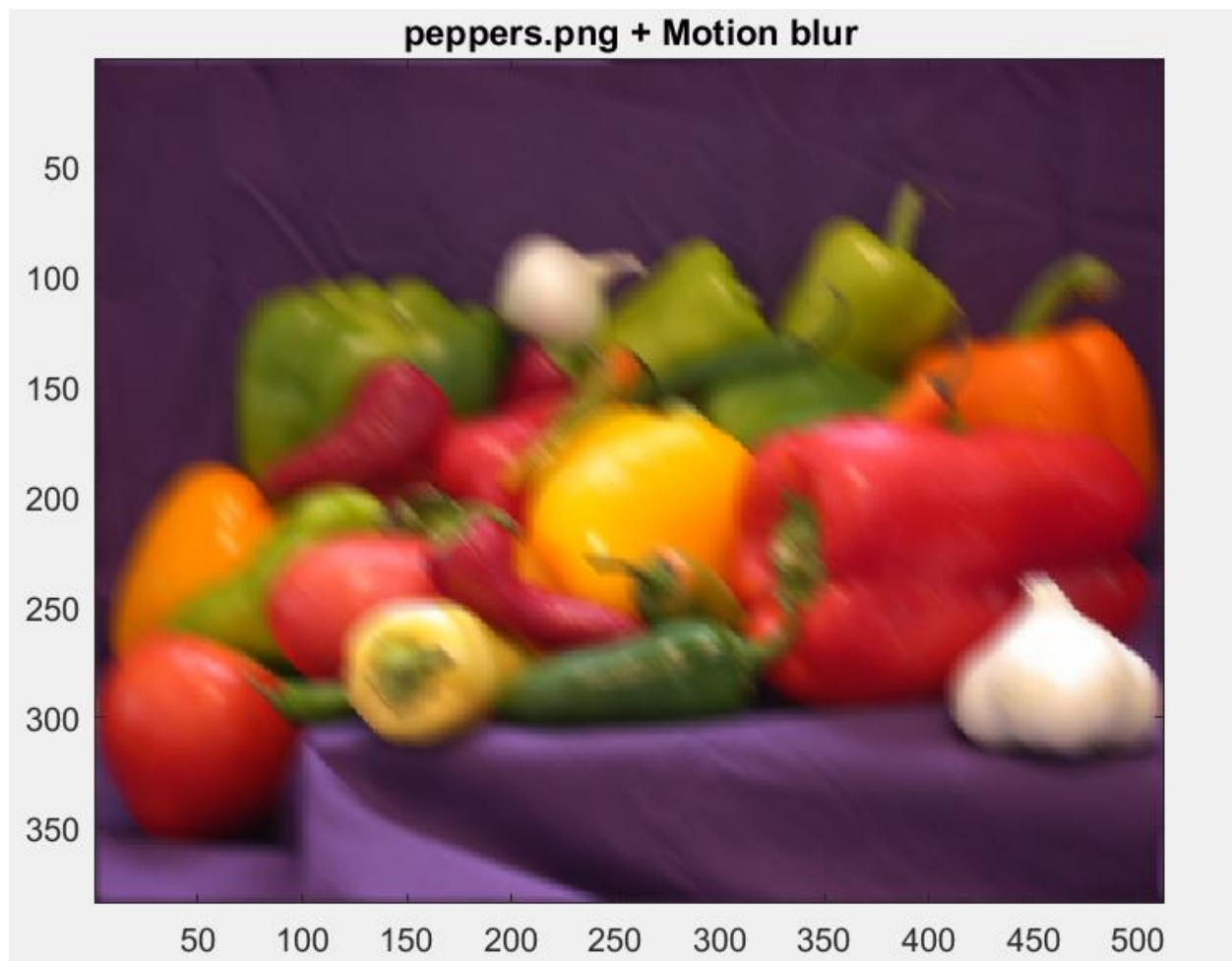
% Blur Gaussian
h = 1/256 * [1 4 6 4 1;...
            4 16 24 16 4;...
            6 24 36 24 6;...
            4 16 24 16 4;...
            1 4 6 4 1];
conv1 = imfilter(image,h,'conv','circular');
figure(5), imagesc(conv1), title('peppers.png + Blur Gaussian');
```



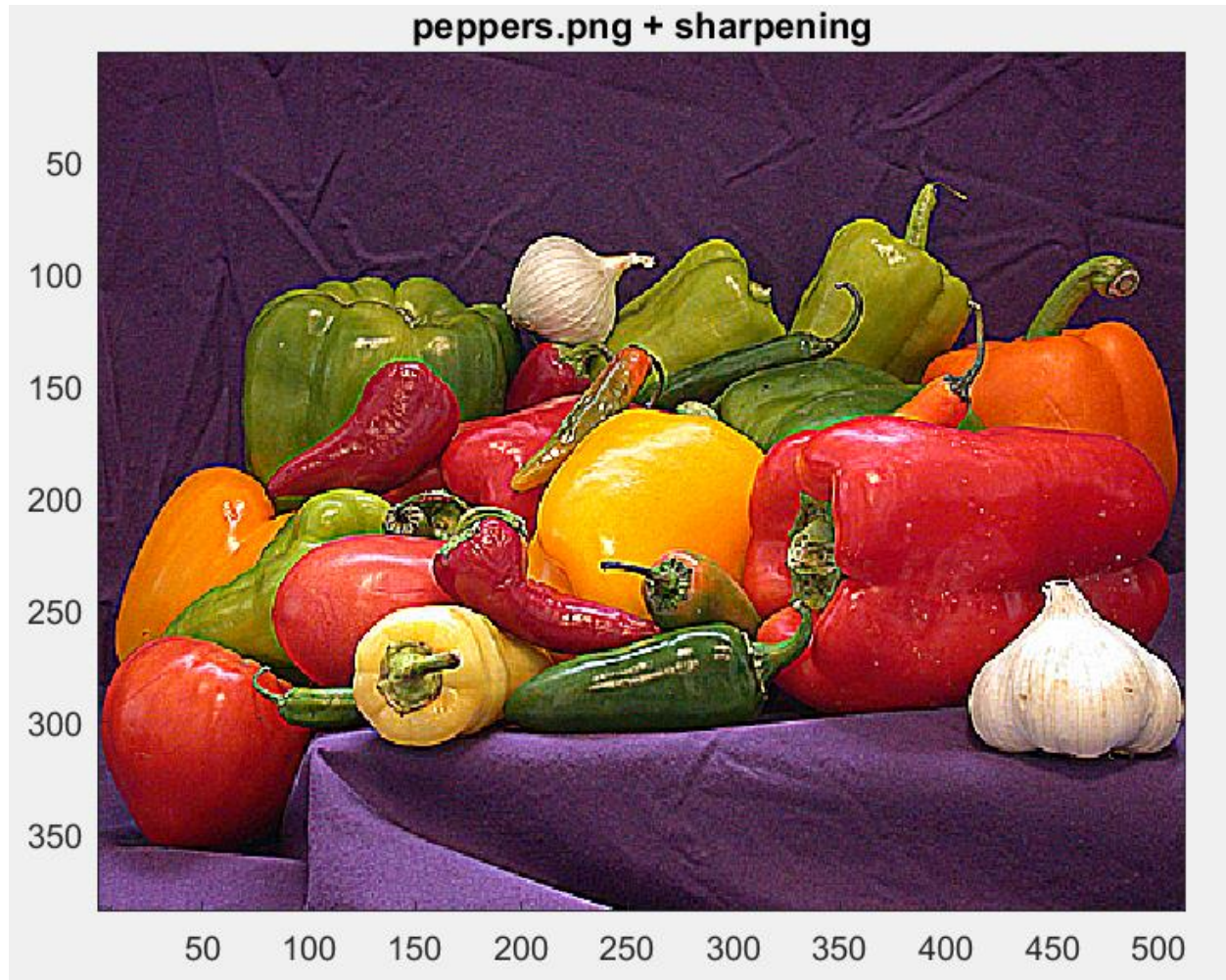
```

% Motion blur
h = zeros(9,9);
for i = 1:length(h)
    for j = 1:length(h)
        if(i==j)
            h(i,j) = 1;
        end
    end
end
h = h/9;
conv2 = imfilter(image,h,'conv','circular');
figure(6), imagesc(conv2), title('peppers.png + Motion blur');

```



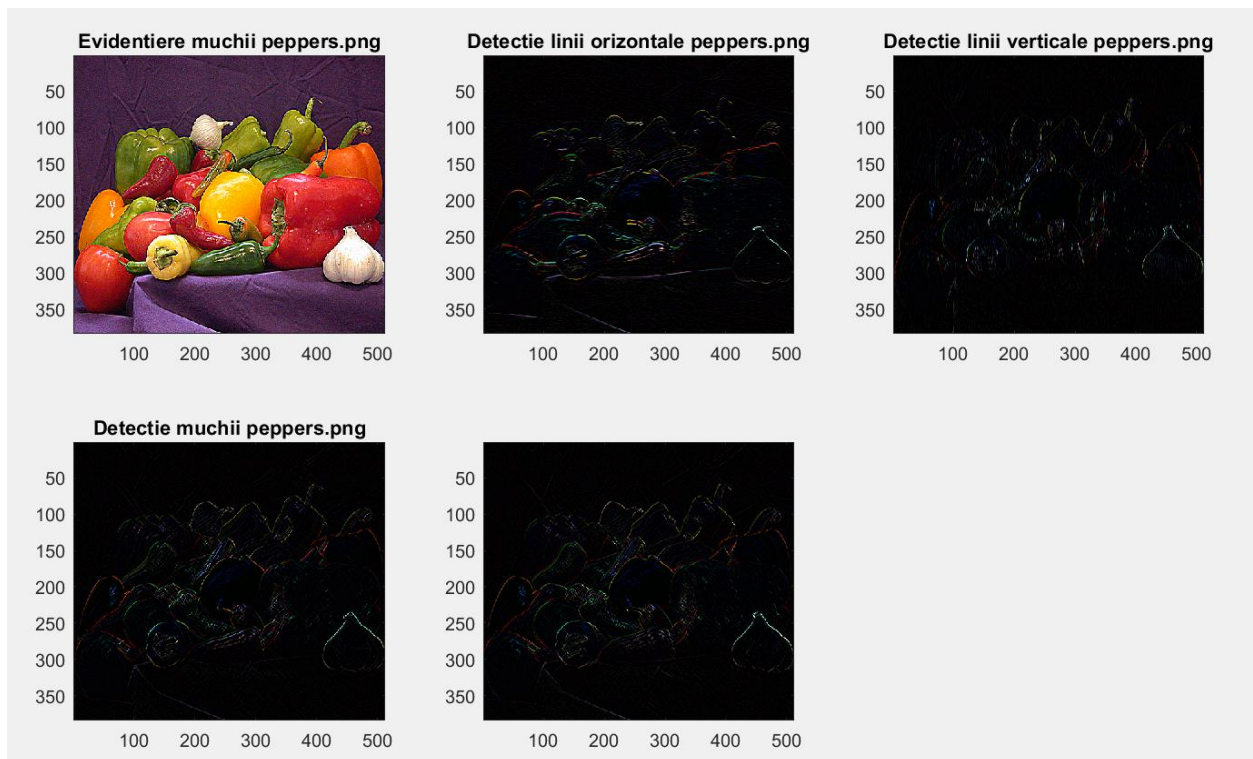

```
% evidentiere muchii (sharpening)
h = [-1 -1 -1;...
     -1 9 -1;...
     -1 -1 -1];
conv3 = imfilter(image,h,'conv','circular');
figure(7), imagesc(conv3), title('peppers.png + sharpening');
```



```

% filtre de tip Laplacian pentru detectia liniilor si muchiilor
figure(8)
h = [-1 -1 -1;...
     -1 9 -1;...
     -1 -1 -1];
conv4 = imfilter(image,h,'conv','circular');
subplot(2,3,1), imagesc(conv4), title('Evidentiere muchii peppers.png');
h = [-1 -1 -1;...
     2 2 2;...
     -1 -1 -1];
conv4 = imfilter(image,h,'conv','circular');
subplot(2,3,2), imagesc(conv4), title('Detectie linii orizontale peppers.png');
h = [-1 2 -1;...
     -1 2 -1;...
     -1 2 -1];
conv4 = imfilter(image,h,'conv','circular');
subplot(2,3,3), imagesc(conv4), title('Detectie linii verticale peppers.png');
h = [-1 -1 2;...
     -1 2 -1;...
     2 -1 -1];
conv4 = imfilter(image,h,'conv','circular');
subplot(2,3,4), imagesc(conv4), title('Detectie muchii peppers.png');
h = [2 -1 -1;...
     -1 2 -1;...
     -1 -1 2];
conv4 = imfilter(image,h,'conv','circular');
subplot(2,3,5), imagesc(conv4);

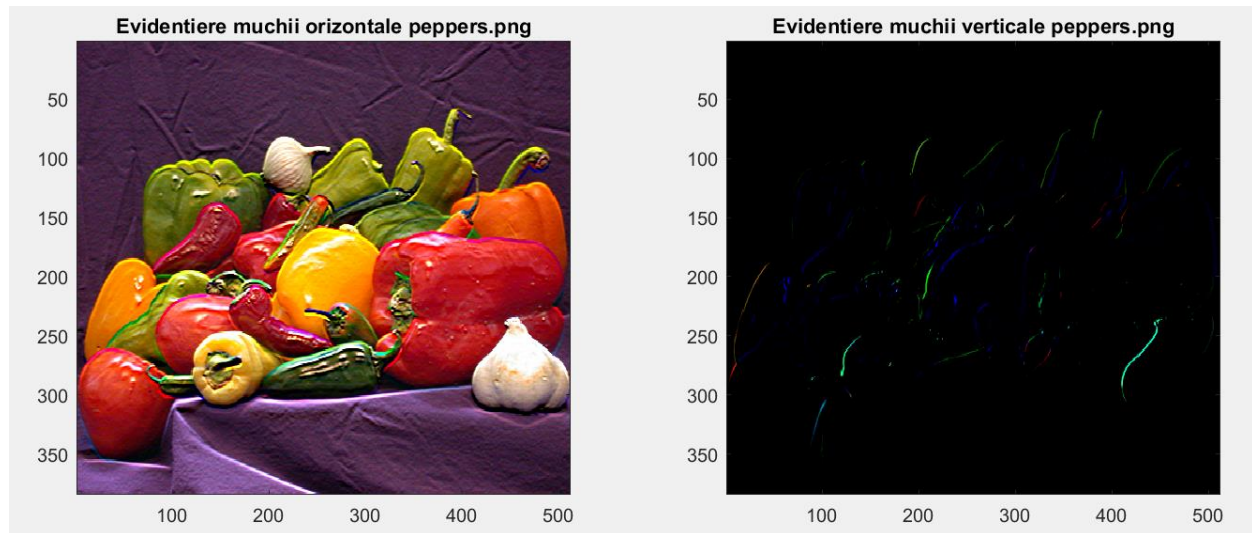
```



```

% filtre Sobel
figure(9)
h = [1 2 1;...
     0 0 0;...
    -1 -1 -1];
conv5 = imfilter(image,h,'conv','circular');
subplot(1,2,1), imagesc(conv5), title('Evidentiere muchii orizontale peppers.png');
h = [1 0 -1;...
     2 0 -2;...
    -1 0 -1];
conv5 = imfilter(image,h,'conv','circular');
subplot(1,2,2), imagesc(conv5), title('Evidentiere muchii verticale peppers.png');

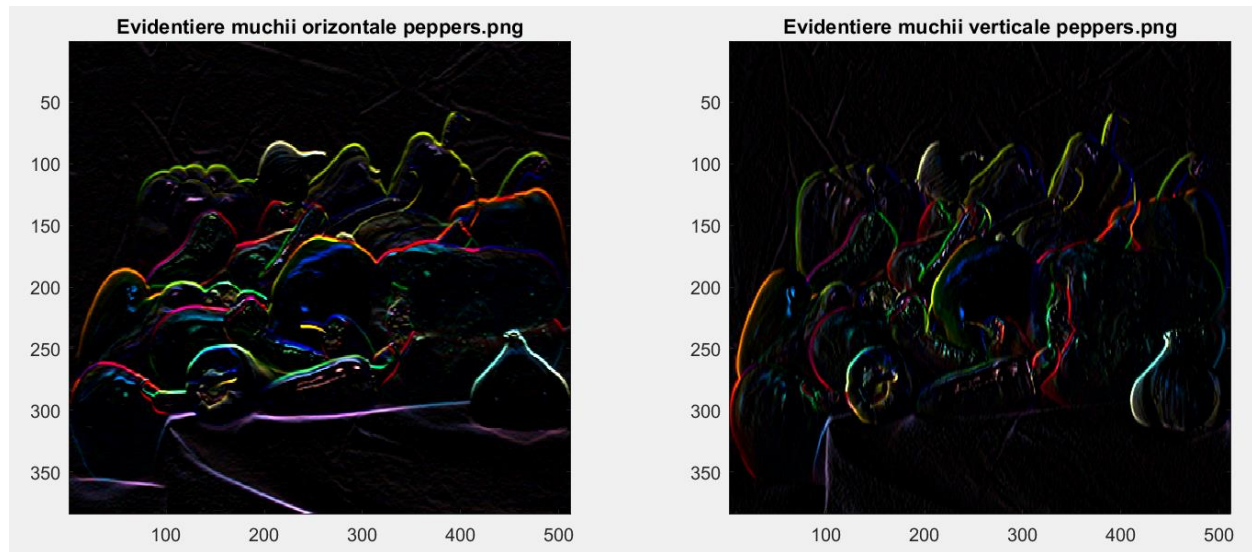
```




```

% filtre Prewitt
figure(10)
h = [1 1 1;...
     0 0 0;...
     -1 -1 -1];
conv6 = imfilter(image,h,'conv','circular');
subplot(1,2,1), imagesc(conv6), title('Evidentiere muchii orizontale peppers.png');
h = [1 0 -1;...
     1 0 -1;...
     1 0 -1];
conv6 = imfilter(image,h,'conv','circular');
subplot(1,2,2), imagesc(conv6), title('Evidentiere muchii verticale peppers.png');

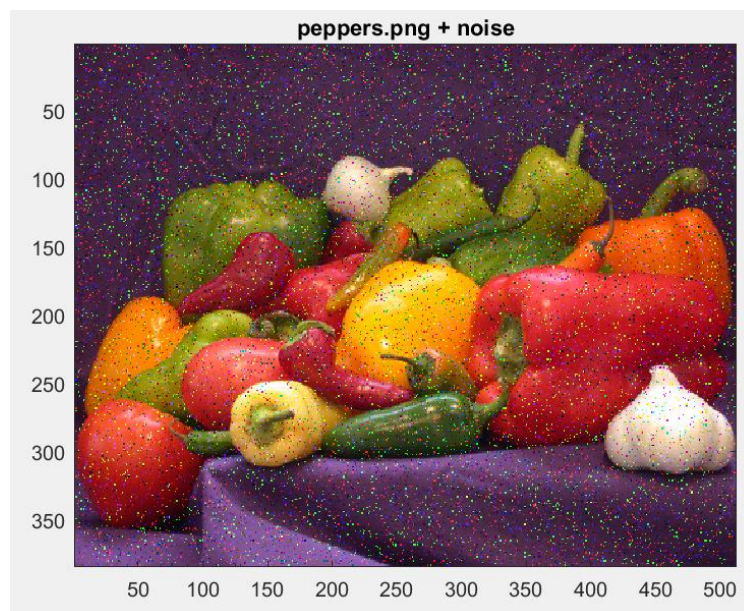
```



```

% c
imageNoisy = imnoise(image,'salt & pepper');
figure(11), imagesc(imageNoisy), title('peppers.png + noise');

```



```
% d
imwrite(imageNoisy,'photo1_noise.jpg','jpg');

% e
h = 1/9 * ones(3,3);
image = imfilter(imageNoisy,h,'conv','circular');
figure(12), imagesc(image), title('peppers.png + noise + filtru');
```

