

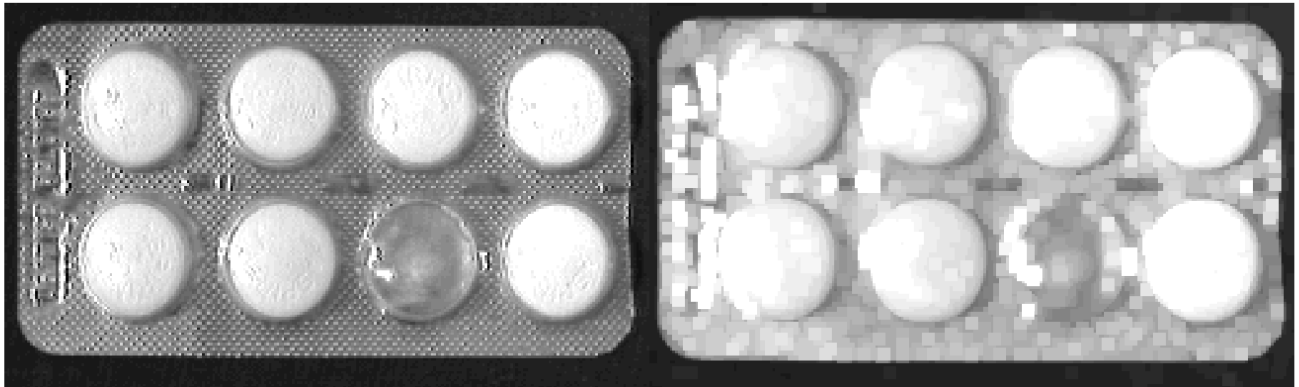
E6

Envolment convexe

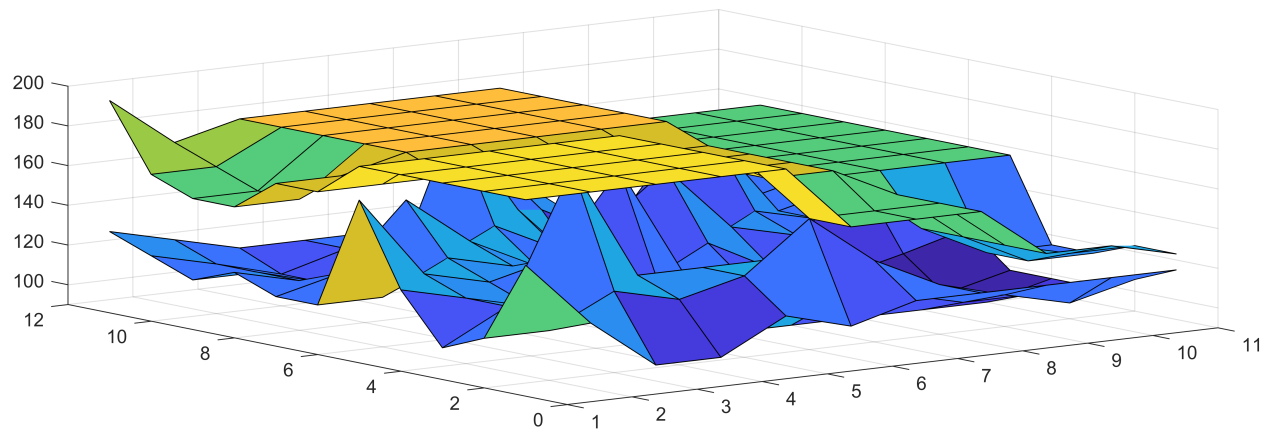
Procés iteratiu amb H&M fins que cap píxel canviï.

Morfologia per a imatges multinivell

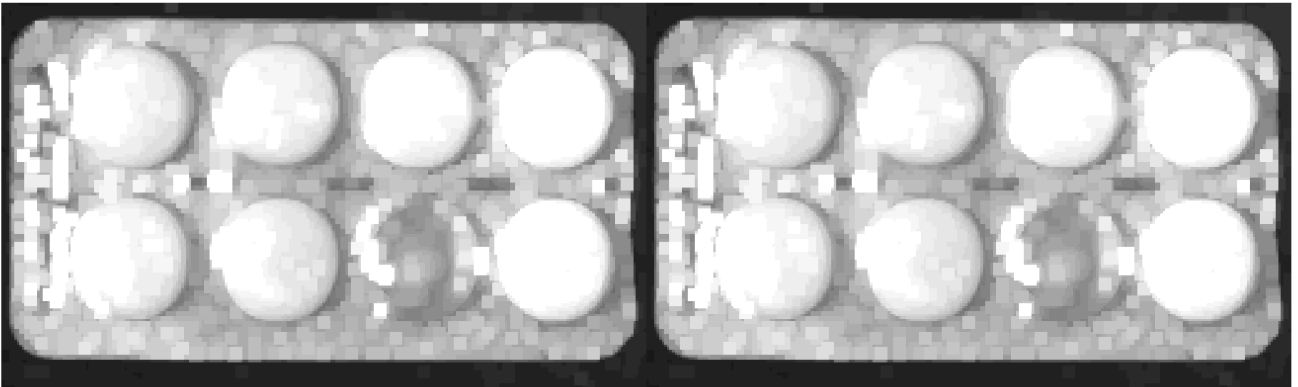
```
% dilate  
I = imread('astablet.tif');  
SE = ones(5,5);  
ID = imdilate(I,SE);  
montage({I,ID});
```



```
% Mirem què ha passat  
[f c] = size(ID);  
ICrop = I(floor(f/2)-5:floor(f/2)+5,floor(c/2)-5:floor(c/2)+5);  
IDCrop = ID(floor(f/2)-5:floor(f/2)+5,floor(c/2)-5:floor(c/2)+5);  
  
surf(ICrop);  
hold on  
surf(IDCrop);  
hold off
```



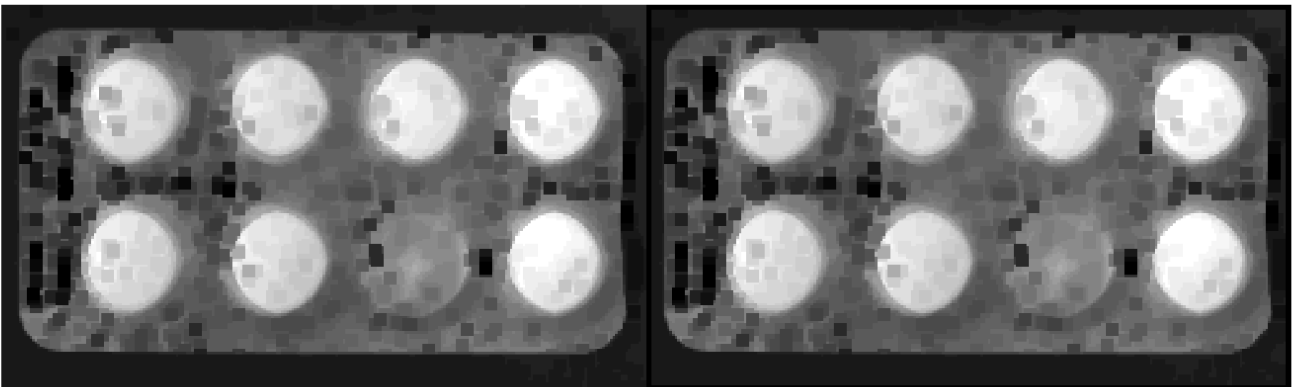
```
% dilate = ? max dels seus veïns
ID2 = colfilt(I,[5 5],"sliding",@max);
montage({ID,ID2});
```



```
% erode
SE = ones(5,5);
IE = imerode(I,SE);
montage({I,IE});
```



```
% erode = ? min dels seus veïns
IE2 = colfilt(I,[5 5],"sliding",@min);
montage({IE,IE2});
```



```
% open
SE = ones(3,3);
IO = imopen(I,SE);
montage({I,IO});
```



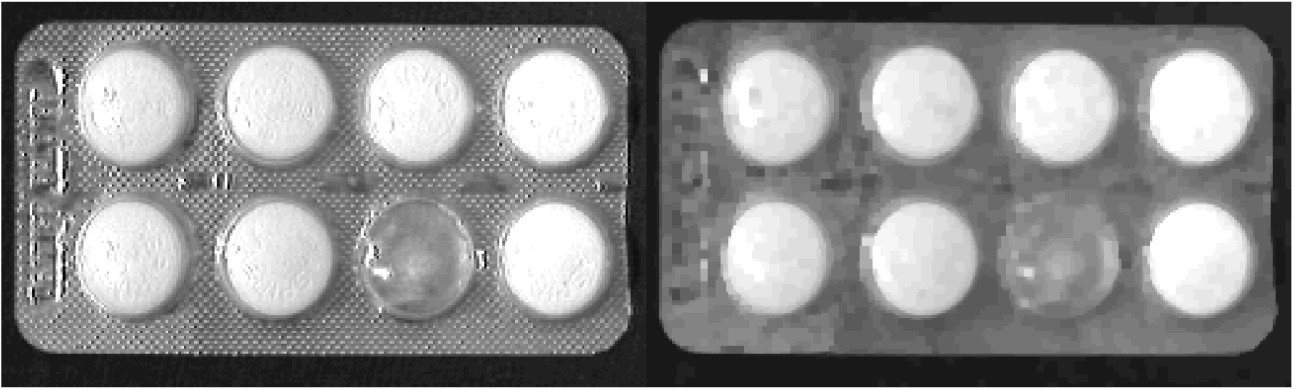
```
% close
```

```
SE = ones(3,3);  
IC = imclose(I,SE);  
montage({I,IC});
```



```
% filtre open close
```

```
IOC = imclose(IO,SE);  
montage({I,IOC});
```



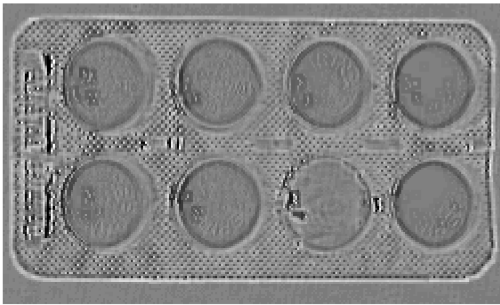
```
% residus
```

```
RI = I - IE; % no pot ser negatiu perquè IE són els mínims
```

```
RE = ID - I; % no pot ser negatiu perquè ID són els màxims
```

```
L = double(RE)-double(RI);
```

```
imshow(L,[]);
```



```
I = imread('nshadow.tif');
```

```
SE = ones(10,10);
```

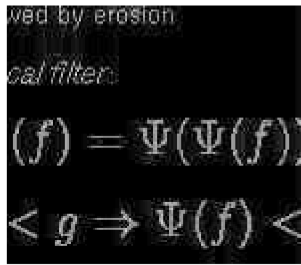
```
IO = imopen(I,SE);
```

```
IC = imclose(I,SE);
```

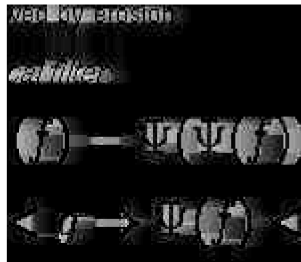
```
% top hat
```

```
TH = I - IO;
```

```
imshow(TH,[]);
```

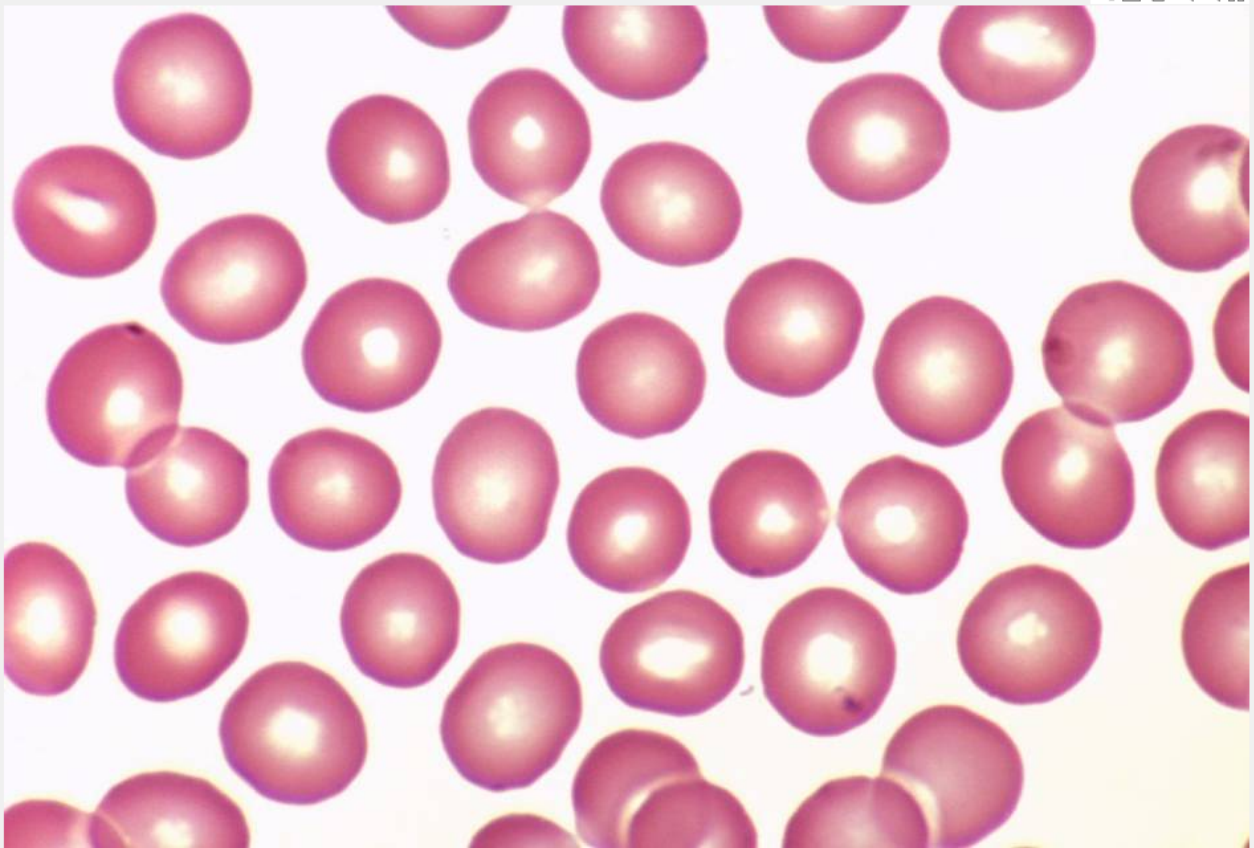


```
% bottom hat
BH = IC - I;
imshow(BH, []);
```

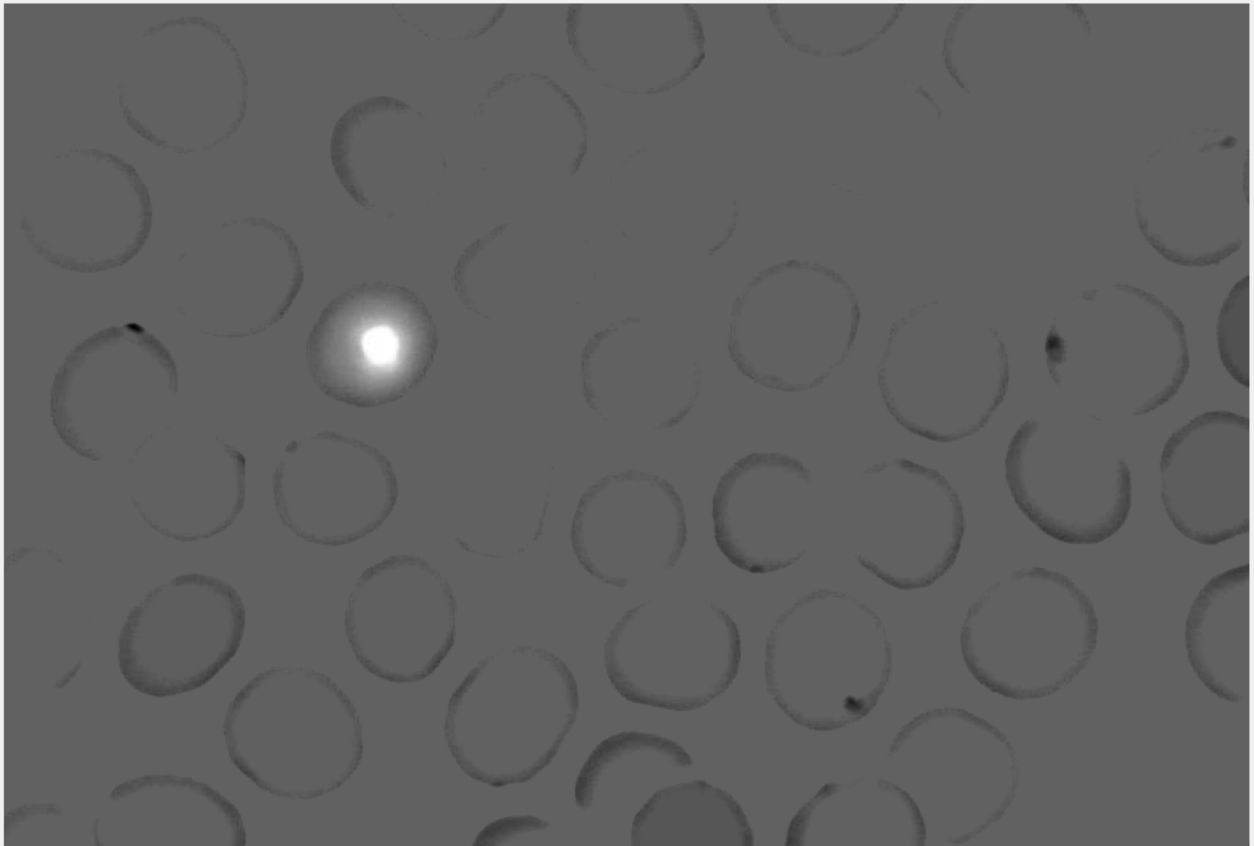


Reconstrucció a partir d'un punt

```
RGB = imread('normal-blood1.jpg');
I = rgb2gray(RGB);
imshow(RGB);
[x y] = getpts;
```

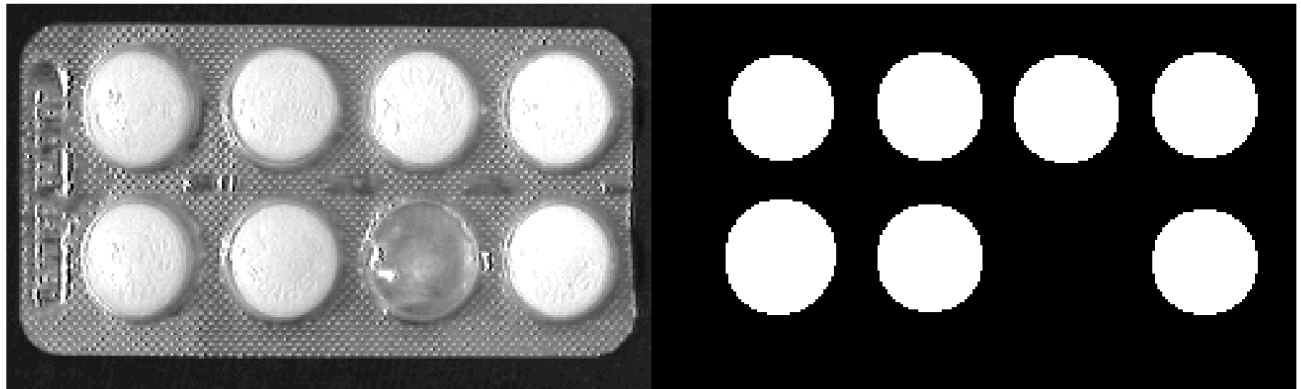


```
[f c] = size(I);  
MARK = uint8(zeros([f c]));  
MARK(uint16(y), uint16(x)) = 255;  
  
REC = imreconstruct(MARK,I);  
imshow(REC,[]);
```



```
% regional max
I = imread('astablet.tif');
MR = imregionalmax(I); % masses màxims regionals
imshow(MR,[]);

SE = fspecial("disk",20) > 0; % la mida del que estem buscant (pastilles)
IO = imopen(I,SE); % filtratge
MR = imregionalmax(IO);
montage({I,IO,MR});
```

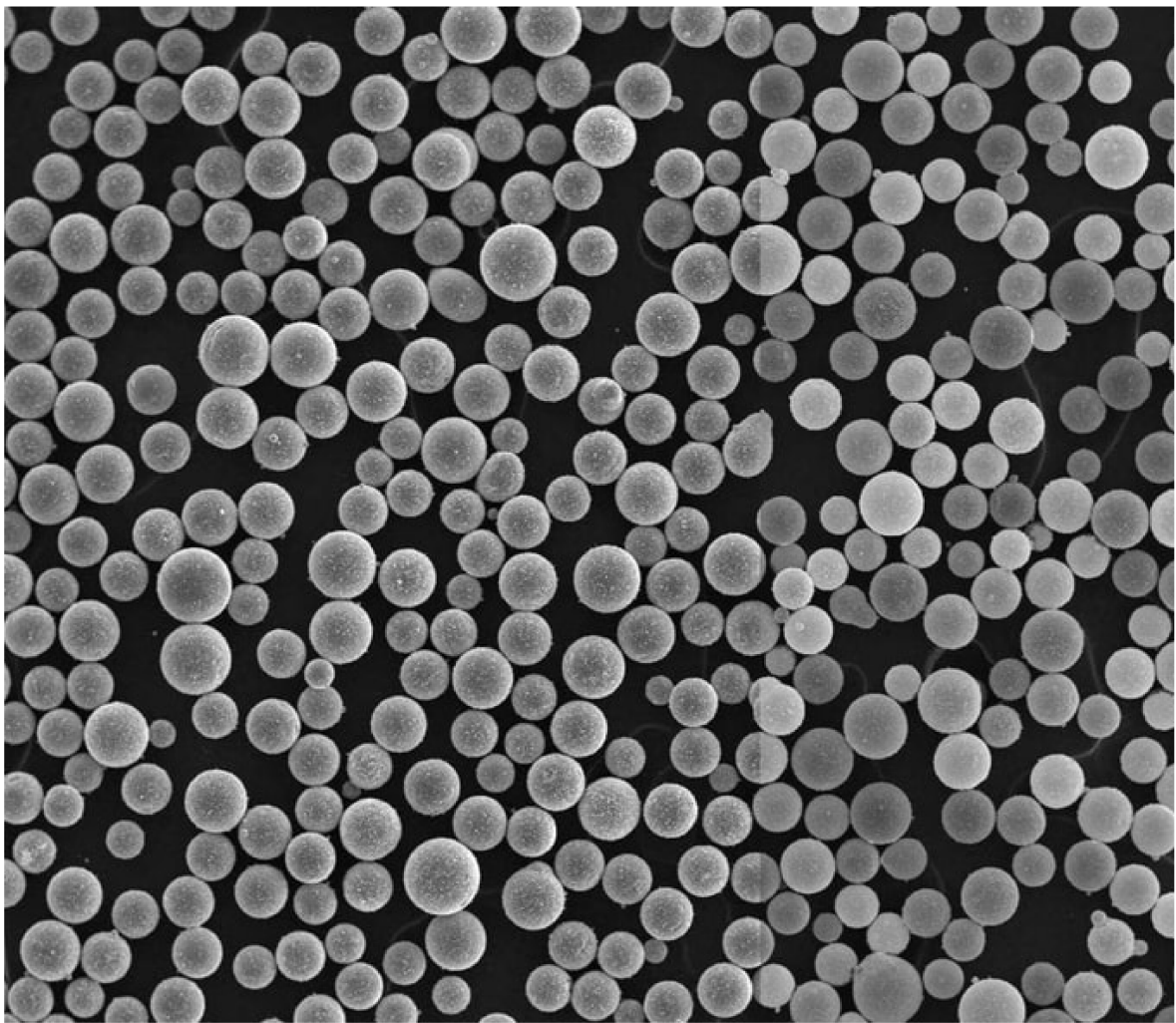
`% reconstrucció`

```
IM = I;
IM(not(MR)) = 0;
REC = imreconstruct(IM,I);
imshow(REC,[]);
```



Exercici: realitzar un plot granulomètric

```
% fer un for amb un element estructurant de més petit a més grant
% anar fent erosions fins que no quedin supervivents
I = rgb2gray(imread('granulometria.png'));
imshow(I);
```



```
for i = 1:30
    ES = fspecial("disk",i) > 0;
    IO = imopen(I,ES);
    t = otsuthresh(imhist(IO));
    t = max(64, t*255);
    BW = IO > t;
    if sum(sum(BW)) > 0
        BWUE = bwulterode(BW);
        CC = bwconncomp(BWUE);
        A(i) = CC.NumObjects;
        %imshow(BWUE);
    else
        A(i) = 0;
    end
end
plot(A)
```

