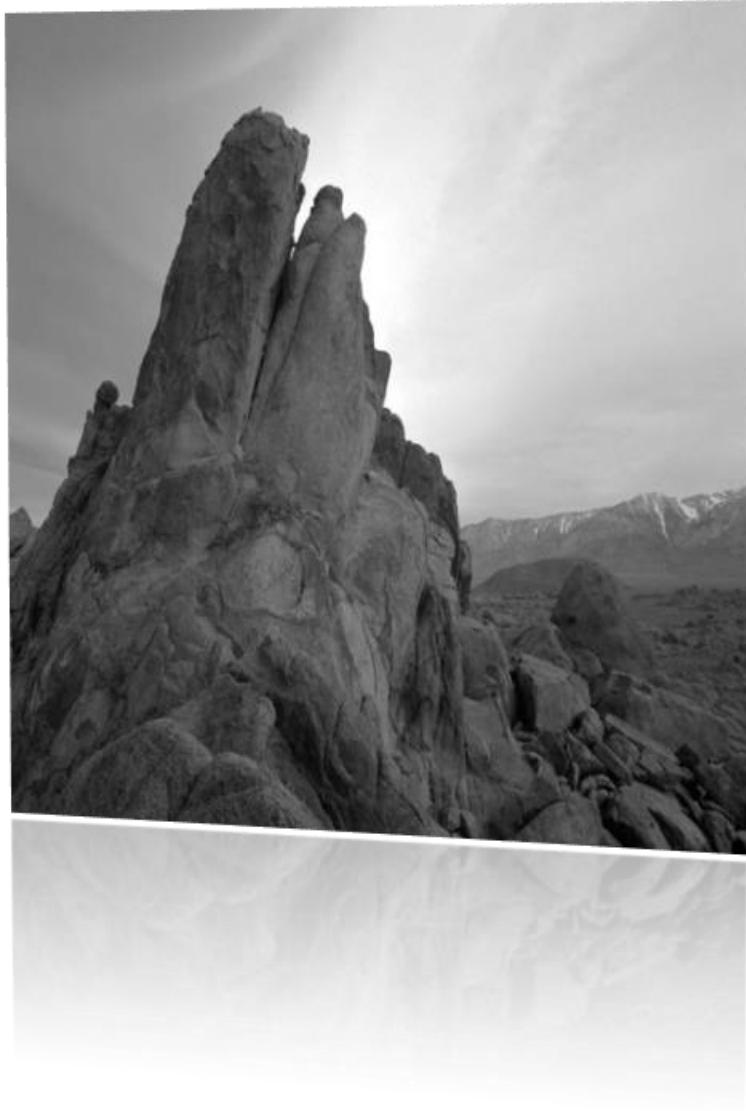




“ THE EXPERT IN
ANYTHING WAS ONCE
A BEGINNER”



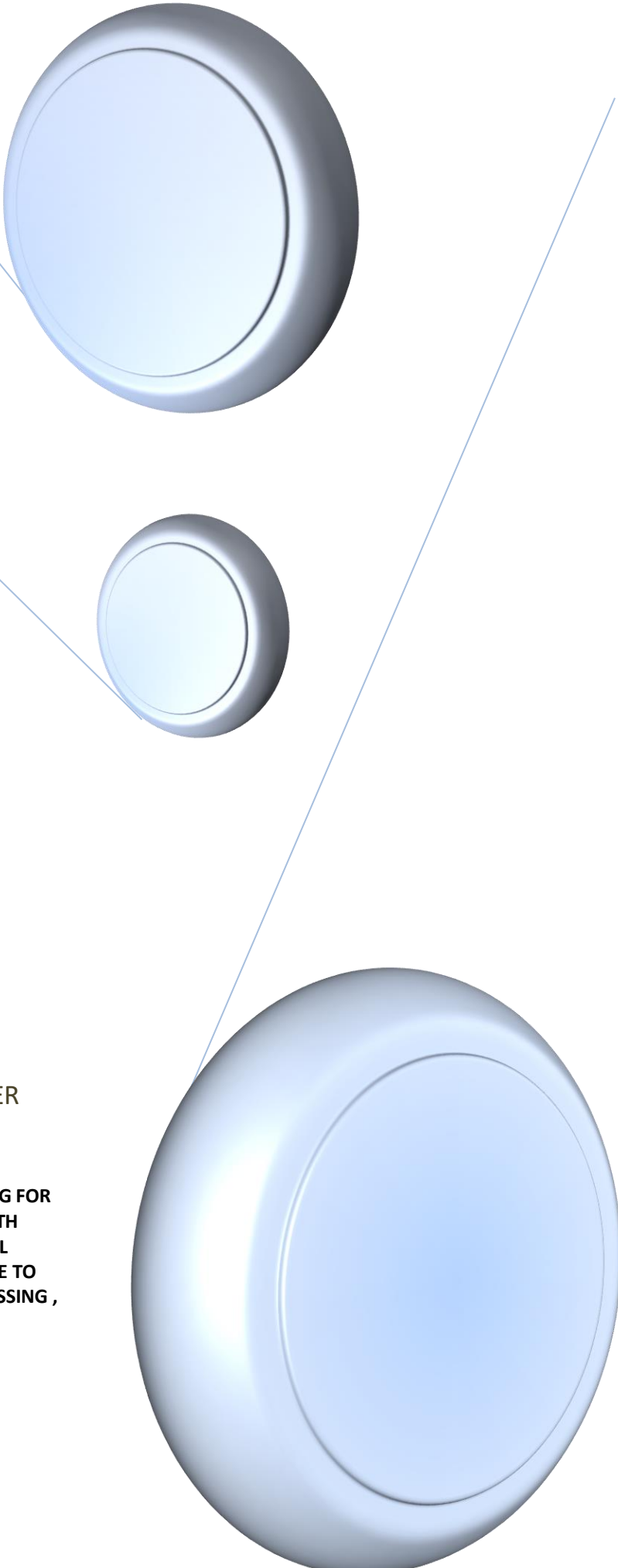
MINOR PROJECT

MEHER KUMAR

MTECH PART TIME

6TH SEMESTER

1906417.....



MINOR PROJECT

IMAGE PROCESSING SYSTEM FOR LEATHER DESIGNING

THIS DESCRIBES THE AUTOMATION OF MOULD CLEANING FOR INCREASING THE PRODUCTIVITY OF SHOE INDUSTRY WITH REDUCED HUMAN WORKLOAD. THIS BECOMES THE VITAL BOTTLENECK IN THE ENTIRE PRODUCTION PROCESS DUE TO COMPUTERIZED DIAGNOSTICS THROUGH IMAGE PROCESSING , SEGMENTATION AND MODELLING.

GUIDE:-PROF. DK CHATTURVEDI
[Pick the date]



EVA COMPRESS MOULDING MACHINE FOR SHOE PREPARATION

THE PURPOSE OF THIS PROJECT IS TO DESIGN THE SYSTEM WHICH MONITORS WHETHER THE MOULDS ARE CLEANED AFTER OPERATED UPON BY EVA MACHINE AND OBTAINED SHOES AS END RESULT .

THE DEVELOPED SYSTEM BASED ON TWO CAMERAS FOLLOWING THE MOULD CONTOUR . THE WORK FOCUSSES ON IMAGE PROCESSING ALGORITHM FOR HANGING EVA MATERIAL ON MOULDS & MATLAB PROGRAMMING ISSUES RELATED TO THE PATH FOLLOWING OPTIMISATION WHICH HAVE BEEN SUCESSFULLY TESTED WITH PROGRAMMING.THIS DESCRIBES THE AUTOMATION IN INCREASING THE PRODUCTION WITH A REDUCED HUMAN WORKLOAD .THE MANUAL DEFECT INSPECTION & ANALYSIS OF PRODUCT GRADING BECOMES TEDIOUS & INACCURATE ATTRIBUTE .THIS BECOMES THE VITAL BOTTLEMARK IN THE ENTIRE PRODUCTION PRTOCESS DUE TO COMPUTERISED DIAGNOSTICS THROUGH IMAGE PROCESSING , SEGMENTATION & MODELLING .

MACHINE DETAILS:-

NAME:- EVA COMPRESS MOULDING MACHINE

MACHINE COST:- 3.5 LAKHS +DYE(1 LAKH 20 THOUSAND)+OIL DRUM= TOTAL(10 LAKHS)

MATERIAL:- EVA MATERIAL GRADE 900(ETHYL VINYLE ACETATE)

GRANULE PRICE:- Rs 210\220 WITH GST PER KG.

MELT:-

LOWER PLATE(SOUL) - THICK MORE- (134+7) DEGRE CENTIGRATE

UPPER PLATE(UPPER PORTION) - THICK LESS - 134 DEGRE CENTIGRATE

PRESSURE- 1500 TO 2000 POUND SQUARE INCH(LESS THAN 1 TONNE SQUARE INCH)

PRESSURE- HYDRAULIC

GRANULES- BLACK & WHITE

TIMER - 15 MINUTES FOR BIG SIZE

8-10 MINUTES FOR SMALL SIZE

MOULDS SIZE AVAILABLE- 6,7,8,9,10 NO MOULDS

PRACTICAL POINT:-IF SIZE OF LAST IS 9 & SHOE PREPARED FROM MACHINE 8 THEN ALSO WE WOULD RECEIVE 9 SIZE SHOE BUT ITS LAYER WILL BE THIN .

. RECYCLING OF WASTE PRODUCT NOT DONE . IT DOES NOT MELT .

. IF THERE ONE/TWO HOLES ACCIDENTLY OCCURRED ON USAGE OR ON MANUFACTURER SIDE , WE CAN PREPARE DESIGNED SHOES FROM IT i.e COULD BE SHOWCASED FOR VENTILLATION

.

. EVEN CHAPPALS/SLEEPERS COULD ALSO BE PREPARED IF SHOES ARE DEFECTED .

. PRESSURE IS RELEASEG FROM HANDS MANUALLY.

. ALLIGNMENT OF DYE/MOULD HAS TO BE SEEN CAREFULLY.

. MULTI COLOUR DIE i.e SOUL(BLACK) & UPPER (RED)

MOTTO/ PRINCIPLE:-

. WE WANT ZERO WASTAGE .

. NO HUMAN ERROR .

. IF SEND THE DEFECTED SHOE TO SELLER , IT IS NOT LIKENED .

IT IS AGAINST COMPANY NAME & FAME .

SELLER WOULD BE AT LOSS OR HE WILL SEND THE PRODUCT BACK .

TIME WASTAGE FOR BOTH MANUFACTURER & SELLER .

MACHINE PARTS:-

PRESSURE SET EQUIPMENT

DYE BED

DYE/MOULD SECTION

CYLINDER(FOR DYE UP & DOWN)

DYE FIXED AT UPPER OR LOWER

MOTOR-2:-

PRESSURE RELEASE MOTOR & PRESSURE PROVIDE MOTOR

PRESSURE RELEASE MOTOR :- 1.5 KW

415 VOLT +/-10%

3.2 AMPERE

1405 RPM

% EFFICIENCY:-82.8%

POWER FACTOR:-0.8

PRESSURE PROVIDE MOTOR:- 2.7 KW

415 VOLT +/-10%

3.2 AMPERE

1430 RPM

% EFFICIENCY:-86.3%

POWER FACTOR:-0.82

OIL TANK

HEATER

MECHANICAL PUMP (IN TANK):- IT UPSTREAMS THE OIL WITH PRESSURE

PRESSURE GAUGE:- (0 TO 8960 TON/SQUARE INCH)OR(0-4 LBS/SQUARE INCH)

AMPERE GAUGE (RANGE:- 0-30 AMPERE)

VOLTMETER GAUGE(RANGE:- 0-500 VOLT)PRACTICALLY SET AT 400 VOLT

UPPER PLATE TEMPERATURE INDICATOR

LOWER PLATE TEMPERATURE INDICATOR

TIMER

3 PHASE INDICATOR ON TOP

**WATERPROOF CAMERA REQUIRE TO BEAR TEMPERATURE 180 DEGREE CENTIGRATE .
CAMERA WOULD BE USED ON TWO SIDES , i.e ONE CAMERA ON EACH SIDE OF MOULD
PLATE.**

IMAGE PROCESSING SYSTEM FOR LEATHER DESIGNING

USING MATLAB:-

TEXTURE SEGMENTATION USING GABOR FILTERS:-

TEXTURE SEGMENTATION IS DONE TO IDENTIFY REGIONS BASED ON THEIR TEXTURE. THE GOAL IS TO SEGMENT THE DOG FROM THE BATHROOM FLOOR. THE SEGMENTATION IS VISUALLY OBVIOUS BECAUSE OF THE DIFFERENCE IN TEXTURE BETWEEN THE REGULAR, PERIODIC PATTERN OF THE BATHROOM FLOOR, AND THE REGULAR, SMOOTH TEXTURE OF THE DOG'S FUR.

FROM EXPERIMENTATION, IT IS KNOWN THAT GABOR FILTERS ARE A REASONABLE MODEL OF SIMPLE CELLS IN THE MAMMALIAN VISION SYSTEM. BECAUSE OF THIS, GABOR FILTERS ARE THOUGHT TO BE A GOOD MODEL OF HOW HUMANS DISTINGUISH TEXTURE, AND ARE THEREFORE A USEFUL MODEL TO USE WHEN DESIGNING ALGORITHMS TO RECOGNIZE TEXTURE.

READ AND DISPLAY INPUT IMAGE :-

Read and display the input image. It shrinks the image to make the example run more quickly.

```
A = imread('kobi.png');
```

```
A = imresize(A,0.25);
```

```
Agray = rgb2gray(A);
```

Figure

```
imshow(A)
```



DESIGN ARRAY OF GABOR FILTERS:-

DESIGN AN ARRAY OF GABOR FILTERS WHICH ARE TUNED TO DIFFERENT FREQUENCIES AND ORIENTATIONS. THE SET OF FREQUENCIES AND ORIENTATIONS IS DESIGNED TO LOCALIZE DIFFERENT, ROUGHLY ORTHOGONAL, SUBSETS OF FREQUENCY AND ORIENTATION INFORMATION IN THE INPUT IMAGE. REGULARLY SAMPLE ORIENTATIONS BETWEEN $[0,150]$ DEGREES IN STEPS OF 30 DEGREES. SAMPLE WAVELENGTH IN INCREASING POWERS OF TWO STARTING FROM $4/\sqrt{2}$ UP TO THE HYPOTENUSE LENGTH OF THE INPUT IMAGE.

imageSize = size(A);

numRows = imageSize(1);

numCols = imageSize(2);

wavelengthMin = $4/\sqrt{2}$;

wavelengthMax = hypot(numRows,numCols);

n = floor(log2(wavelengthMax/wavelengthMin));

wavelength = 2.^(0:(n-2)) * wavelengthMin;

deltaTheta = 45;

orientation = 0:deltaTheta:(180-deltaTheta);

g = gabor(wavelength,orientation);

EXTRACT GABOR MAGNITUDE FEATURES FROM SOURCE IMAGE. WHEN WORKING WITH GABOR FILTERS, IT IS COMMON TO WORK WITH THE MAGNITUDE RESPONSE OF EACH FILTER. GABOR MAGNITUDE RESPONSE IS ALSO SOMETIMES REFERRED TO AS "GABOR ENERGY". EACH MXN GABOR MAGNITUDE OUTPUT IMAGE IN GABORMAG(:, :, IND) IS THE OUTPUT OF THE CORRESPONDING GABOR FILTER G(IND).

gabormag = imgaborfilt(Agray,g);

POST-PROCESS THE GABOR MAGNITUDE IMAGES INTO GABOR FEATURES :-

TO USE GABOR MAGNITUDE RESPONSES AS FEATURES FOR USE IN CLASSIFICATION, SOME POST-PROCESSING IS REQUIRED. THIS POST PROCESSING INCLUDES GAUSSIAN SMOOTHING, ADDING ADDITIONAL SPATIAL INFORMATION TO THE FEATURE SET, RESHAPING OUR FEATURE SET TO THE FORM EXPECTED BY THE PCA AND KMEANS FUNCTIONS, AND NORMALIZING THE FEATURE INFORMATION TO A COMMON VARIANCE AND MEAN.

EACH GABOR MAGNITUDE IMAGE CONTAINS SOME LOCAL VARIATIONS, EVEN WITHIN WELL SEGMENTED REGIONS OF CONSTANT TEXTURE. THESE LOCAL VARIATIONS WILL THROW OFF THE SEGMENTATION. WE CAN COMPENSATE FOR THESE VARIATIONS USING SIMPLE GAUSSIAN LOW-PASS FILTERING TO SMOOTH THE GABOR MAGNITUDE INFORMATION. WE CHOOSE A SIGMA THAT IS MATCHED TO THE GABOR FILTER THAT EXTRACTED EACH FEATURE. WE INTRODUCE A SMOOTHING TERM K THAT CONTROLS HOW MUCH SMOOTHING IS APPLIED TO THE GABOR MAGNITUDE RESPONSES.

for i = 1:length(g)

sigma = 0.5*g(i).Wavelength;

K = 3;

gabormag(:, :, i) = imgaussfilt(gabormag(:, :, i), K*sigma);

end

WHEN CONSTRUCTING GABOR FEATURE SETS FOR CLASSIFICATION , IT IS USEFUL TO ADD A MAP OF SPATIAL LOCATION INFORMATION IN BOTH X AND Y. THIS ADDITIONAL INFORMATION ALLOWS THE CLASSIFIER TO PREFER GROUPINGS WHICH ARE CLOSE TOGETHER SPATIALLY .

```
X = 1:numCols;
```

```
Y = 1:numRows;
```

```
[X,Y] = meshgrid(X,Y);
```

```
featureSet = cat(3,gabormag,X);
```

```
featureSet = cat(3,featureSet,Y);
```

RESHAPE DATA INTO A MATRIX X OF THE FORM EXPECTED BY THE KMEANS FUNCTION . EACH PIXEL IN THE IMAGE GRID IS A SEPARATE DATAPOINT, AND EACH PLANE IN THE VARIABLE FEATURESET IS A SEPARATE FEATURE. IN THIS EXAMPLE, THERE IS A SEPARATE FEATURE FOR EACH FILTER IN THE GABOR FILTER BANK, PLUS TWO ADDITIONAL FEATURES FROM THE SPATIAL INFORMATION THAT WAS ADDED IN THE PREVIOUS STEP. IN TOTAL, THERE ARE 24 GABOR FEATURES AND 2 SPATIAL FEATURES FOR EACH PIXEL IN THE INPUT IMAGE.

```
numPoints = numRows*numCols;
```

```
X = reshape(featureSet,numRows*numCols,[]);
```

NORMALIZE THE FEATURES TO BE ZERO MEAN, UNIT VARIANCE.

```
X = bsxfun(@minus, X, mean(X));
```

```
X = bsxfun(@rdivide,X,std(X));
```

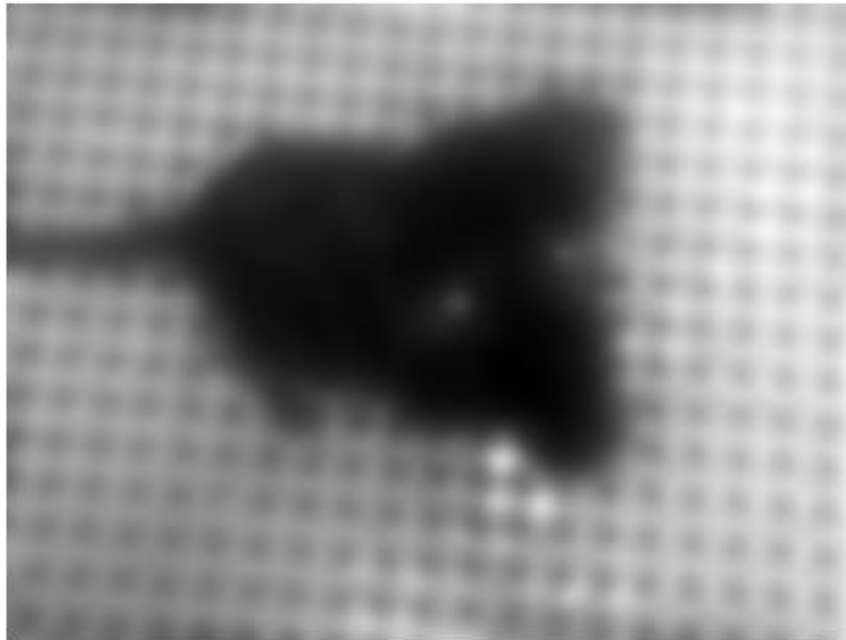
VISUALIZE THE FEATURE SET. TO GET A SENSE OF WHAT THE GABOR MAGNITUDE FEATURES LOOK LIKE, PRINCIPAL COMPONENT ANALYSIS CAN BE USED TO MOVE FROM A 26-D REPRESENTATION OF EACH PIXEL IN THE INPUT IMAGE INTO A 1-D INTENSITY VALUE FOR EACH PIXEL.

```
coeff = pca(X);
```

```
feature2DImage = reshape(X*coeff(:,1),numRows,numCols);
```

```
figure
```

```
imshow(feature2DImage,[])
```



IT IS APPARENT IN THIS VISUALIZATION THAT THERE IS SUFFICIENT VARIANCE IN THE GABOR FEATURE INFORMATION TO OBTAIN A GOOD SEGMENTATION FOR THIS IMAGE . THE DOG IS VERY DARK COMPARED TO THE FLOOR BECAUSE OF THE TEXTURE DIFFERENCES BETWEEN THE DOG AND THE FLOOR .

CLASSIFY GABOR TEXTURE FEATURES USING KMEANS:-

REPEAT K-MEANS CLUSTERING FIVE TIMES TO AVOID LOCAL MINIMA WHEN SEARCHING FOR MEANS THAT MINIMIZE OBJECTIVE FUNCTION. THE ONLY PRIOR INFORMATION ASSUMED IN THIS EXAMPLE IS HOW MANY DISTINCT REGIONS OF TEXTURE ARE PRESENT IN THE IMAGE BEING SEGMENTED. THERE ARE TWO DISTINCT REGIONS IN THIS CASE. THIS PART OF THE EXAMPLE REQUIRES THE STATISTICS AND MACHINE LEARNING TOOLBOX™.

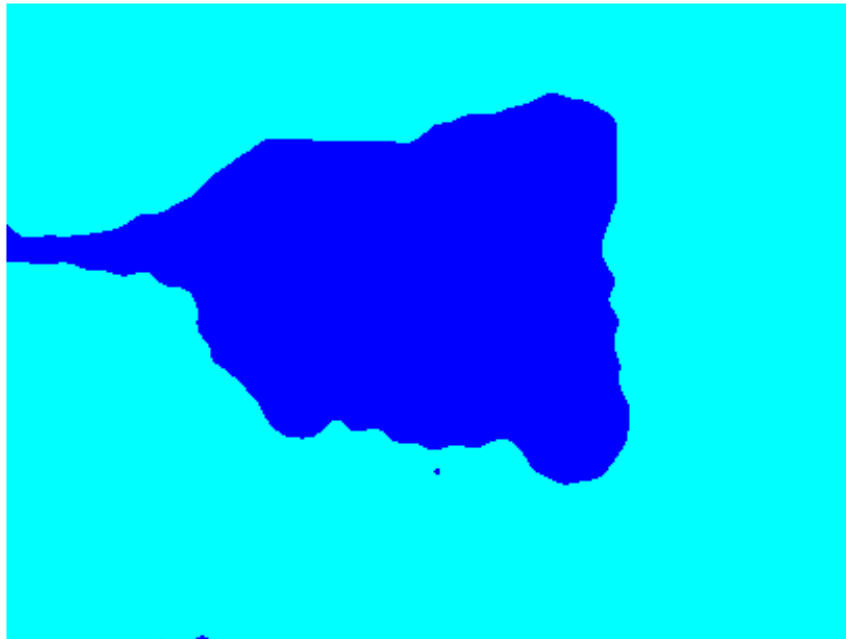
```
L = kmeans(X,2,'Replicates',5);
```

VISUALIZE SEGMENTATION USING LABEL2RGB.

```
L = reshape(L,[numRows numCols]);
```

Figure

```
imshow(label2rgb(L))
```



VISUALIZE THE SEGMENTED IMAGE USING IMSHOWPAIR. EXAMINE THE FOREGROUND AND BACKGROUND IMAGES THAT RESULT FROM THE MASK BW THAT IS ASSOCIATED WITH THE LABEL MATRIX L.

```
Aseg1 = zeros(size(A),'like',A);
```

```
Aseg2 = zeros(size(A),'like',A);
```

```
BW = L == 2;
```

```
BW = repmat(BW,[1 1 3]);
```

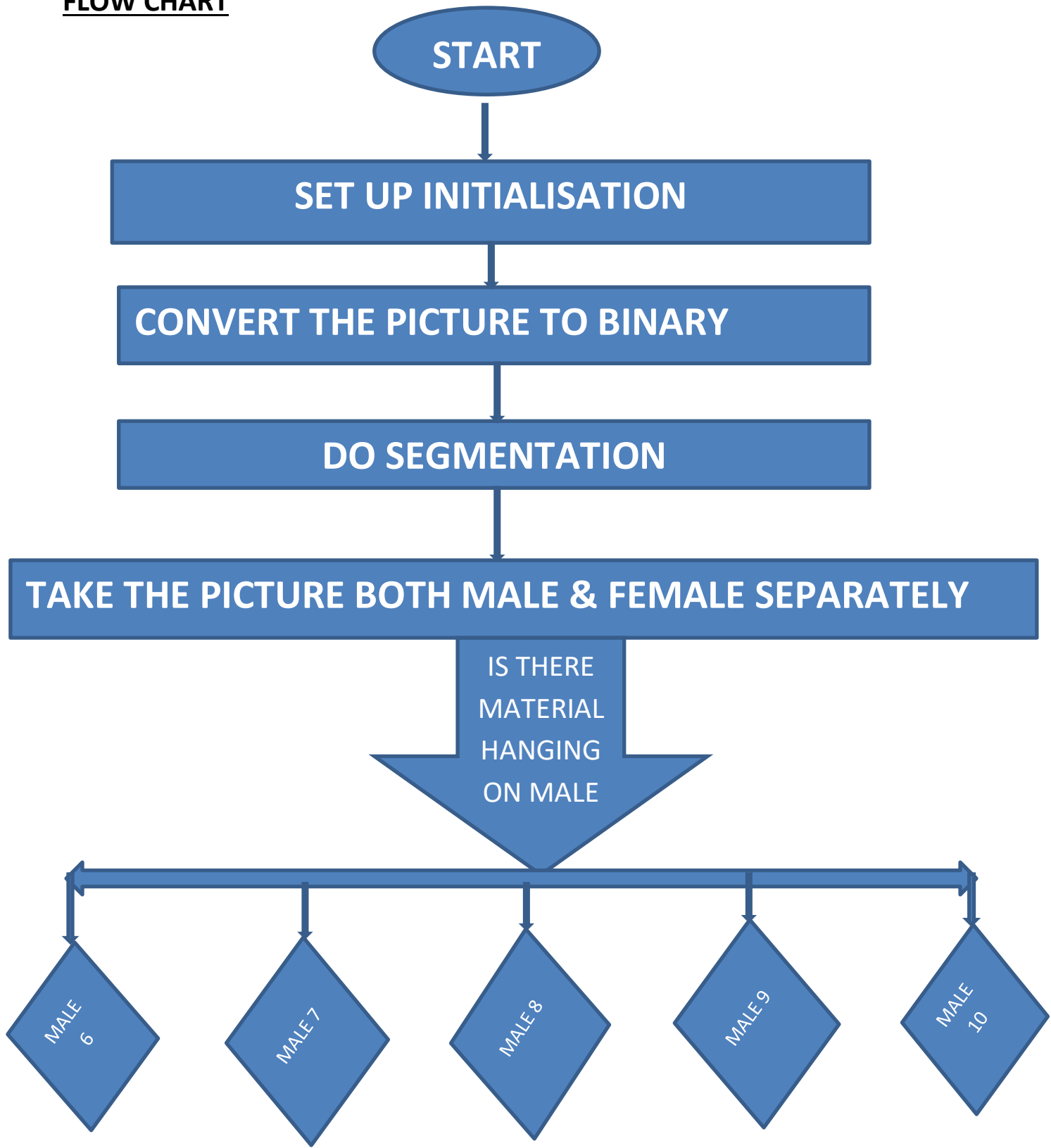
```
Aseg1(BW) = A(BW);
```

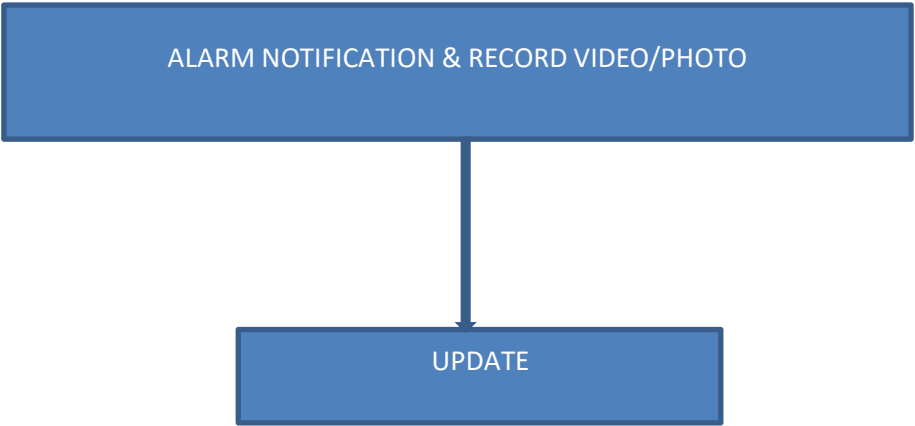
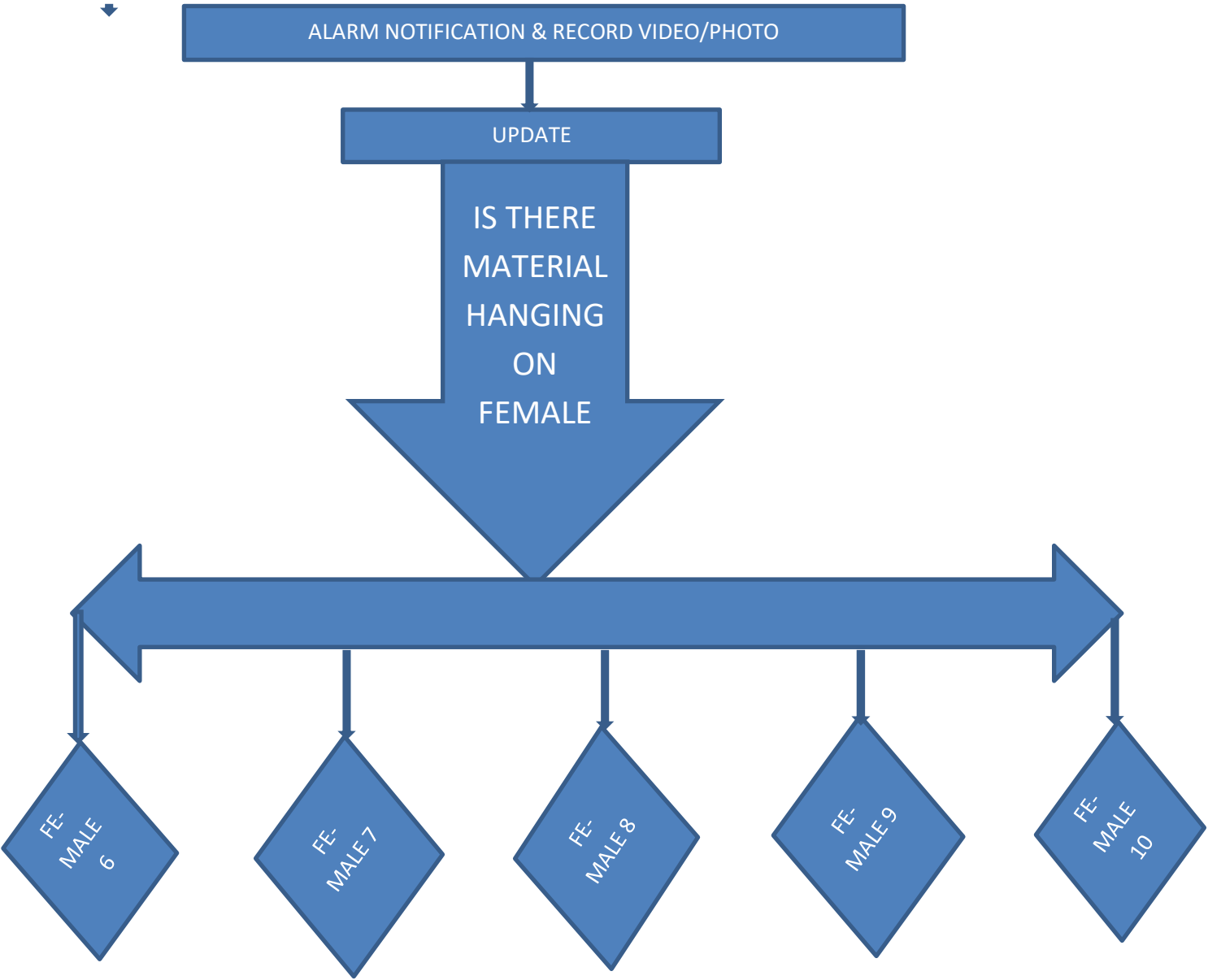
```
Aseg2(~BW) = A(~BW);
```

Figure

```
imshowpair(Aseg1,Aseg2,'montage');
```


FLOW CHART





PROGRAM: -

```
A = imread('picture_input.bmp');
size (A)

A = imresize(A,0.75);

A=A(1:500,1:500, 1:3);

Agray = rgb2gray(A);

figure(1)

imshow(A)

imageSize = size(A);

figure (2)

imshow(Agray)

numRows = imageSize(1);

numCols = imageSize(2);

figure

wavelengthMin = 4/sqrt(2);

wavelengthMax = hypot(numRows,numCols);

n = floor(log2(wavelengthMax/wavelengthMin));

wavelength = 2.^(0:(n-2)) * wavelengthMin;

    deltaTheta = 45;

orientation = 0:deltaTheta:(180-deltaTheta);

g = gabor(wavelength,orientation);

gabormag = imgaborfilt(Agray,g);
```

```

for i = 1:length(g)

    sigma = 0.5*g(i).Wavelength;

    K = 3;

    gabormag(:,:,i) = imgaussfilt(gabormag(:,:,i),K*sigma);

end

X = 1:numCols;

Y = 1:numRows;

[X,Y] = meshgrid(X,Y);

featureSet = cat(3,gabormag,X);

featureSet = cat(3,featureSet,Y);

numPoints = numRows*numCols;

X = reshape(featureSet,numRows*numCols,[]);

X = bsxfun(@minus, X, mean(X));

X = bsxfun(@rdivide,X,std(X));

coeff = pca(X);

feature2DImage = reshape(X*coeff(:,1),numRows,numCols);

figure (3)

L =imshow(feature2DImage,[])

kmeans(X,2,'Replicates',5);

% L = reshape(L,[numRows numCols]);

figure (4)

%imshow(label2rgb(L))

Aseg1 = zeros(size(A),'like',A);

```

```
Aseg2 = zeros(size(A), 'like', A);  
BW = L == 2;  
BW = repmat(BW, [1 1 3]);  
Aseg1(BW) = A(BW);  
Aseg2(~BW) = A(~BW);  
figure(5)  
imshowpair(Aseg1, Aseg2, 'montage');
```

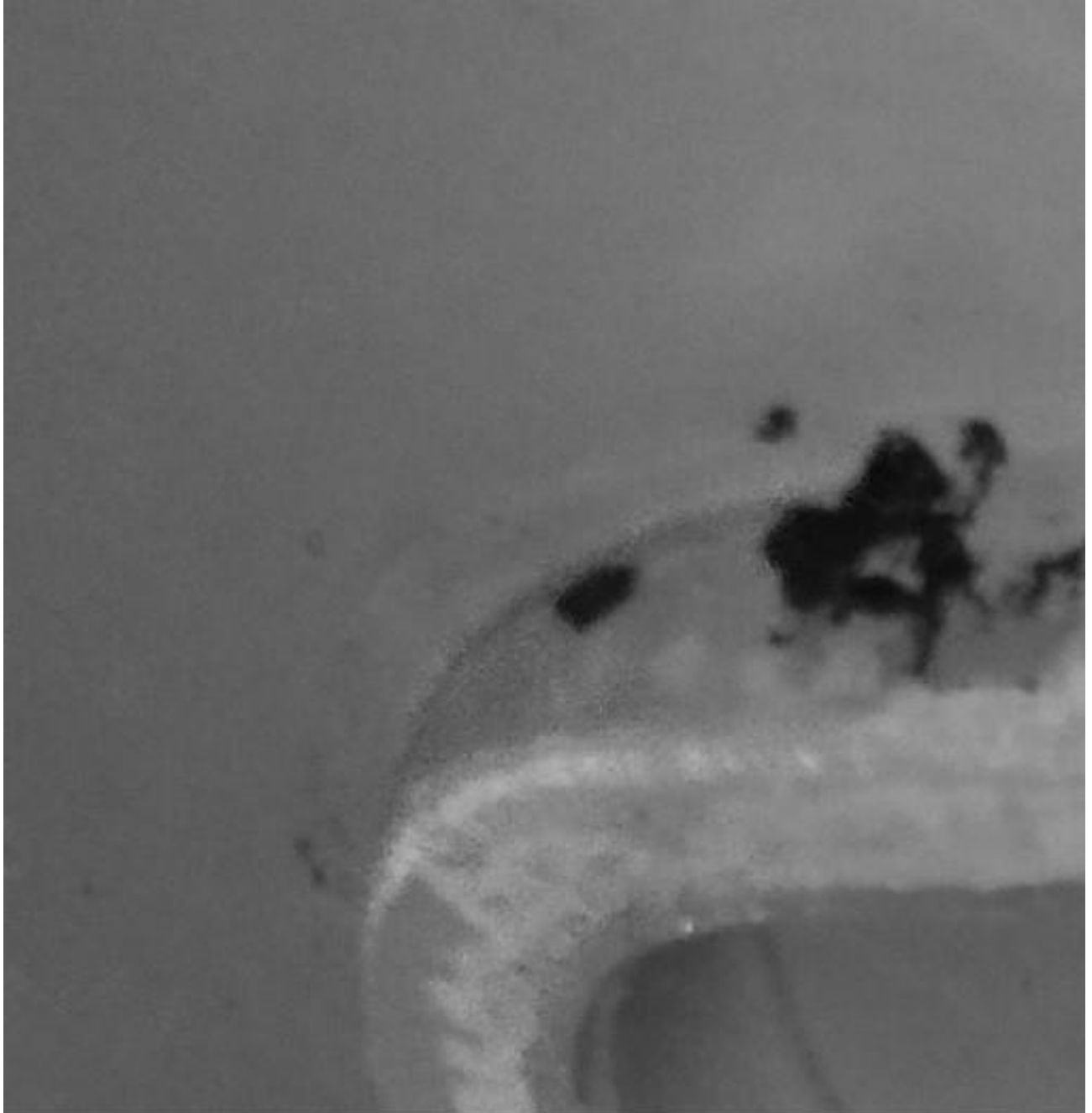
RESULTS:-



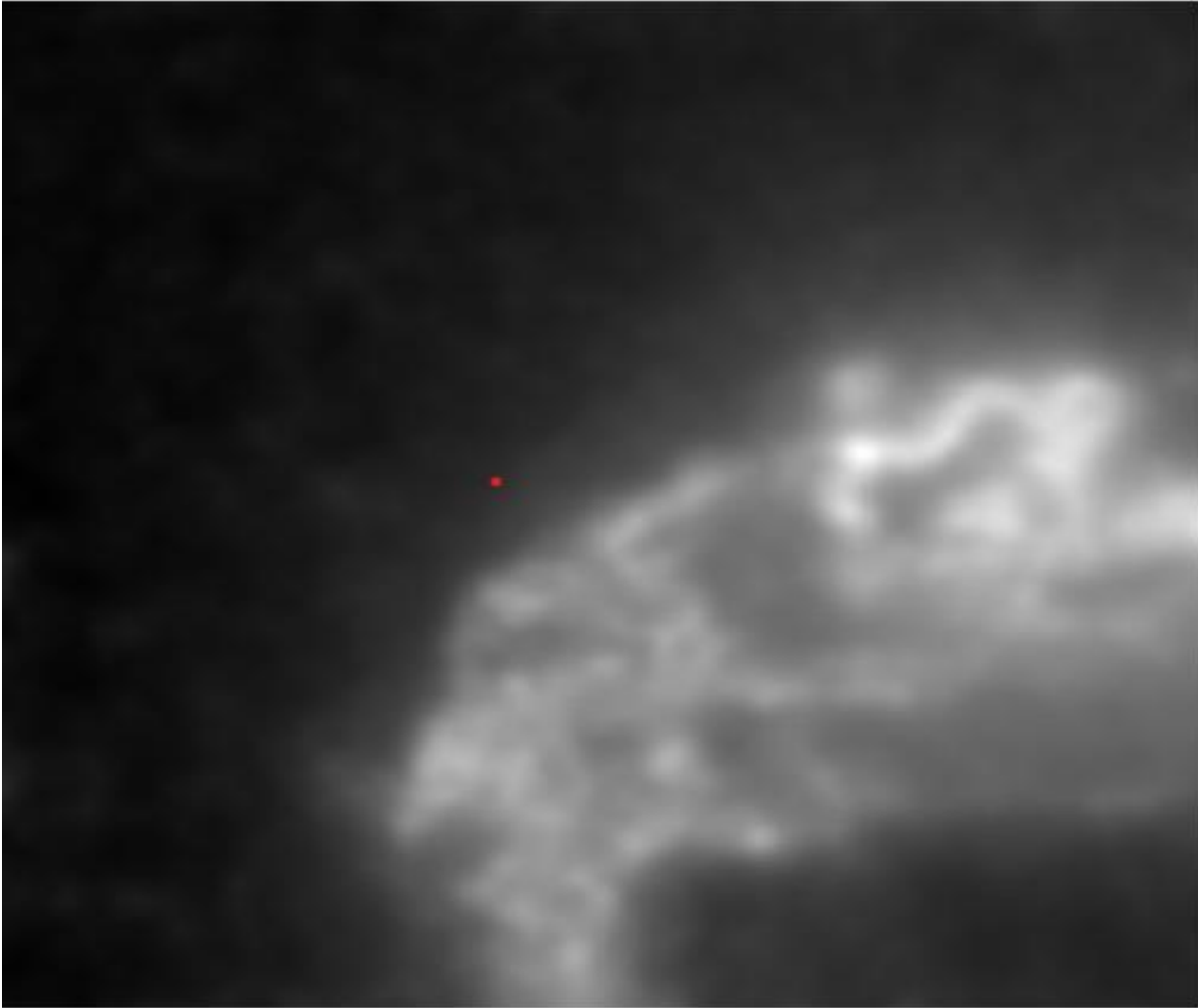
DYE FIXED AT UPPER SECTION



SECTION OF A MOULD WHERE EVA MATERIAL IS HANGING AFTER REMOVAL OF PREPARED SHOE FROM MOULD



**GREY PICTURE OF SECTION OF A MOULD WHERE EVA MATERIAL IS HANGING
AFTER REMOVAL OF PREPARED SHOE FROM MOULD**



K-MEANS OUTPUT OF THE PICTURE

