

## Homework 2

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### Question 1:

The result images of the image “objects1.png” processed by the Linear Bayes Classifier and the Quadratic Bayes Classifier are showed below.

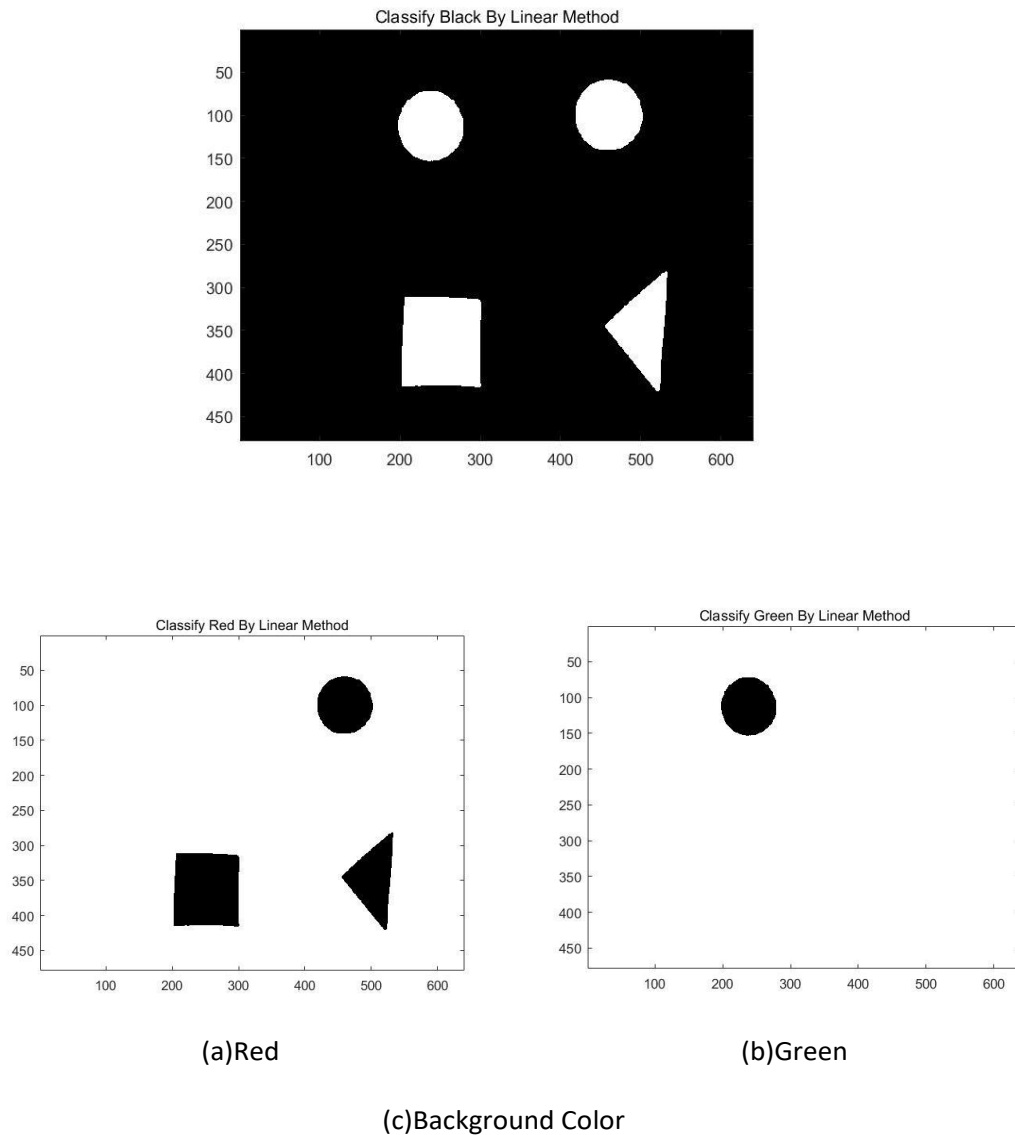
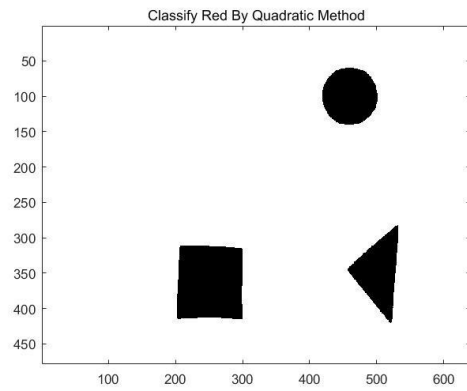
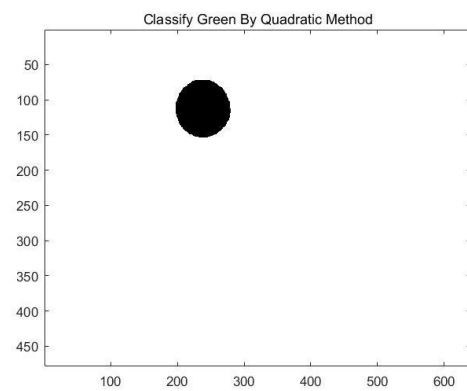


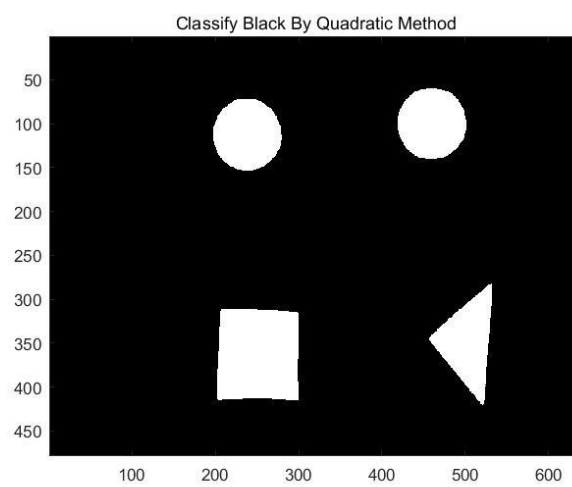
Fig.1 the result images in Q1 that processed by Linear method



(a)Red



(b)Green

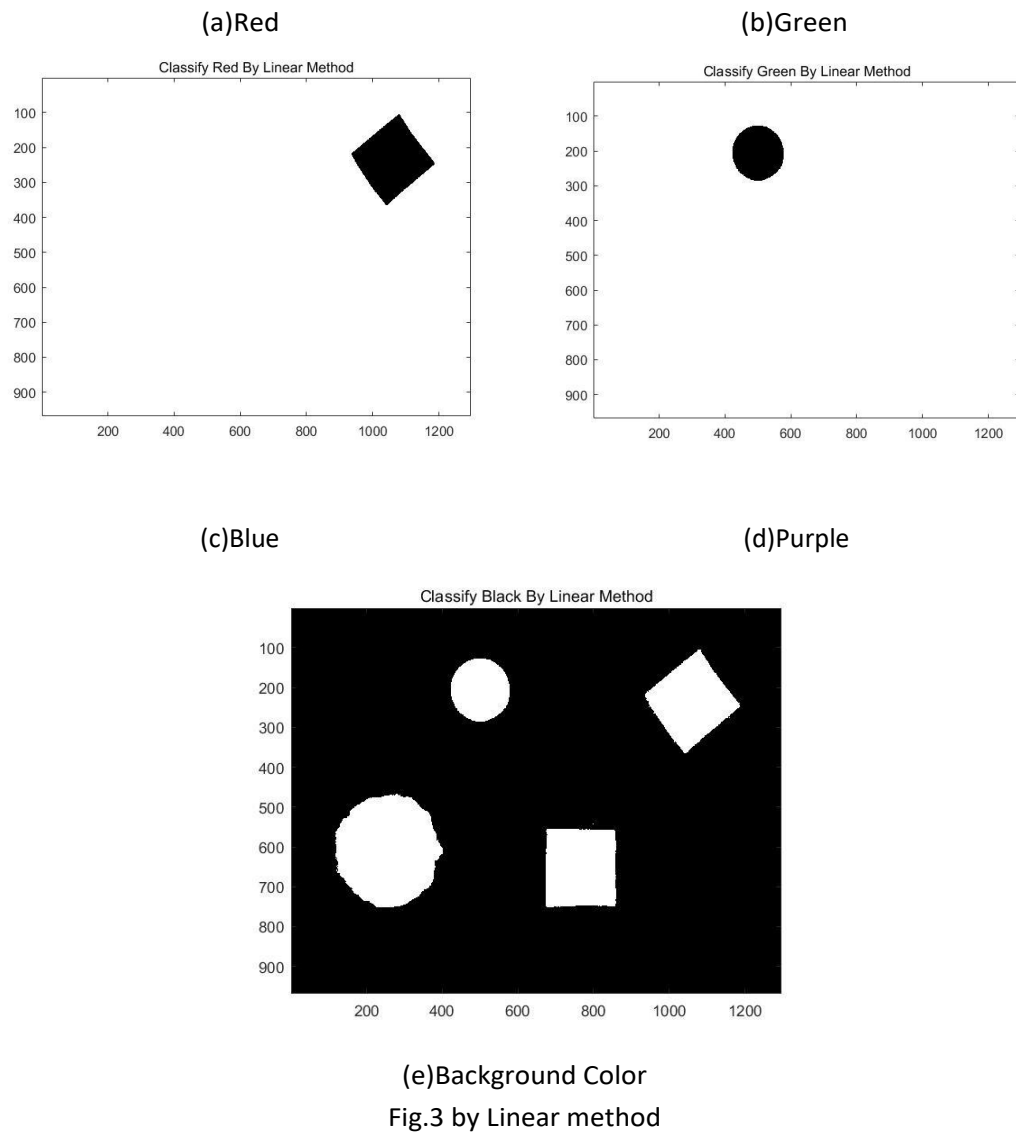


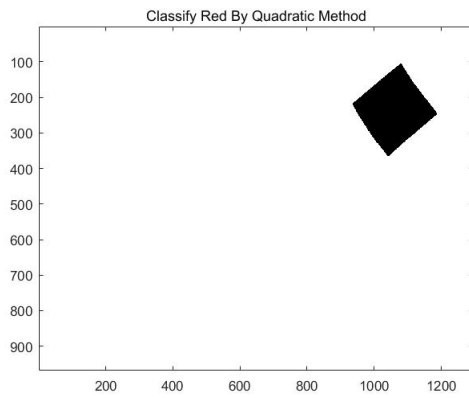
(c)Background color

Fig.2 the result images in Q1 that processed by Quadratic method

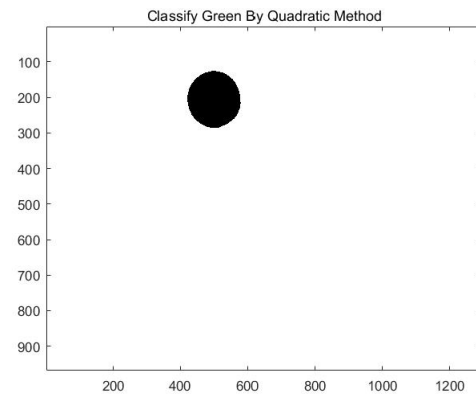
## Question 2:

The result images of the image “objects2.png” processed by the Linear Bayes Classifier and the Quadratic Bayes Classifier are showed below.

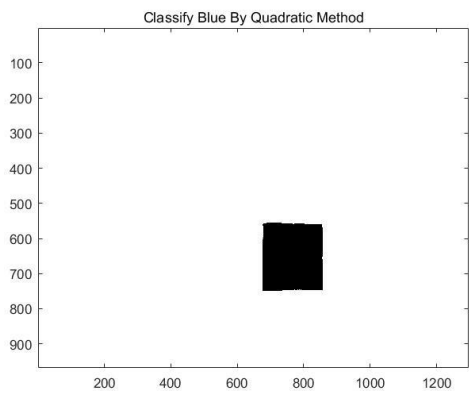




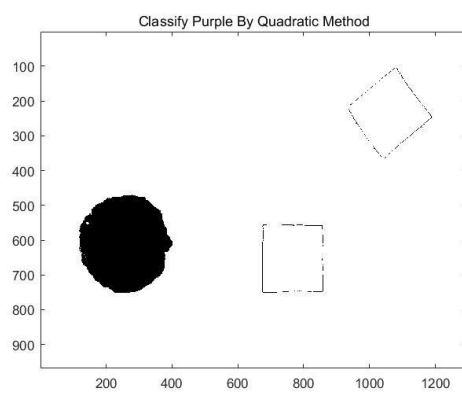
(a)Red



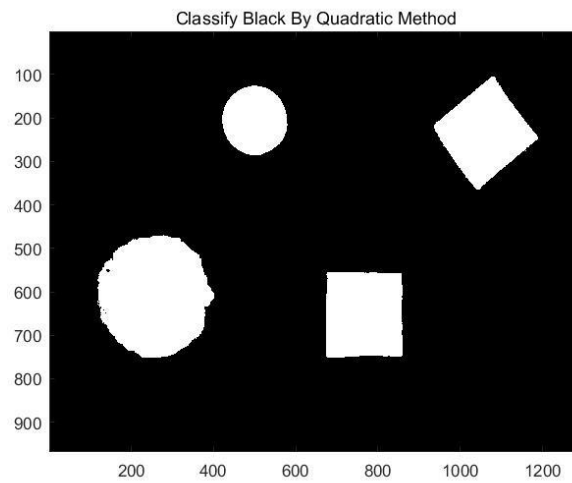
(b)Green



(c)Blue



(d)Purple

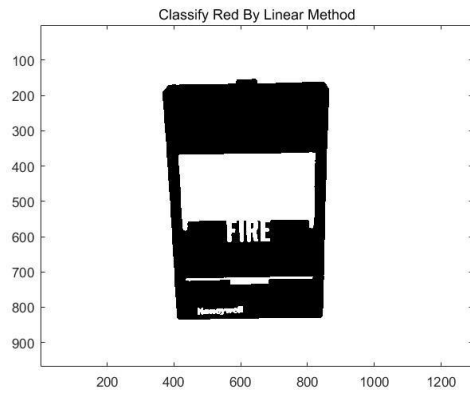


(e)Background Color

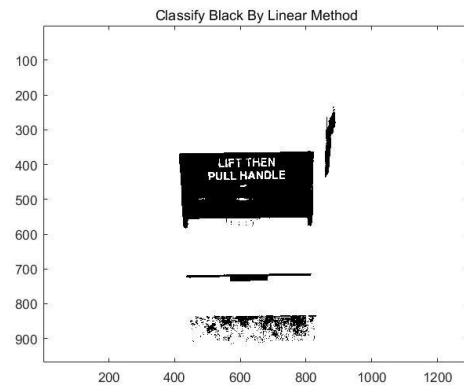
Fig.4 by Quadratic method

### Question 3:

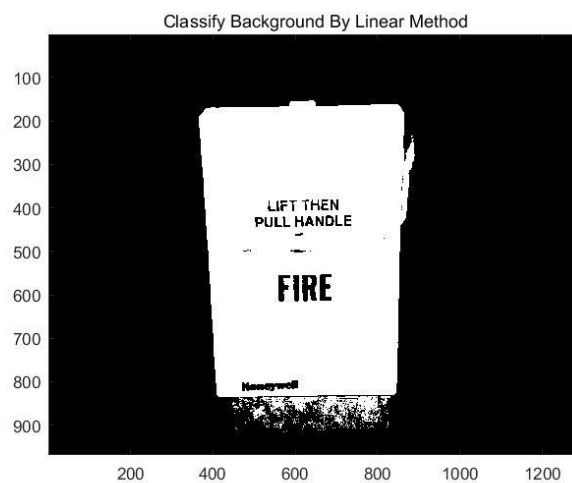
The result images of the image “firealarm.jpg” processed by the Linear Bayes Classifier and the Quadratic Bayes Classifier are showed below



(a) Red

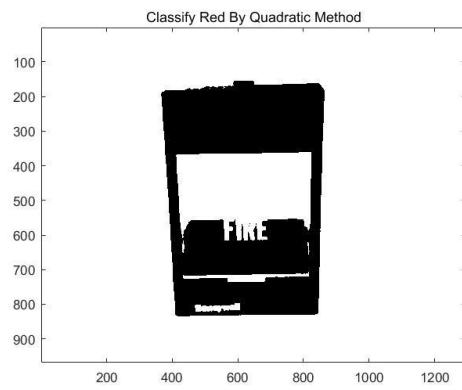


(b) Black

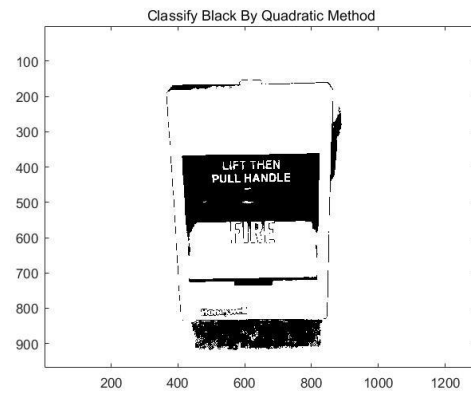


(c) Background Color

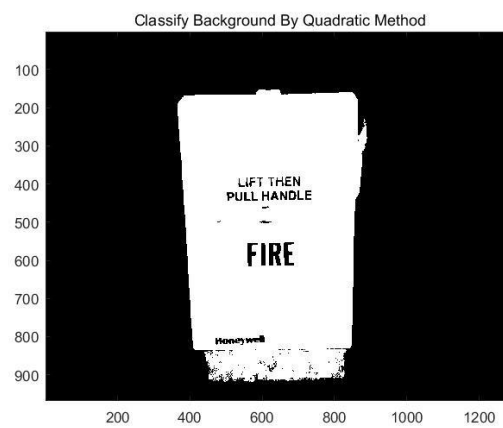
Fig.5 by Linear method



(a)Red



(b)Black



(c)Background Color

Fig.6 by Quadratic method

## Appendix:

The Matlab codes of each problem are shown below.

### Question 1:

```
%% detection of object1
I = imread('objects1.png');
figure,image(I),truesize;
% sample the different colors of different parts
[redrow1,bluerow1,greenrow1]=mygetRGBvalues(I(326:355,211:240,:))
;
[redrow2,bluerow2,greenrow2]=mygetRGBvalues(I(101:130,226:255,:))
;
[redrow3,bluerow3,greenrow3]=mygetRGBvalues(I(11:40,11:40,:));
%covert to the column vectors
redrow1=reshape(redrow1',[900,1]);
bluerow1=reshape(bluerow1',[900,1]);
greenrow1=reshape(greenrow1',[900,1]);
```

```

redrow2=reshape(redrow2',[900,1]);
bluerow2=reshape(bluerow2',[900,1]);
greenrow2=reshape(greenrow2',[900,1]);
redrow3=reshape(redrow3',[900,1]);
bluerow3=reshape(bluerow3',[900,1]);
greenrow3=reshape(greenrow3',[900,1]);
% create the sample data to form the training data
reddata = [redrow1 ,bluerow1,greenrow1];
greendata = [redrow2, bluerow2, greenrow2];
bgdata = [redrow3, bluerow3, greenrow3];
reddata = double(reddata);
greendata = double(greendata);
bgdata = double(bgdata);
trainingdata = [reddata;greendata;bgdata];
% create the labels to each sample to form the group
redlabels = ones(900,1);
greenlabels = 2*ones(900,1);
bglabls = 3*ones(900,1);
group = [redlabels; greenlabels; bglabls];
% sample the detected image
[Xred,Xblue,Xgreen] = mygetRGBvalues(I);
Xred = reshape(Xred,[478*640,1]);
Xblue = reshape(Xblue,[478*640,1]);
Xgreen = reshape(Xgreen,[478*640,1]);
Xdata = [Xred, Xblue, Xgreen];
Xdata = double (Xdata);
sample = Xdata;
% layout the images of the results by Linear one
Dec = classify (sample,trainingdata,group,'Linear');
Class = reshape(Dec,[640,478]);
Class=double(Class');
red=255*ones(478,640);
green=255*ones(478,640);
black=255*ones(478,640);
for i=1:478
    for j=1:640
        if (Class(i,j)==1)
            red(i,j)=0;
        elseif(Class(i,j)==2)
            green(i,j)=0;
        elseif(Class(i,j)==3)
            black(i,j)=0;
        end
    end
end

```



```

end
figure,image(red),colormap(gray);
title('Classify Red By Linear Method');
figure,image(green),colormap(gray);
title('Classify Green By Linear Method');
figure,image(black),colormap(gray);
title('Classify Black By Linear Method');
% layout the images of the results by Quadratic one
Dec = classify (sample,trainingdata,group,'Quadratic');
Class = reshape(Dec,[640,478]);
Class=double(Class');
red=255*ones(478,640);
green=255*ones(478,640);
black=255*ones(478,640);
for i=1:478
    for j=1:640
        if (Class(i,j)==1)
            red(i,j)=0;
        elseif(Class(i,j)==2)
            green(i,j)=0;
        elseif(Class(i,j)==3)
            black(i,j)=0;
        end
    end
end
end
figure,image(red),colormap(gray);
title('Classify Red By Quadratic Method');
figure,image(green),colormap(gray);
title('Classify Green By Quadratic Method');
figure,image(black),colormap(gray);
title('Classify Black By Quadratic Method');

```

#### Question 2:

```

%% detection of object2
I = imread('objects2.png');
figure,image(I),truesize;
% sample the different colors of different parts
[redrow1,bluerow1,greenrow1]=mygetRGBvalues(I(201:230,1001:1030,:));
[redrow2,bluerow2,greenrow2]=mygetRGBvalues(I(176:205,466:495,:));
;
[redrow3,bluerow3,greenrow3]=mygetRGBvalues(I(591:620,716:745,:));
;
[redrow4,bluerow4,greenrow4]=mygetRGBvalues(I(536:565,171:200,:));

```

```

;
[redrow5,bluerow5,greenrow5]=mygetRGBvalues(I(1:30,1:30,:));
%convert to the column vectors
redrow1=reshape(redrow1',[900,1]);
bluerow1=reshape(bluerow1',[900,1]);
greenrow1=reshape(greenrow1',[900,1]);
redrow2=reshape(redrow2',[900,1]);
bluerow2=reshape(bluerow2',[900,1]);
greenrow2=reshape(greenrow2',[900,1]);
redrow3=reshape(redrow3',[900,1]);
bluerow3=reshape(bluerow3',[900,1]);
greenrow3=reshape(greenrow3',[900,1]);
redrow4=reshape(redrow4',[900,1]);
bluerow4=reshape(bluerow4',[900,1]);
greenrow4=reshape(greenrow4',[900,1]);
redrow5=reshape(redrow5',[900,1]);
bluerow5=reshape(bluerow5',[900,1]);
greenrow5=reshape(greenrow5',[900,1]);
% create the sample data to form the training data
reddata = [redrow1 ,bluerow1,greenrow1];
greendata = [redrow2, bluerow2, greenrow2];
bluedata = [redrow3, bluerow3, greenrow3];
purpledata = [redrow4, bluerow4, greenrow4];
bgdata = [redrow5, bluerow5, greenrow5];
reddata = double(reddata);
greendata = double(greendata);
bluedata = double(bluedata);
purpledata = double(purpledata);
bgdata = double(bgdata);
trainingdata = [reddata;greendata;bluedata;purpledata;bgdata];
% create the labels to each sample to form the group
redlabels = ones(900,1);
greenlabels = 2*ones(900,1);
bluelabels = 3*ones(900,1);
purplelabels = 4*ones(900,1);
bglabels = 5*ones(900,1);
group = [redlabels; greenlabels; bluelabels; purplelabels;
bglabels];
% sample the detected image
[Xred,Xblue,Xgreen] = mygetRGBvalues(I);
Xred = reshape(Xred,[968*1296,1]);
Xblue = reshape(Xblue,[968*1296,1]);
Xgreen = reshape(Xgreen,[968*1296,1]);
Xdata = [Xred, Xblue, Xgreen];

```

```

Xdata = double (Xdata);
sample = Xdata;
% layout the images of the results by Linear one
Dec = classify (sample,trainingdata,group,'Linear');
Class = reshape(Dec,[1296,968]);
Class=double(Class');
red=255*ones(968,1296);
green=255*ones(968,1296);
blue=255*ones(968,1296);
purple=255*ones(968,1296);
black=255*ones(968,1296);
for i=1:968
    for j=1:1296
        if (Class(i,j)==1)
            red(i,j)=0;
        elseif(Class(i,j)==2)
            green(i,j)=0;
        elseif(Class(i,j)==3)
            blue(i,j)=0;
        elseif(Class(i,j)==4)
            purple(i,j)=0;
        elseif(Class(i,j)==5)
            black(i,j)=0;
        end
    end
end
figure,image(red),colormap(gray);
title('Classify Red By Linear Method');
figure,image(green),colormap(gray);
title('Classify Green By Linear Method');
figure,image(blue),colormap(gray);
title('Classify Blue By Linear Method');
figure,image(purple),colormap(gray);
title('Classify Purple By Linear Method');
figure,image(black),colormap(gray);
title('Classify Black By Linear Method');
% layout the images of the results by Quadratic one
Dec = classify (sample,trainingdata,group,'Quadratic');
Class = reshape(Dec,[1296,968]);
Class=double(Class');
red=255*ones(968,1296);
green=255*ones(968,1296);
blue=255*ones(968,1296);
purple=255*ones(968,1296);

```

```

black=255*ones(968,1296);
for i=1:968
    for j=1:1296
        if (Class(i,j)==1)
            red(i,j)=0;
        elseif(Class(i,j)==2)
            green(i,j)=0;
        elseif(Class(i,j)==3)
            blue(i,j)=0;
        elseif(Class(i,j)==4)
            purple(i,j)=0;
        elseif(Class(i,j)==5)
            black(i,j)=0;
        end
    end
end
figure,image(red),colormap(gray);
title('Classify Red By Quadratic Method');
figure,image(green),colormap(gray);
title('Classify Green By Quadratic Method');
figure,image(blue),colormap(gray);
title('Classify Blue By Quadratic Method');
figure,image(purple),colormap(gray);
title('Classify Purple By Quadratic Method');
figure,image(black),colormap(gray);
title('Classify Black By Quadratic Method');

```

### Question 3:

```

%% detection of object2
I=imread('firealarm.jpg');
figure,image(I),truesize;
% sample the different colors of different parts
[redrow1,bluerow1,greenrow1]=mygetRGBvalues(I(201:230,561:590,:))
;
[redrow2,bluerow2,greenrow2]=mygetRGBvalues(I(381:410,431:460,:))
;
[redrow3,bluerow3,greenrow3]=mygetRGBvalues(I(801:830,1171:1200,:))
;
%covert to the column vectors
redrow1=reshape(redrow1',[900,1]);
bluerow1=reshape(bluerow1',[900,1]);
greenrow1=reshape(greenrow1',[900,1]);
redrow2=reshape(redrow2',[900,1]);
bluerow2=reshape(bluerow2',[900,1]);

```

```

greenrow2=reshape(greenrow2',[900,1]);
redrow3=reshape(redrow3',[900,1]);
bluerow3=reshape(bluerow3',[900,1]);
greenrow3=reshape(greenrow3',[900,1]);
% create the sample data to form the training data
reddata = [redrow1 ,bluerow1,greenrow1];
blackdata = [redrow2, bluerow2, greenrow2];
bgdata = [redrow3, bluerow3, greenrow3];
reddata = double(reddata);
blackdata = double(blackdata);
bgdata = double(bgdata);
trainingdata = [reddata;blackdata;bgdata];
% create the labels to each sample to form the group
redlabels = ones(900,1);
blacklabels = 2*ones(900,1);
bglabels = 3*ones(900,1);
group = [redlabels; blacklabels; bglabels];
% sample the detected image
[Xred,Xblue,Xgreen] = mygetRGBvalues(I);
Xred = reshape(Xred,[968*1296,1]);
Xblue = reshape(Xblue,[968*1296,1]);
Xgreen = reshape(Xgreen,[968*1296,1]);
Xdata = [Xred, Xblue, Xgreen];
Xdata = double (Xdata);
sample = Xdata;
% layout the images of the results by Linear one
Dec = classify (sample,trainingdata,group,'Linear');
Class = reshape(Dec,[1296,968]);
Class=double(Class');
red=255*ones(968,1296);
black=255*ones(968,1296);
background=255*ones(968,1296);
for i=1:968
    for j=1:1296
        if (Class(i,j)==1)
            red(i,j)=0;
        elseif(Class(i,j)==2)
            black(i,j)=0;
        elseif(Class(i,j)==3)
            background(i,j)=0;
        end
    end
end
figure,image(red),colormap(gray);

```

```

title('Classify Red By Linear Method');
figure,image(black),colormap(gray);
title('Classify Black By Linear Method');
figure,image(background),colormap(gray);
title('Classify Background By Linear Method');
% layout the images of the results by Quadratic one
Dec = classify (sample,trainingdata,group,'Quadratic');
Class = reshape(Dec,[1296,968]);
Class=double(Class');
red=255*ones(968,1296);
black=255*ones(968,1296);
background=255*ones(968,1296);
for i=1:968
    for j=1:1296
        if (Class(i,j)==1)
            red(i,j)=0;
        elseif(Class(i,j)==2)
            black(i,j)=0;
        elseif(Class(i,j)==3)
            background(i,j)=0;
        end
    end
end
figure,image(red),colormap(gray);
title('Classify Red By Quadratic Method');
figure,image(black),colormap(gray);
title('Classify Black By Quadratic Method');
figure,image(background),colormap(gray);
title('Classify Background By Quadratic Method');

```