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Drowsy Driver Identification Using MATLAB Video Processing

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Abstract— Drivers who do not take regular breaks when driving long distances run a high risk of becoming drowsy and cause accidents. It is astate which they often fail to recognize early enough according to the experts. Studies show that around one quarter of all serious motorway accidents is attributable to sleepy drivers in need of a rest, meaning that drowsiness causes more road accidents than drink-driving. Driver fatigue is a significant factor in a large number of vehicle accidents. The development of technologies for detecting drowsiness at the wheel is a major challenge in the field of accident avoidance systems. Because of the hazard that drowsiness presents on the road, methods need to be developed for counteracting its affects. The main aim of this is to develop a drowsiness detection system by monitoring the eyes and mouth; it is believed that the symptoms of driver fatigue can be detected early enough to avoid a car accident. Detection of fatigue involves the observation of eye movements, blink patterns and mouth opening for yawning. The analysis of face images is a popular research area with applications such as face recognition, and human identification security systems. This project is focused on the localization of the eyes, which involves looking at the entire image of the eye, and determining the position of the eyes, by a self-developed image-processing algorithm.
Index Terms— Drowsy, Accident, Algorithm, Image Processing.

I. INTRODUCTION

Driver drowsiness detection is a car safety technology which prevents accidents when the driver is getting drowsy. Various studies have suggested that around 20% of all road accidents are fatigue-related, up to 50% on certain roads. Driver fatigue is a significant factor in a large number of vehicle accidents. Recent statistics estimate that annually 1,200 deaths and 76,000 injuries can be attributed to fatigue related crashes. The development of technologies for detecting or preventing drowsiness at the wheel is a major challenge in the field of accident avoidance systems. .

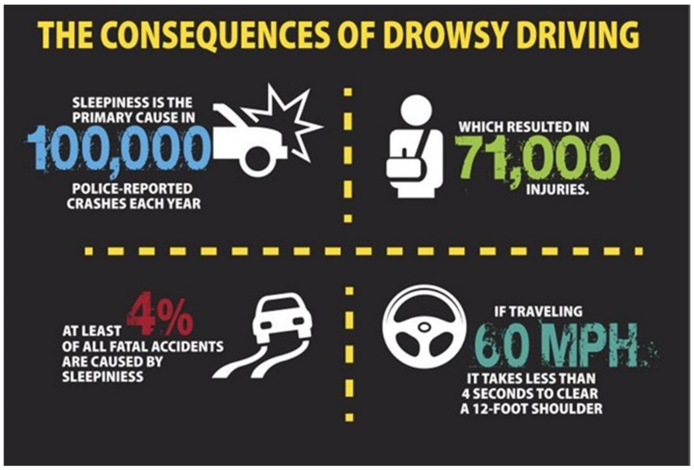

Fig.1: Impact of drowsy driving

Because of the hazard that drowsiness presents on the road, methods need to be developed for counteracting its affects. Driver inattention might be the result of a lack of alertnesswhen driving due to driver drowsiness and distraction.Driver distraction occurs when an object or event draws aperson's attention away from the driving task. Unlike driverdistraction, driver drowsiness involves no triggering eventbut, instead, is characterized by a progressive withdrawal ofattention from the road and traffic demands. Both driverdrowsiness and distraction, however, might have the sameeffects, i.e., decreased driving performance, longer reactiontime, and an increased risk of crash involvement. Based on Acquisition of video from the camera that is in front of driver perform real-time processing of an incoming video stream in order to infer the driver's level of fatigue if the drowsiness is Estimated then the output is send to the alarm system and alarm is activated.

II. DRIVER DROWSINESS DETECTION SYSTEM USING MATLAB VIDEO PROCESSING AND MLL

In our proposed project the eye blink and mouth opening of the driver is detected. If the driver's eyes remain closed for more than a certain period of time and if the driver's mouth remains open for unusual time then the driver is said to be drowsy and an alarm is sounded. The programming for this is done using MATLAB using facial feature extraction. The eyes and mouth are checked for long time close and open condition. The response comes like drowsy or non-drowsy based on MLL result.The software used for this process is Matlab 8.1

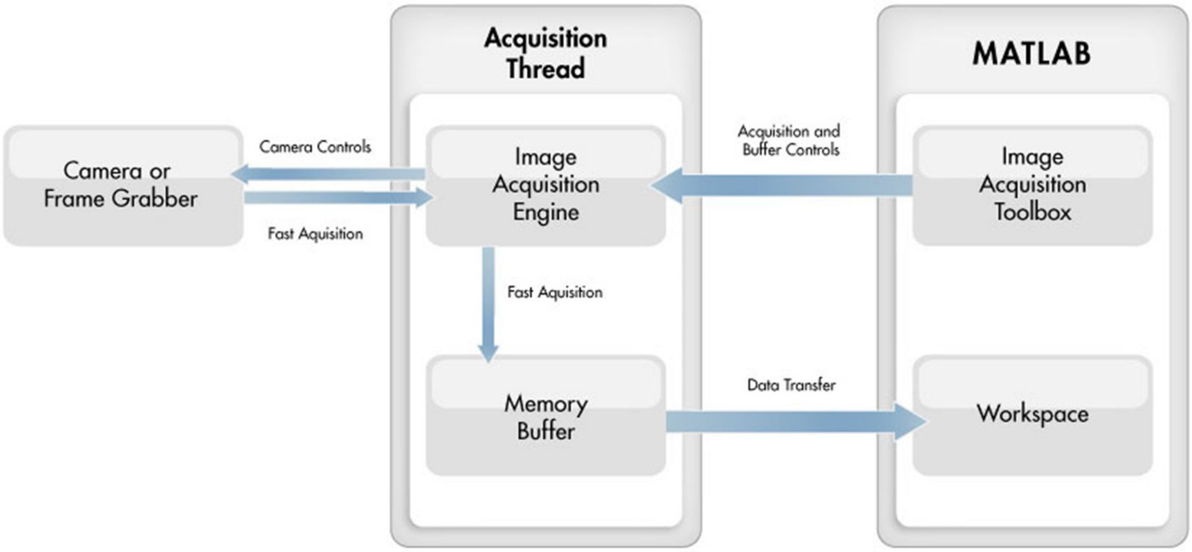

Fig.2: Architecture

A. Machine Learning

The goal of machine learning is to turn data into information. After having learned from a gathering of data, we want a machine that is able to answer any question about the data: What are the other data that are similar to given data? Is there a face in the image? What kind of ad will influence the user? There is usually a cost component, so the question may become:

Of the many products that we can make the money from, which one will most likely be bought by the user if an ad is shown for it? Machine learning converts data into information by detecting rules or patterns from that data. Machine learning works on data like temperature values or stock prices or color intensities, and in our case face and eye detection. The data is usually preprocessed into features. We might take a database containing 1,000 face images then perform an edge detector on all the faces, and then obtain features such as edge direction, edge intensity, also offset from the face center for every face. We may obtain up to 500 such values for every face or a feature vector of 500 entries. We may then use machine learning to construct some sort of model from the obtained data. If we want to see how the faces fall into various groups (narrow, wide, etc.), after that a clustering algorithm can be the preferred choice. In case we want to learn how to guess the age of a woman from the pattern of the edges that are detected on her face, then we can use a **classifier** algorithm. To reach our goals, machine learning algorithms can analyze our obtained features and hence adjust the weights, the thresholds, and all the other parameters for maximizing performance set by those goals. This method of parameter adjustment for meeting a goal is what is called learning.

It is very important to understand how efficiently machine learning methods can work. This might be a delicate task. Usually, we break up the input data set into a very large training set (i.e. 900 faces, in our project) and a relatively small test set (i.e. remainder 100 faces). Then we can run our classifier on the training set in order to learn for a age prediction model, data feature

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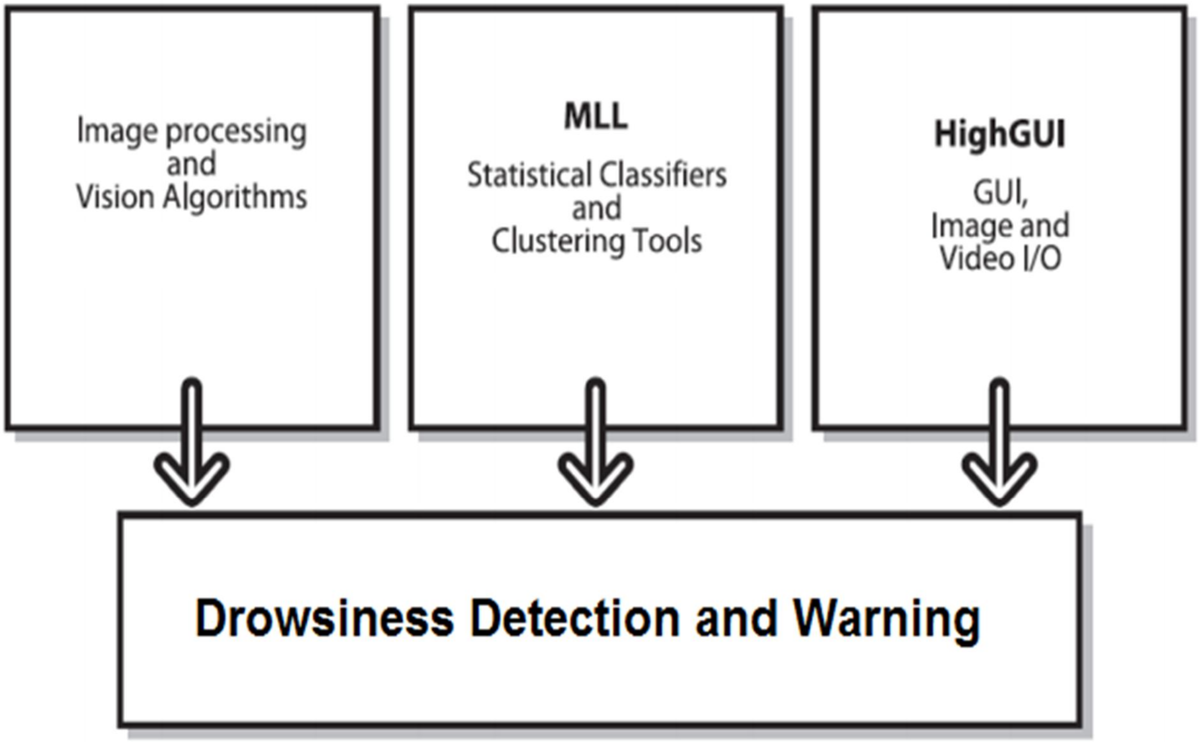

Fig.3: Architecture

It is used to recognize our facial features in normal condition i.e. eyes open and mouth closed .When the driver feels drowsy he/she yawns and close eyes. This difference in the expression is caught by our classifier.

III. MODULE DESCRIPTION

A. Image Acquisition Module

To take input image from web cam we use image acquisition module of MATLAB 2013a.
It activates the web cam of laptop and camera to act as the interface for face recognition.

B. Video Processing Module

To analyze frame by frame status of the image captured we use image processing module.
It always tracks face part only.
Region of Interest (ROI) is only human face which is checked always by this module.

C. Machine Learning

This module is used to recognize our facial features in normal condition i.e eyes open and mouth closed.
When the driver feels drowsy he/she yawns and close eyes.
This difference in the expression is caught by our classifier.

D. Abnormal Classification

In this module all the facial expression is detected from MLL algorithm.
It is only responsible to classify whether the driver feels drowsy or not.

E. Sleep Alert

We can use MATLAB to generate warning beep which will produce sound once it detects the sleep.
We can even use SAPI toolbox to speak our name and alert us by name.

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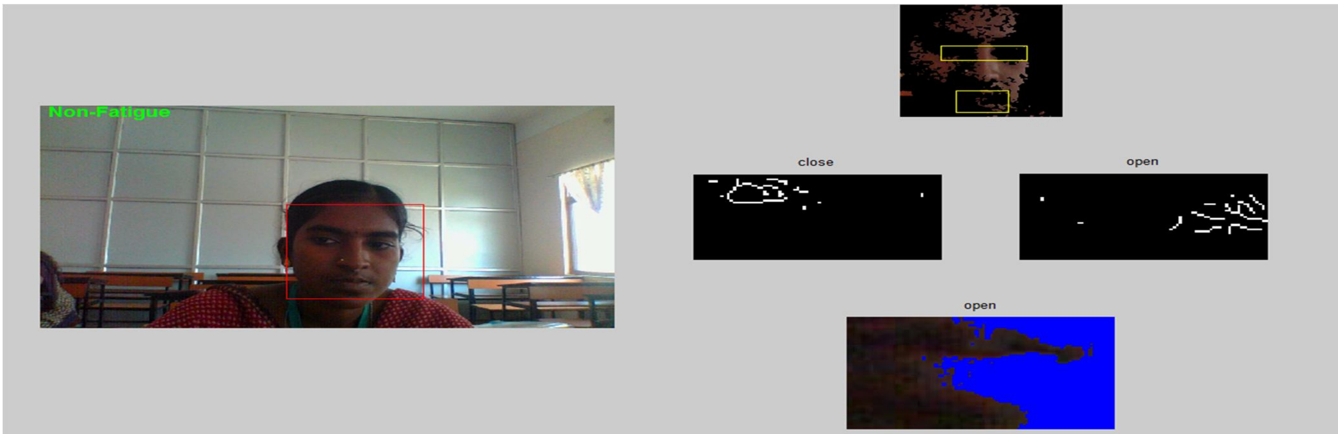
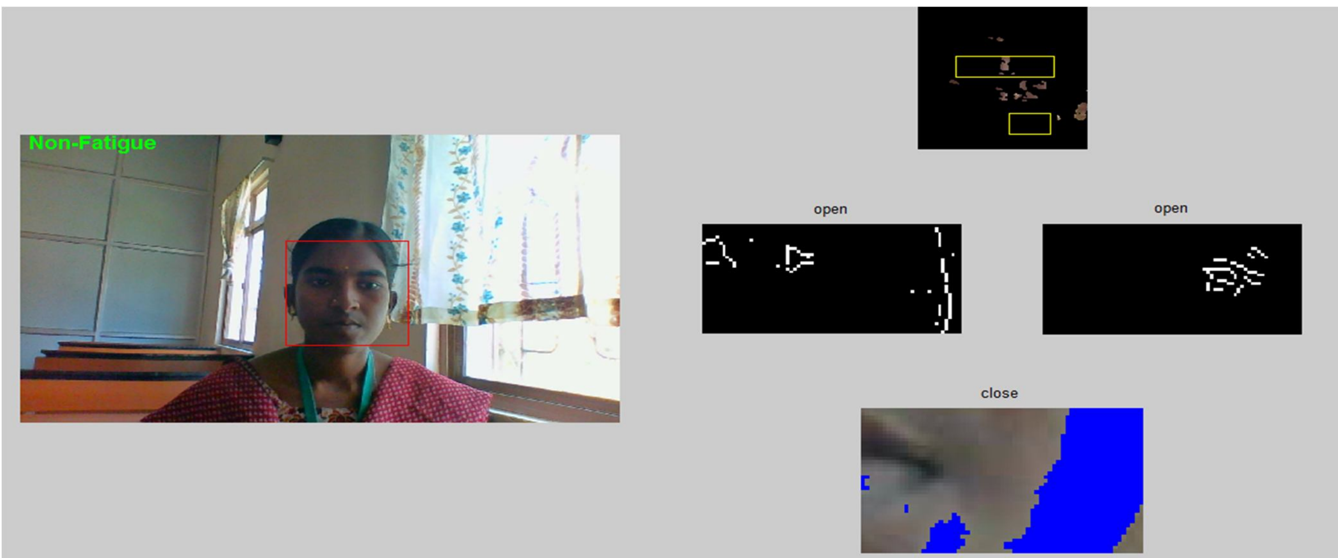
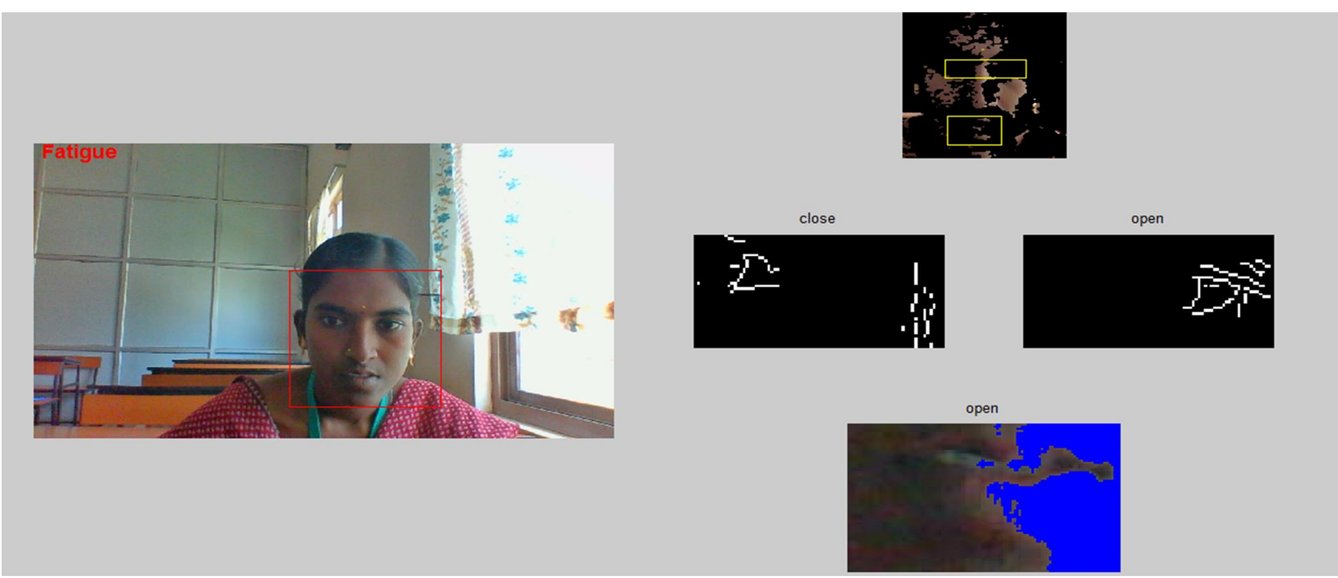
IV. OUTPUT







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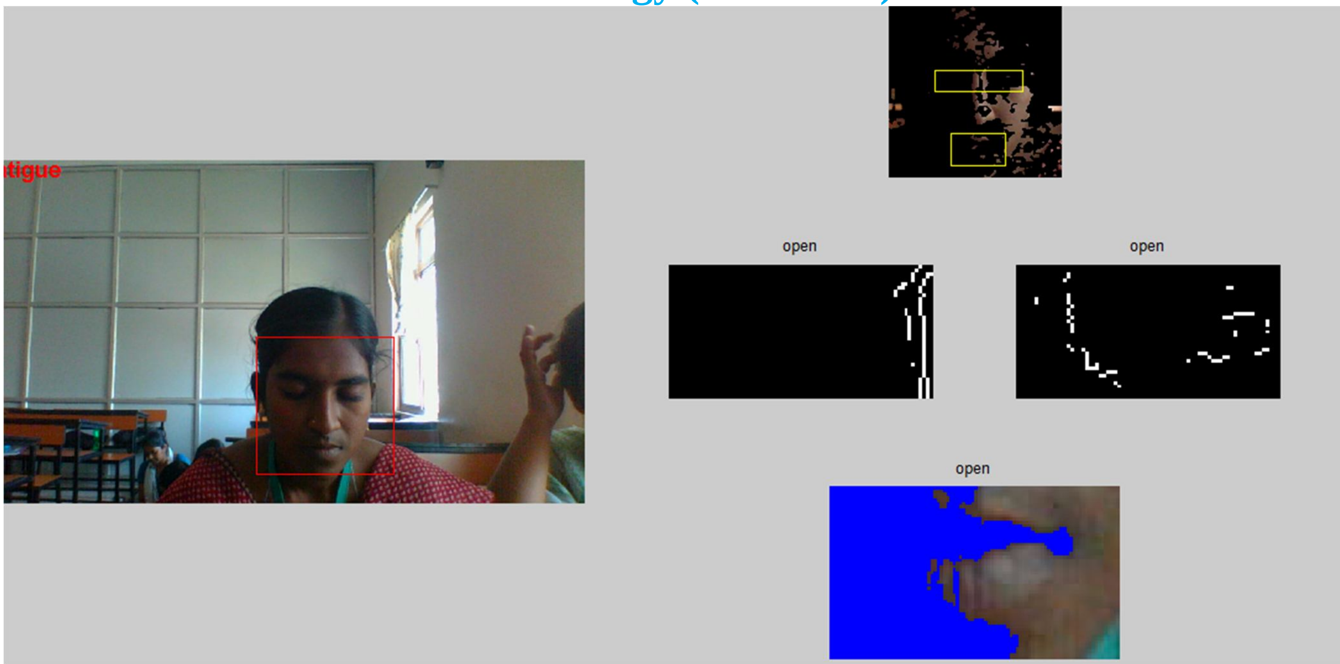

V. CODING

```
clc;
clearall;
closeall;
%%
loadDB
loadsvm
cl = {'open','close'};

dim = [30 60;
       30 60
       40 65];
delete(imaqfind)
vid=videoinput('winvideo',1);
triggerconfig(vid,'manual');
set(vid,'FramesPerTrigger',1 );
set(vid,'TriggerRepeat', Inf);
% start(vid);

%  View the default color space used for the data
color_spec=vid.ReturnedColorSpace;

% Modify the color space used for the data
if  ~strcmp(color_spec,'rgb')
set(vid,'ReturnedColorSpace','rgb');
end
start(vid)


% objects
faceDetector = vision.CascadeObjectDetector;
faceDetectorLeye = vision.CascadeObjectDetector('EyePairBig');
faceDetectorM = vision.CascadeObjectDetector('Mouth');
tic
% Initialise vector
LC = 0;
RC = 0;
MC = 0;
TF = 0;
TC = 0;
Feature = [];
c1p = 1;
species = 'Non-Fatigue';
for ii = 1:600

trigger(vid);
im=getdata(vid,1); % Get the frame in im
imshow(im)

subplot(3,4,[1 2 5 6 9 10]);
imshow(im)

% Detect faces
bbox = step(faceDetector, im);

if ~isempty(bbox);
bbox = bbox(1,:);

% Plot box
rectangle('Position',bbox,'edgecolor','r');

        S = skin_seg2(im);

% Segment skin region
       bw3 = cat(3,S,S,S);

% Multiply with original image and show the output
Iss = double(im).*bw3;

Ic = imcrop(im,bbox);
       Ic1 = imcrop(Iss,bbox);
subplot(3,4,[3 4]);
imshow(uint8(Ic1))
```

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```
bboxeye = step(faceDetectorLeye,
Ic);

if ~isempty(bboxeye);
bboxeye = bboxeye(1,:);

Eeye = imcrop(Ic,bboxeye);
% Plot box
rectangle('Position',bboxeye,'edgecol
or','y');
else
disp('felomenon Eyes not detected')
end

ifisempty(bboxeye)
continue;
end
Ic(1:bboxeye(2)+2*bboxeye(4),:,:) =
0;

% Detect Mouth
bboxM = step(faceDetectorM, Ic);


if ~isempty(bboxM);
bboxMtemp = bboxM;

if ~isempty(bboxMtemp)

bboxM = bboxMtemp(1,:);
Emouth=  imcrop(Ic,bboxM);

% Plot box
rectangle('Position',bboxM,'edgecolor
','y');
else
disp('Mouth  not detected')
continue;
end
else
disp('Mouth not detected')
continue;
end

    [nrence k ] = size(Eeye);

% Divide into two parts
Leye = Eeye(:,1:round(nce/2),:);
    Reye =
Eeye(:,round(nce/2+1):end,:);

subplot(3,4,7)
imshow(edge(rgb2gray(Leye),'sobel')
);
subplot(3,4,8)
imshow(edge(rgb2gray(Reye),'sobel')
);

    Emouth3 = Emouth;


Leye = rgb2gray(Leye);
    Reye = rgb2gray(Reye);
Emouth = rgb2gray(Emouth);

% K means clustering
    X = Emouth(:);
    [nr1 nc1 ] = size(Emouth);
cid =
kmeans(double(X),2,'emptyaction','dr
op');

kout = reshape(cid,nr1,nc1);
subplot(3,4,[11,12]);

% Segment
    Ism = zeros(nr1,nc1,3);
%       Ism(:,:,3) = 255;
%       Ism(:,:,3) = 125;
Ism(:,:,3) = 255;

bwm = kout-1;
    bwm3 = cat(3,bwm,bwm,bwm);

% Right eye
% Resize to standard size
    Reye =  imresize(Reye,[dim(2,1)
dim(2,2)]);
    c2 = match_DB(Reye,DBR);
subplot(3,4,8)
title(cl{c2})

% Mouth
% Resize to standard size
Emouth=  imresize(Emouth,[dim(3,1)
dim(3,2)]);
    c3 = match_DB(Emouth,DBM);
subplot(3,4,[11,12]);
title(cl{c3})


if c1 == 2
        LC = LC+1;
if c1p == 1
            TC = TC+1;
end
end
if c2==2
        RC = RC+1;
end
if c3 == 1
        MC = MC + 1;
end


    TF = TF + 1;
toc
iftoc>8
        Feature = [LC/TF RC/TF
MC/TF TC]
species =
svmclassify(svmStruct,Feature);


tic
% Initialise vector
        LC = 0; %
        RC = 0; %
        MC = 0; %
        TF = 0; %
        TC = 0; %
end
subplot(3,4,[1 2 5 6 9 10]);
ifstrcmpi(species,'Fatigue')
text(20,20,species,'fontsize',14,'color',
'r','Fontweight','bold')
tts('fenomena drowsy detection');
else
text(20,20,species,'fontsize',14,'color',
'g','Fontweight','bold')
```

VI. CONCLUSION

Thus we developed a system of anti-accident based on drowsy driving detection and tries to look at the emerging technologies and determine the best approaches in trying to prevent the number one cause of fatal vehicle crashes. Currently, the number one selling product in the market is nothing more than a reed switch to detect head angle tilt. Available product is extremely limited and not very effective. In our future enhancement of our project we plan to slow down a vehicle automatically when fatigue level crosses a certain limit. Instead of threshold drowsiness level it is suggested to design a continuous scale driver fatigue detection system. It monitors the level of drowsiness continuously and when this level exceeds a certain value a signal is generated which controls the hydraulic braking system of the vehicle.Dedicated hardware for image acquisition processing and display Interface support with the hydraulic braking system which includes relay, timer , stepper motor and a linear actuator.When drowsiness level exceeds a certain limit then a signal is generated which is communicated to the relay through the parallel port(parallel data transfer required for faster results).The relay drives the on delay timer and this timer in turn runs the stepper motor for a definite time period .The stepper motor is connected to a linear actuator.

VI. ACKNOWLEDGEMENT

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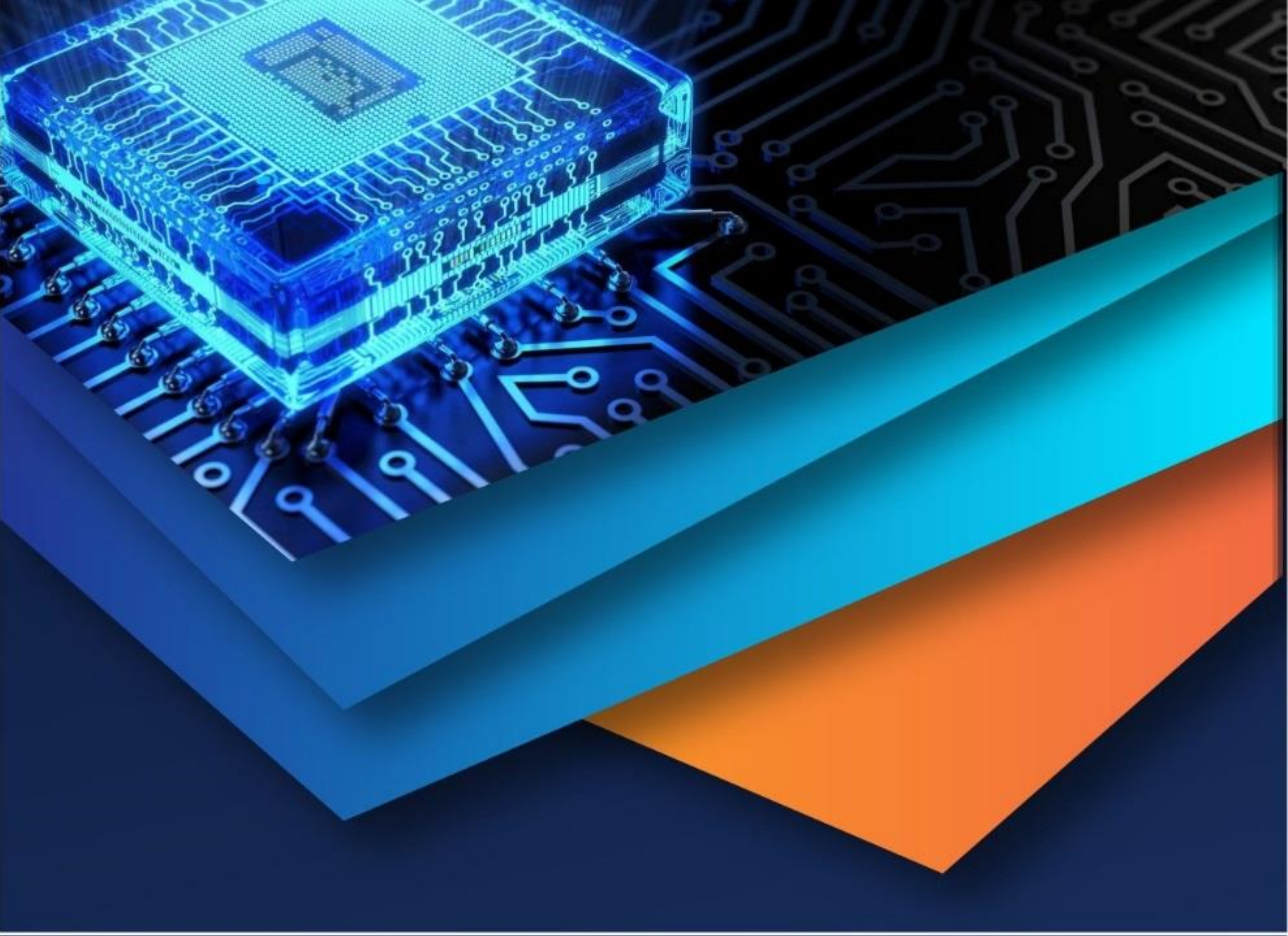

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