MANIPAL UNIVERSITY
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A Project Report

on

Drowsiness Detection System

carried out as part of the Digital Image Processing course (CS-1553) submitted by

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- **Introduction/Purpose**

  The aim of this project is to develop a prototype drowsiness detection system. The focus will be placed on designing a system that will accurately monitor the open or closed state of the driver's eyes in real-time. By monitoring the eyes, it is believed that the symptoms of driver fatigue can be detected early enough to avoid a car accident.

- **Approach**
  - The libraries used in this project are dlib, scipy.spatial, openCV and imutils.
  - Each eye is represented by 6 (x, y)-coordinates, starting at the left-corner of the eye (as if you were looking at the person), and then working clockwise around the eye.
  - It checks 15 consecutive frames and if the Eye Aspect ratio is less than 0.20, Alert is generated.

- **Code**

```
from scipy.spatial import distance
import imutils
from imutils import face_utils
import dlib
import cv2
def eye_aspect_ratio(eye):
     LE = distance.euclidean(eye[1], eye[5])
     RE = distance.euclidean(eye[2], eye[4])
     CE = distance.euclidean(eye[0], eye[3])
     EAR = (LE + RE) / (2.0 * CE)
     return EAR
threshold = 0.25
frames_to_be_checked = 15
```

```
detect = dlib.get_frontal_face_detector()
predict=dlib.shape_predictor("shape_predictor_68_face_landmarks.dat")
(lStart, lEnd) = face_utils.FACIAL_LANDMARKS_IDXS["left_eye"]
(rStart, rEnd) = face_utils.FACIAL_LANDMARKS_IDXS["right_eye"]
cap=cv2.VideoCapture(0)
flag=0
while True:
    ret, frame=cap.read()
    frame = imutils.resize(frame, width=450)
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
    subjects = detect(gray, 0)
    for subject in subjects:
    shape = predict(gray, subject)
    shape = face_utils.shape_to_np(shape)
    lEye = shape[lStart:lEnd]
    rEye = shape[rStart:rEnd]
    LEAR = eye_aspect_ratio(lEye)
    REAR = eye_aspect_ratio(rEye)
    ear = (LEAR + REAR) / 2.0
    lEyeHull = cv2.convexHull(lEye)
    rEyeHull = cv2.convexHull(rEye)
    cv2.drawContours(frame, [lEyeHull], -1, (0, 255, 0), 1)
    cv2.drawContours(frame, [rEyeHull], -1, (0, 255, 0), 1)
    if ear < threshold:
        flag += 1
        #print (flag)
        if flag >= frames_to_be_checked:
            cv2.putText(frame,"ALERT!", (10, 30),
                cv2.FONT_HERSHEY_SIMPLEX, 0.7, (0, 0, 255), 2)
    else:
        flag = 0
    cv2.imshow("Frame", frame)
    key = cv2.waitKey(1) & 0xFF
```

```
if key == ord("x"):
cv2.destroyAllWindows()
cap.release()
break
```

- **Results**
  - Whenever the person is drowsy, an alert is generated. A simultaneous hardware implementation of this will help us in sounding an alarm which would be the future scope of this project.
- **Screenshots**