# CITY UNIVERSITY

COMPUTER SCIENCE AND ENGINEERING

ARTIFICIAL INTELLIGENCE LABORATORY

## CSE 418

DETECTING COMPUTER VISION SYNDROME

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# 1 ABSTRACT

We Spend Most Of Our Time In Front Of Digital Devices, Be It At Home, At Work Or While Travelling. When Working With Screens Is Important To Blink Regularly, Failure Of Which Can Result In A Condition Known As Computer Vision Syndrome(CVS). To Avoid The Above Situation, We Can Create A System Which Involves Blink Detection And If The Rate Falls Below The Normal Threshold The Person Is Warned Immediately. This Paper Overviews Different Algorithms Used In Blink Detection. The Various Phases In This System Are Image Capture, Face Detection, Eye Localization And Finally Blink Detection. The Standard Algorithms For Each Phase Have Been Discussed. We Have Proposed A Method For Blink Detection Using Convolutional Neural Network To Detect The Eye States And Predict The Blinks. Finally, A Comparison Of Our Method Is Made To The Other Methods Of Detecting Blinks In Both Still Images And Live Video Feed Scenarios. Regular Usage Of The Proposed System Could Significantly Reduce The Signs Of Computer Vision Syndrome And Ensure Efficient Work Experience For People With Long Term Computer Use. (1)

# 2  INTRODUCTION

Computer Vision Syndrome(CVS) Is A Condition Which Is Caused By Focusing On A Computer Or Any Other Display Device For Long Intervals Of Time. Some Of The Symptoms Include A Headache, Blurred Vision, Irritated Eyes, Double Vision And Much More. It Has Been Demonstrated That Blinking Reduces Up To 60 While Using Digital Devices Which Is A Major Cause For CVS. Poor Lighting Conditions Can Make Matters Worse. One Of The Major Symptoms Of CVS Is Dry Eye Which Is A Condition When Eyes Dry Up Accompanied By Redness, Burning, Eye Irritation And Eye Fatigue. Dry Eye Is Affected By Many Internal And External Factors Including Reduced Blink Rate, Incomplete Blinking, Usage Of Contact Lens And Dysfunction Of Glands. Dry Eye Could Be Avoided By Taking Up Measures Like Having A Minimum Distance Of 20cm Between The User's Eye And Screen, Adjusting The Viewing Angle To 15 Degrees Lower Than Horizontal Level And A Minimal Refresh Rate Of 75hz. Room Lighting And Screen Lighting Should Be Checked Before Using The Computer. One Of The Most Important Measures Is To Blink At A Normal Rate And Avoid Drying Up Of Tears. This Paper Aims To Provide The Reader With A Comprehensive Review Of The Blink Detection Algorithms. The Paper Compares The Different Techniques And Systems. The Authors Hope That This Paper Will Act As A Guide For Researchers And Users Of These Systems. The Methods Involved Could Be Either Through Expensive Hardware Or Simple Hardware Having The Optimized Software. The Former Method Includes Infrared Cameras And Illuminators But The Latter Involves A Simple Camera With Algorithms Going Through The Phases Of Face Detection, Eye Detection And Then Finally Blink Detection. All The Algorithms Discussed Primarily Use The More Passive Method.(1)

# 3 PROPOSED SYSTEM

Eyeblink detection is made up of four phases.(1)
(1) Image Capture
(2) Face Detection
(3) Eye localization and finally
(4) Blink Detectin
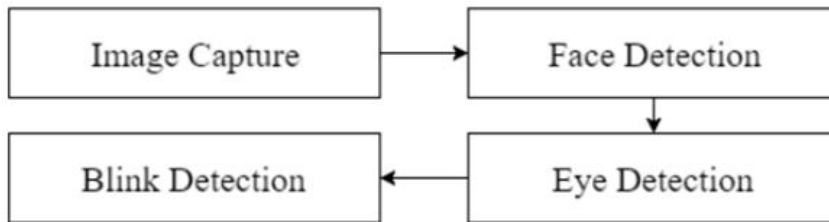


All stages are discussed individually and possible algorithms and techniques used in particular stages have been discussed.

## 3.1 Image Capture

Image Capturing Is Done In Real Time Online Mode. Webcams Mounted On The Monitor Screens, Inbuilt Laptop Webcams And Front Camera Of Mobile Phones Will Be Used For The Purpose. A Real Blink Of An Eye Takes 300 To 400 Milliseconds. Since There're 1000 Milliseconds In Each Second, A Blink Of An Eye Takes Around One-Third Of A Second. Though It Seems Like A Short Period, Considering The Span Of A Single Second It Is Significant Enough. The Standard Webcams And Front Cameras Usually Have Recording Rates Of 30fps With Some Going Up To 120fps To 240fps. For This System, A Capturing Device Of 30fps Is Well Suited.
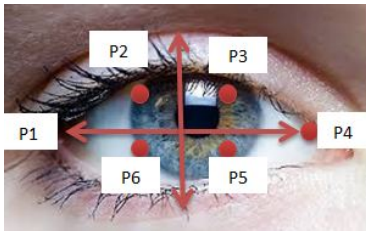
## 3.2 Face Detection

For Face Detection We Are Performing Facial Landmark Detection. We Can Apply Facial Landmark Detection To Localize Important Regions Of The Face, Including Eyes, Eyebrows, Nose, Ears, And Mouth.

## 3.3    Eye Detection

In Terms Of Blink Detection, We Are Only Interested In Two Sets Of Facial Structures — The Eyes.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 Remainder Of The Region. Based On This Image, We Should Take Away On Key Point.There Is A Relation Between The Width And The Height Of These Coordinates.



The Eye Aspect Ratio Equation

$$EAR = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2\|p_1 - p_4\|}$$

## 3.4    Blink Detection

Interms Of Blink Detection We Are Using Opencv ,Dlib To Detect Our Blinks . The Dlib Library Uses A Pre-Trained Face Detector Which Is Based On A Modification To The Histogram Of Oriented Gradients + Linear Svm Method For Object Detection.

# 4 REQUIREMENTS

(1)PYTHON
(2)OPEN CV LIBRARY
(3)WEBCAM
(4)DESKTOP/LAPTOP

# 5 APPLICATION

(1)This System Is Special For Notifying Him/Her Who Is Affected By CVS Or Want Save Him/Her From CVS.
(2)This System Can Count Eye-Blink Simultaneously.
(3)We Try To Implement Recent Developed Method.
(4)This Can Run Instantly When The Computer Open.
(5)It Helps You To Live A Healthy Life.

# 6 PROJECT SCREENSHOT

# 7 FUTURE WORK

(1)In Future This Software Can Use Rapidly Throughout The World.
(2)People Can Save Themselves From Cvs Dieases.
(3)In Medical It Also Be Using Next Time And Suggest People To Use This Software.
(4)It Also Use For Driver Alertness.

# 8 CONCLUSION

System Should Play An Important Role In Preventing Computer Vision Syndrome. Out Of All The Blink Detection Algorithms, We Have Tried, Our Proposed CNN Algorithm Works The Best. This Performance Is Directly Visible Both In Still Image And Video Feed Dataset With Our Algorithm Achieving Near Perfect Results. This Deep Learning CNN Trains Fast In A GPU Based System And Can Be Deployed Quickly. The Main Objective Of The Blink Detection Is To Only Find Whether The Blink Rate Is Low And Not The Exact Blink Rate. Therefore, Improvement In Accuracy In The Future Iteration Of This Systems Won't Directly Affect The Performance Of The System. However, Such Improvements Can Be Useful In The Implementation Of Applications Mentioned In The Future Scope Section Of This Paper.

# References

[1] https://www.pyimagesearch.com/2017/04/24/
eye-blink-detection-opencv-python-dlib/?fbclid=
IwAR2GYSmgcLPZwMZJdWF2NB5MojYDMaVqRRVMWkiXzS1wxLiUqJvRahfnBvk