Smart shut or sleep mode and vision protection in system

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ABSTRACT

There are a lot of features in our system(laptop/desktop) where no change has been made for long time and need to be upgraded ,like TOT (time out timer) to make the system go into sleep mode, and no proper energy saving algorithm based on detection of the outside world. This paper presents the system with an idea and implementation that outsmart the previous technology still in use. Computer vision being one of the branches of artificial intelligence that teaches and equips machines to comprehend the visual environment has many applications in today's world and can offer lot in this as well. Digital images and deep learning models may be used by computers to precisely detect, categorize, and respond to things**.** Based on that, our ideas make the system capable of preventing person from coming very near to screen thereby preventing eye strain, taking smart decision to shut down the system if someone left the system running (even if movie is playing) and forget to shutdown. Not letting the system to go into sleep mode if anyone is there and looking (reading) at screen. These all features as a result somewhat also help in safety of the system, prolong the system's life and save energy. Looking at the world report on vision by WHO, there are billions of people facing eye issues and many of that could have been prevented as per the report, so these features could have also helped at base level to at least reduce this number by prevention.

Keywords – AI, Computer Vision, Smart shut/sleep mode, Vision protection.

1. INTRODUCTION

Many parents find it challenging to set good and healthy limits on themselves so how can we expect them to care well about their child or other ones**. The Kaiser Family Foundation** estimates that the typical adult spends more than 7 hours a day in front of a screen. Many people sit very close to the laptop-screen or use a tablet by bringing it very near to their eyes. The light released from screens disrupts the brain's sleep cycle, which can cause insomnia as well as eyesight issues. [1]

In many cases working professionals tend to think for a long time on a problem before starting it and the laptop goes into sleep mode in between. In other cases, if a person is watching a movie on his laptop/tablet and in an immediate emergency he leaves but the laptop is still playing the movie and will be playing the whole movie before it shuts down or run out of power, but a smart system will automatically off the system if no one is watching it.[2]

sometimes we get so involved in work or content that we move very close to our system screen and that causes eye-strain and tiredness in us, so our system should warn us that we are too close to screen and if its child in that situation he/she can ignore the alarm so system should shutdown if they don't back off even after multiple warning.[3]

Hence, such a system has to be built which can eradicate these problems or at least reduce it to the minimum level. This paper gives one of the efficient ways to come out of all these above-mentioned problems.[4]

As we always hear prevention and protection is better than cure so, the main objective of this paper revolves around, maintaining a safe distance from the screen so as to protect our eyes and prevent loss or blur of eye sight.[5]

For energy saving and proper power management if there is no one watching or working on the system the system will turn off itself after an alarm.(making a beep sound).[6]

2. IDEAS

We have utilized web camera to record the outside surroundings and then utilizing OpenCV (which is the huge open-source library for the computer vision, machine learning, and image processing.) and CVZone, a computer vision package (which at its core uses the OpenCV and Mediapipe libraries for face detection) that makes it simple to conduct image processing and AI activities.

Once the faces are detected we are required to find the distance between the person and the laptop-screen/tablet. So In order to find the distance we use the technique explained below.
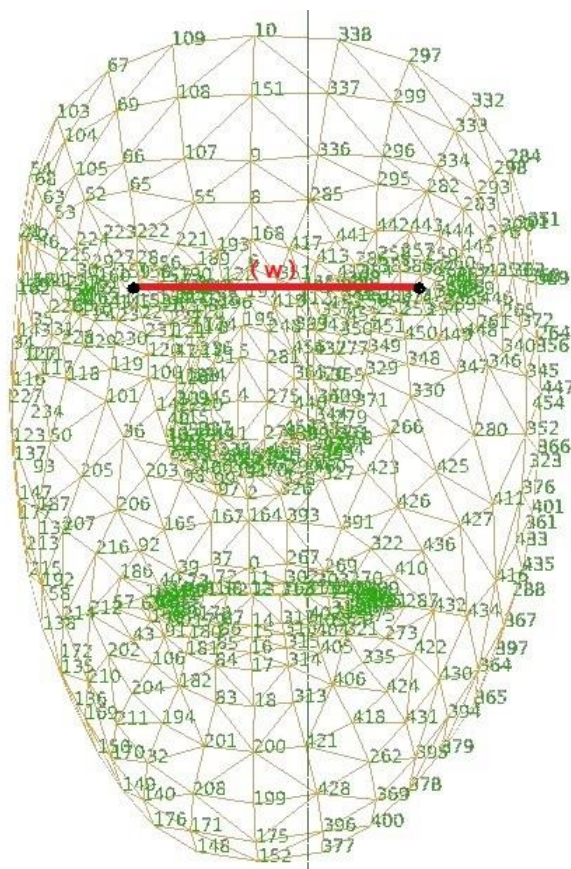
"fig.1", face landmark

We took the two landmarks from the face detected which is pointing to pupils of left and right eyes in the captured images and considering the distance between these two landmarks as image width (w) in fig1.

And next , taking average gap (distances) between pupils of our left and right eyes as the object width (W).
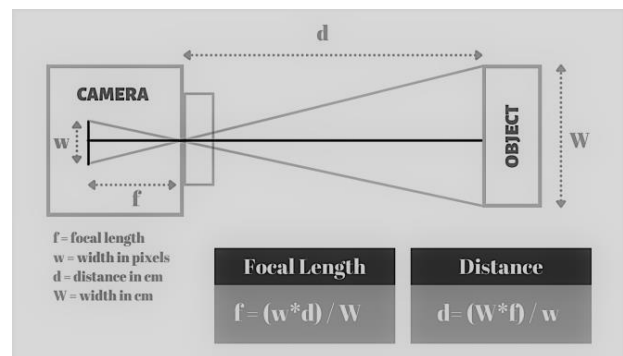
"fig2", formulas for distance calculation

While implementation we are required to have focal length, to get that we first measure the distance (d) between eyes and laptop-screen/tablet manually. And now use the below formula to get focal-length.

focal-length (f) = (w*d)/W

w: the image width as stated above in (pixel)
W: object width which is generally 6.3(cm)
d: distance measured(cm) between screen and eyes

Now we have the focal-length that would be used to get the distance between screen and person every time we make decision based on our algorithm using the below formula.

d=(W*f)/w

For alarming at many instances we need beep sound so to make that sound We have used the Python 3 winsound module, which offers an interface for interacting with Window's sound-playing machinery.

The Beep function plays a beep of the specified frequency for the specified duration.

If this module isn't working or the system's operating system is not windows in that

situation we can use alternate module such as PyAudio in mac, playsound in linux or similar module in other cases.

In different-different cases as per the situation the decision is made and many times we have to shut the system so for that we have Python OS module which offers the ability to set up the user's interaction with the operating system. It provides a variety of practical OS features that may be utilized to carry out OS-based operations and obtain pertinent OS-related data. The

operating system falls under Python's basic utility modules and also provides us command to shut the system.

We have used time module to wait for a particular time if no face is detected and later make beep sound and then finally to sleep mode by using conditional statement etc.

Lastly we will require a user interface after integration so, for that we have used a free and open-source framework called Streamlit that allows us to quickly create and distribute stunning machine learning and data science web apps. This Python-based library was created keeping the need of machine learning developers in mind.

3. METHODOLOGIES & INTEGRATION

The coordination of a project's components is known as project integration management. This involves managing disputes between various project components, striking trade-offs between conflicting demands, and assessing resources in addition to coordinating tasks, resources, users, and any other project components. In doing so and explaining that here, I have used abbreviation of my own, and small variable name to keep things organized, neat and clean.

Those are:

LFDT: - last face detected time (this keep the record of when was the last time system detected face).

Gap_limit_time:- this tells the time for which a system waits before making beep sound if face is not detected.

max_gap_limit time: - the time till which a system will make beep sound after gap limit time before shutdown.

Continuously_beep_count: - the continuous count of beep sound if the person is still very near to screen and isn't moving backward.

3.1. WORKFLOW & PSEUDO CODE.
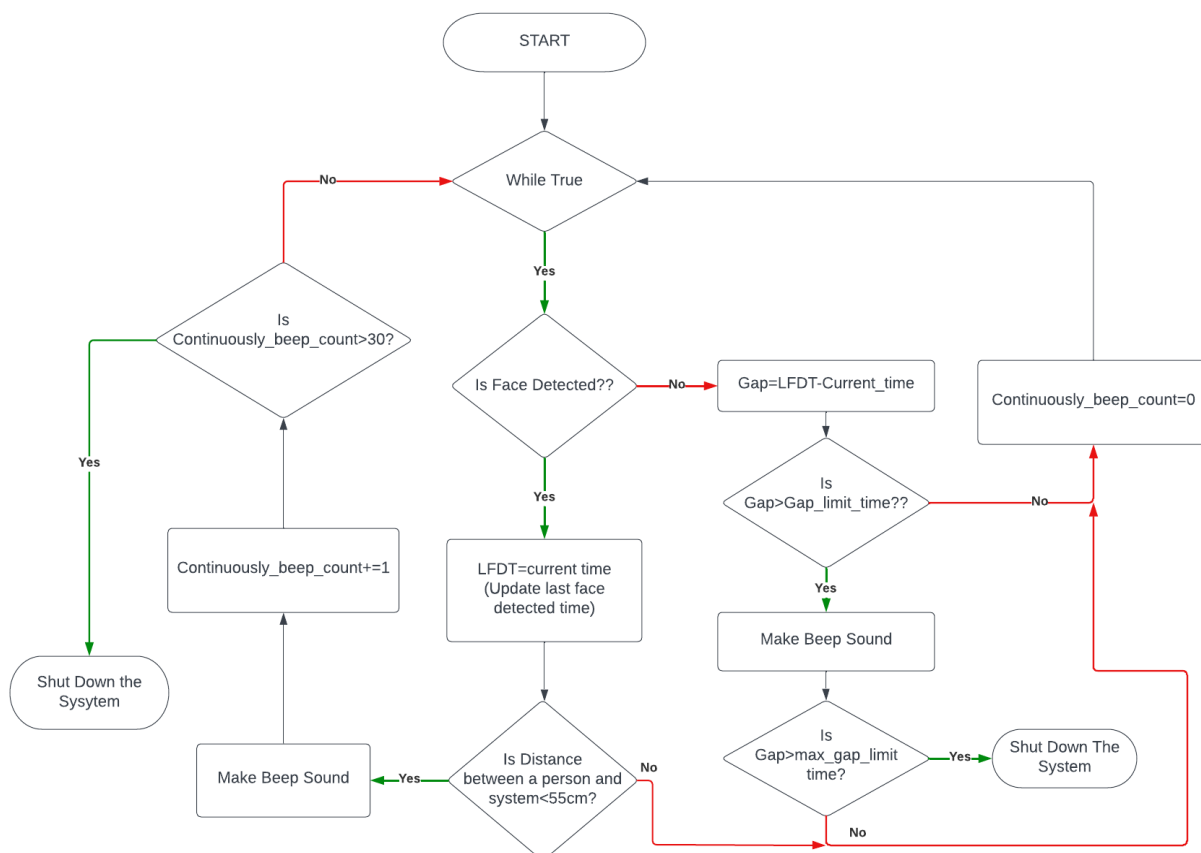
"fig.3", work flow diagram

(Pseudo Code, logic)

Start.

Is face detected by web camera?

1. If yes

    i. Update last face detected time to the current time.

    ii. Calculate and check if the distance between screen and person is greater than 55cm?

        A. If yes

            a. makes beep sound.

            b. increases the number of Continuously_beep_count by 1.

            c. check if number of Continuously_beep_count is greater than 30 or not.?

                If yes: Shut down the system.

                If no: Back to beginning and start again.

        B. If no

            a. Make the number of Continuously_beep_count equal to zero

            b. Back to beginning and start again.

2. If face is not detected.

    i. Update gap (the time since the last time face detected, which is difference of last face detected time and current time.)

    ii. Check if the gap is greater than gap_limit_time or not?

        A. If yes

            a. Make beep sound

            b. Check the gap is greater than max gap limit time or not.?

                I. If yes: Shut down the system.

                II. If no:

                    Make the Continuously_beep_count equal to zero.

                    Back to beginning and start again.

        B. If no

            a. Make the Continuously_beep_count equal to zero.

            b. Back to beginning and start again

3.2. REQUIREMENTS

Python 3.10.1

Required module/packages of python

[1]comtypes==1.1.14

[2]cvzone==1.5.6

[3]mediapipe==0.9.1.0

[4]numpy==1.22.3

[5]opencv_python==4.6.0.66

[6]pyautogui==0.9.53

[7]pycaw==20220416

[8]streamlit==1.15.2

4. RESULTS

If a person comes very close to laptop-screen/tablet the system will make beep sound and this beep sound will continue till the person back off to a safe distance for eyes sight or if the beep continuous for 30times he/she is still there the system will shutdown.[1]

If someone forget to shut his laptop and movie or anything is running into it the system will detect if there is no one it will make beep sound for some time and yet if no one comes in front of it, it will shut down the system. [2]

The system is also safeguarding the screen as people will keep distance from it.[3]

System will not go into sleep mode itself if you're looking at the screen even if you haven't touched or commanded anything for a long while.[4]

5. CONCLUSION

As in today's system (laptop/tablet) we have the time out timer for making the system go into sleep mode when there is no work or no input is fed. But that could be made smart by the ideas that have been put into this paper by keeping the system ON till the time person is there and looking at the screen. This paper also solves the problem of bad and old habit of sitting very near to screen while watching any good content that makes our eyes tired and may cause eye problem in long run. The constraints being if even the face in pictures are there it

would consider that as human and other constraints are the high processing capacities requirement for the system.

ACKNOWLEDGEMENTS

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streamlit https://docs.streamlit.io/
os https://docs.python.org/3/library/os.html
timehttps://docs.python.org/3/library/time.html