



Driver Drowsiness Detection System

CSE 495
3rd Presentation

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- Project Definition
- Goal of the Project
- What is done so far?
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- In this project we have a system that gives an alarm if driver is detected as drowsy.
- Drowsiness detection works on two different situations :
 - If driver is closing their eyes for an amount of time
 - If driver can't keep their head up for an amount of time (moves the head to any side without turning head)



When driver is
detected as drowsy



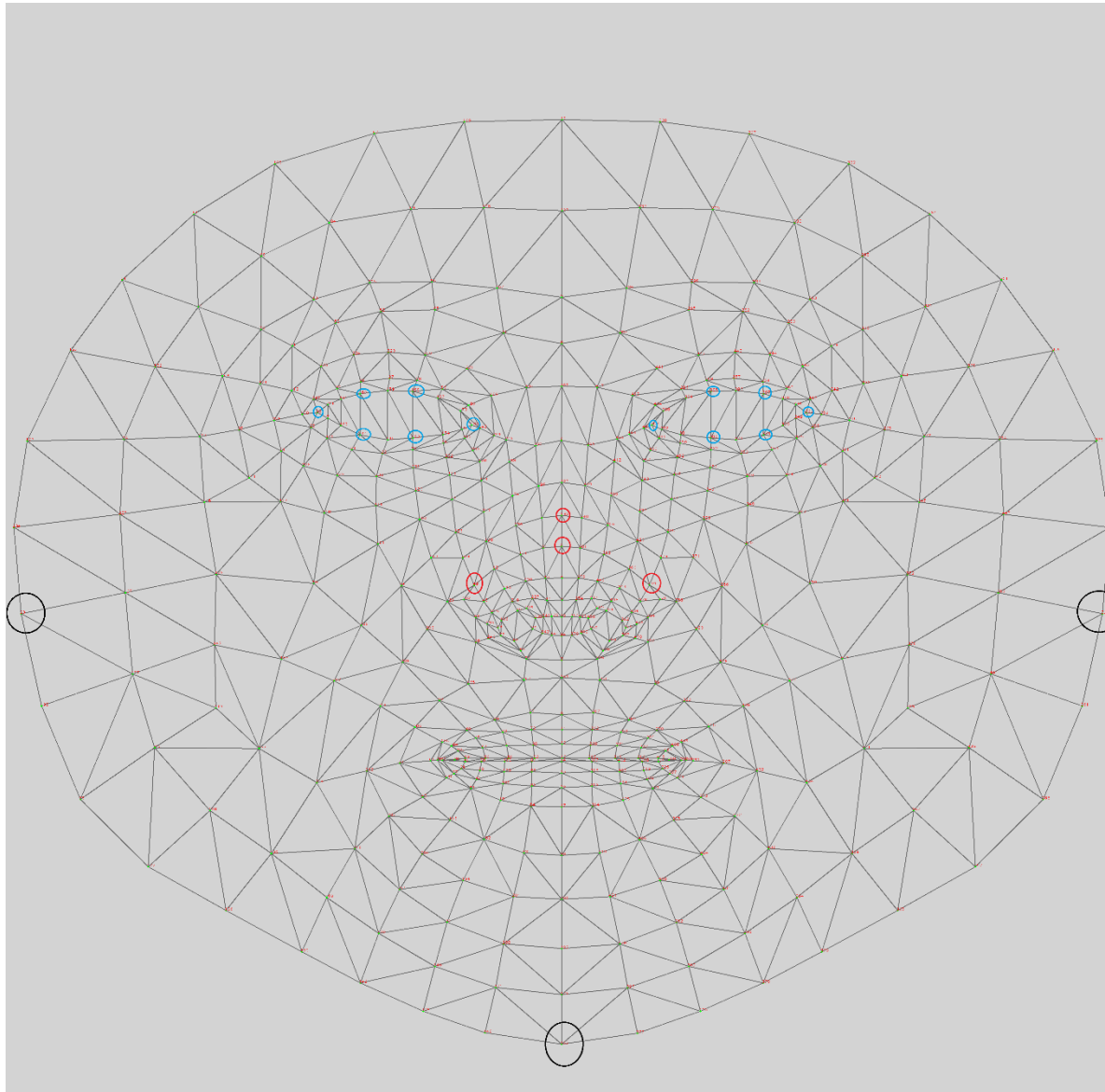
What is done so far?

24.10-06.11	07.11-15.12	15.12-04.01	04.01-17.01
<ul style="list-style-type: none">• Get ready the hardware (Raspberry pi, camera etc...)• Determine datasets to be used	<ul style="list-style-type: none">• Installing needed libraries to the hardware.• Training models and compare models with each other to determine success rates.• CHANGE IN THE TIMELINE!!	<ul style="list-style-type: none">• I decided continue with Python mediapipe library. I installed the required modules and I coded the necessary algorithm for 3 different situations.	<ul style="list-style-type: none">• I connected real alarm sound to computer.• I tested program with different images

After second presentation I decided to change to datasets and libraries that I used so far. There is Python library called MediaPipe developed by Google. MediaPipe Face Mesh estimates 468 3D face landmarks in real-time



Explanation of MediaPipe



Eye
situation will
be
explained in
next slide.

Check cheeks mode

right_cheek_index = 93

left_cheek_index = 323

chin_index = 152

Black indices : helps to
check head is towards right
or left, by looking angles
between left cheek-chin
and right cheek-chin

Check head down mode

right_nose_index = 49

left_nose_index = 279

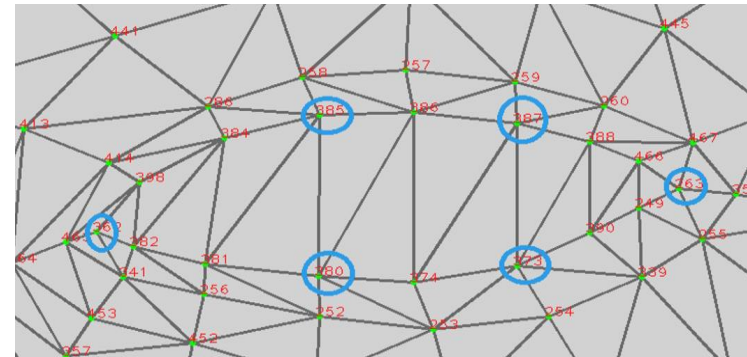
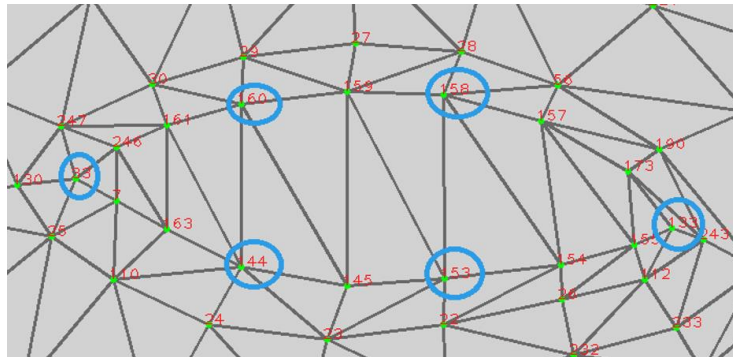
up_nose_index = 195

up_nose_index_2 = 5

Red indices : helps to
check move is going down
or not, I am deciding the
drowsiness situation by
looking y indices of the
upper points. If their
average becomes larger
than the right and left
points average, then this is
drowsiness.

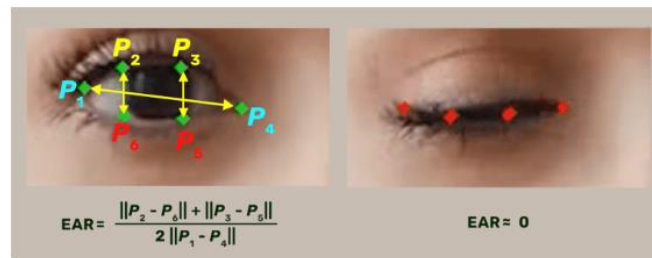


Explanation of MediaPipe - contd

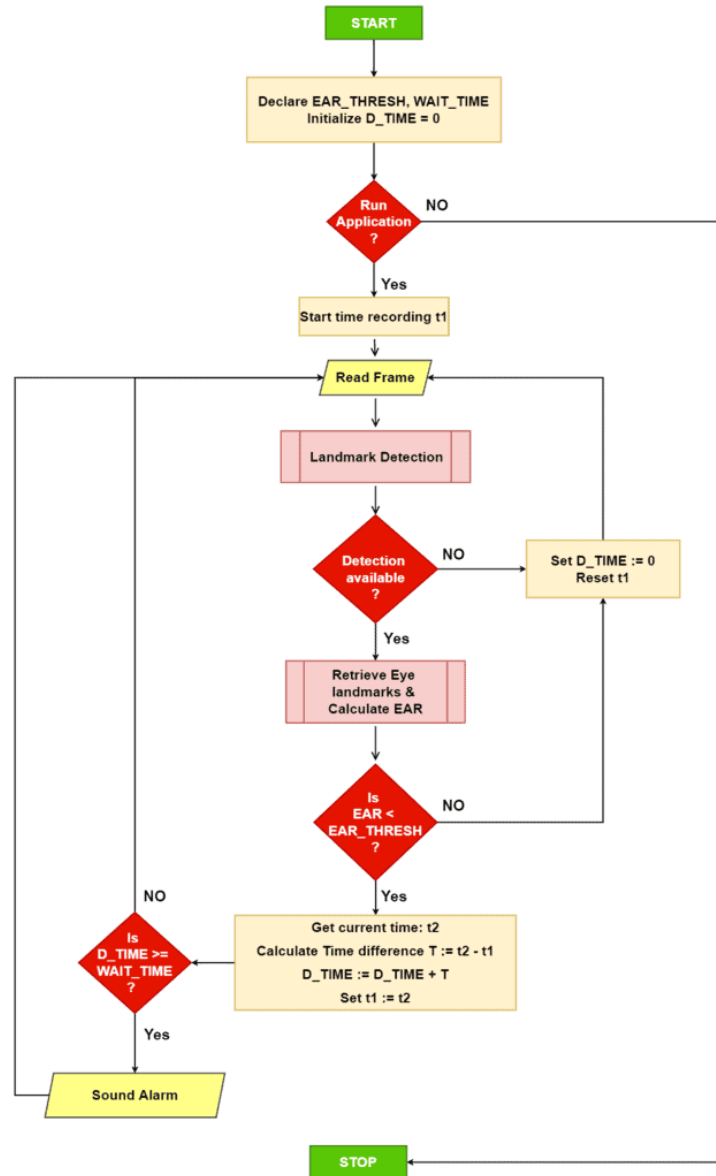


$$EAR = \frac{||P_2 - P_6|| + ||P_3 - P_5||}{2||P_1 - P_4||}$$

The EAR formula returns a single scalar quantity that reflects the level of eye-opening.

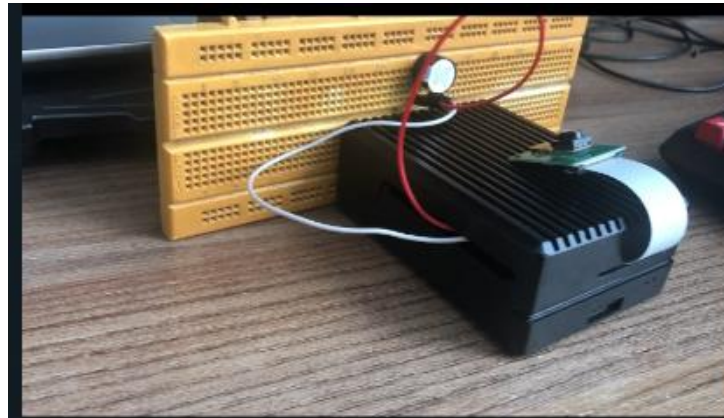


Flowchart of Program



What could be done from now on?

Program is now running on Raspberry Pi, but with the additional hardwares next to it. To increase portability we can embed this hardware into driver panel.



Test Results



Not drowsy



Drowsy



Drowsy



Drowsy



Drowsy



- Predicting the drowsiness of the driver in 5 seconds at max.

This criteria is achieved, if the necessary conditions is achieved, because of computer does not make any complex computations, time can be adjusted into various numbers depend on the choice.



Resources and References

1. <https://www.nauto.com/blog/introducing-driver-drowsiness-alerts> (Drowsy driver in Project Definition page)
2. <https://www.canstockphoto.com/the-view-inside-the-empty-car-the-54421487.html> (Empty car inside view used in Project Design Page)
3. <https://dergipark.org.tr/en/download/article-file/19838> (Analysis of Traffic Accidents in Turkey, İslim Sungur, Recep Akdur , Birgül Piyal)
4. Poursadeghiyan M, Mazloumi A, Nasl Saraji G, Baneshi MM, Khammar A, Ebrahimi MH. Using Image Processing in the Proposed Drowsiness Detection System Design. Iran J Public Health. 2018 Sep;47(9):1371-1378. PMID: 30320012; PMCID: PMC6174048.
5. Identification of Driver Drowsiness Using Image Processing K.Praveen Kumar, Srinivasa Rao Thamanam, M. Naresh Kumar
6. Gilbile, P., Bhore, P., Kadam, A., Balbudhe, K. (2019). Driver's Drowsiness Detection Using Image Processing. In: Pandian, D., Fernando, X., Baig, Z., Shi, F. (eds) Proceedings of the International Conference on ISMAC in Computational Vision and Bio-Engineering 2018 (ISMAC-CVB). ISMAC 2018. Lecture Notes in Computational Vision and Biomechanics, vol 30. Springer, Cham. https://doi.org/10.1007/978-3-030-00665-5_70
7. [https://www.sciencedirect.com/science/article/pii/S2667241322000039#:~:text=\(2\)%20EARM%20\(%20t%20\),as%2011%20in%20this%20experiment](https://www.sciencedirect.com/science/article/pii/S2667241322000039#:~:text=(2)%20EARM%20(%20t%20),as%2011%20in%20this%20experiment)
8. <https://learnopencv.com/driver-drowsiness-detection-using-mediapipe-in-python/>

