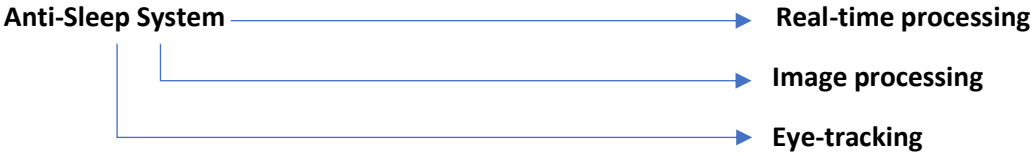
TASK 1: "FATIGUE AND SOMNOLENCE DETECTION"

State of the Art

After speeding and drunk driving, falling asleep is one of the main causes of accidents. Specifically, one in three fatal accidents is caused by sleepiness on highways. Automakers are working to reduce this rate by using increasingly sophisticated electronic systems.

Some constraints:



What is already done?

If you've ever fallen asleep on a subway train or in your programming class, you know that your head tends to fall forward as you doze off. You also know that you may stay asleep for a few seconds or a couple of minutes before your head jerks upright and you're awake again. The anti-sleep alarm looks for any indication that the driver's head is tipping forward: When the earpiece senses that the angle has increased from zero to, say, 15 or 30 degrees, it sounds an alarm. Most manufacturers stress that the sound is loud and irritating enough to wake the driver, but not so loud or sudden that he wakes up with a start and yanks on the wheel or steps harder on the gas.

- **Mercedes-Benz Attention Assist** uses the car's engine control unit to monitor changes in steering and other driving habits and alerts the driver accordingly.
- **Lexus** placed a camera in the dashboard that tracks the driver's face, rather than the vehicle's behavior, and alerts the driver if his or her movements seem to indicate sleep.
- **Volvo's Driver Alert Control** is a lane-departure system that monitors and corrects the vehicle's position on the road, then alerts the driver if it detects any drifting between lanes.
- **Saab** uses two cameras in the cockpit to monitor the driver's eye movement and alerts the driver with a text message in the dash, followed by a stern audio message if he or she still seems sleepy.

Proposed solution:

We will focus on Saab's solution, and eye tracking for solving this issue. Eye-tracking is an already existing technology and used in many domains such as security, psychology or usability research, but it can be developed for the automobile domain's constraints.

Eye tracking in automotive has been linked to numerous applications:

Drowsiness detection: By observing the specifics of eyelid closure, in combination with driver eye gaze patterns, an eye tracking sensor can reliably detect if a driver is falling asleep and warns accordingly or take other actions.

Distraction detection: Give warnings if the eyes are off the road and encourage evasive action (Example: the use of the phone while driving).

Personalization & Identification: An eye tracking system can identify the driver and automatically adjust to user preference settings (music, seat, mirrors, etc.).

Gaze interaction: Control the dashboard and heads-up display using the eye-tracking system. For instance, the look at the dashboard or heads-up display would be more a fluid and intuitive experience.

Driver state assessment / Autonomous Driving: For Autonomous Driving to become a reality, the car must reach a symbiotic relationship with the driver. Only eye tracking can tell the car where the driver is paying attention, what information he has processed.

Webography:

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https://newatlas.com/volvo-automated-driver-monitoring/31257/

https://www.thesun.co.uk/motors/3779714/vibrating-sleep-detectors-clipped-to-your-ear-will-monitor-heart-rate-and-stop-you-nodding-off-at-the-wheel/