**Sleep Detection System For Vehicle Drivers**

**Case Study Analysis**

**Shashi Shivaraju**

**Srihith Alwala**

**CPSC 8750**

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# Abstract

This report documents the results of applying the Architecture Analysis and Design Language (AADL) in designing and developing a sleep detection system for vehicle drivers. While driving fatigue and microsleep at the wheel are often the cause of serious accidents. However, these initial signs of fatigue can be detected before a critical situation arises. The proposed sleep detection system for drivers can do this by tracking eye movements using sensors like camera and infrared sensors [[1]](https://www.bosch-mobility-solutions.com/en/products-and-services/passenger-cars-and-light-commercial-vehicles/driver-assistance-systems/driver-drowsiness-detection/).

# Introduction

This document presents the results of a case study of the application of the Architecture Analysis and Design Language (AADL) to the Sleep Detection System for Vehicle Drivers.

Model-based software design is the application of model-based engineering techniques (i.e., the use of models and abstractions to perform typical engineering tasks) to design, verify and validate software. Model-based software design relies on analytical practices using analysis and modelling languages and supporting tools. The AADL and its supporting tools such as the Open Source AADL Tool Environment (OSATE) [SEI 2010] have been designed to design and capture the architecture of embedded software systems in terms of the application software as a runtime architecture deployed on a particular computer system. This allows the software architect to develop a thorough understanding of and insight into (1) critical characteristics vital to a system’s correct operation and (2) the impact the runtime architecture and computer system deployment on the non-functional system properties. These characteristics include considerations such as sensor/command data latency and update rates; CPU throughput; synchronous/asynchronous task management; and data-bus packet definitions and update rates. The SAE AADL industry standard for modelling and analysis of embedded software system architectures was chosen because of its ability to support analysis of non-functional properties, such as robustness, safety, performance, and security.

The model and analyses presented in this report are results of a case study effort that is applying the AADL to represent and analyse the proposed sleep detection system for vehicle drivers.

The report is organized as follows:

Section 2 provides an overview of sleep detection system for vehicle drivers.

Section 3 presents AADL model of sleep detection system for vehicle drivers and discusses the specific approaches for organizing and modelling the architecture in AADL in terms of a Control System under control and a computer platform.

Section 4

# Sleep Detection System for Vehicle Drivers Overview

When driving alone on highways or driving over a long period of time, drivers are inclined to feel bored and sleepy or even fall asleep. Feeling sleepy while driving could result in hazardous traffic accident. So, sleep detection for drivers is crucial for safety of the driver and for those on the road. Particularly important for truck drivers who drive for a living and for people who prefer driving as a preferred mode of transportation. Some of the existing solutions in automotive industry are:

* Rest recommendation system in Audi
* Driver Alert system in Ford
* Attention Assist in Mercedes-Benz.

But these existing portable systems are either inefficient or costly (search for inefficiencies). So, the considered system for case study proposes use of camera sensors with real time image processing for eye tracking during day-time environment and uses Infrared sensors for eye tracking during night or dark environments. The data from sensors are used in eye-lid distance tracking algorithm in order to detect sleepiness and triggers a sound alarm along with flashing LED to notify the user

# References