Ai approach for road Safety

University of batna 2

Allaoui Mohamed Khalil

Aouina Khansa

mars 8

Abstract

Abstract goes here

Dedication

To mum and dad

Acknowledgements

I want to thank...

Contents

Nomenclature

ADAS Advanced Driving assistance Systems

BSM Blind-Spot Monitoring

DAA Driver Attention Alert

DAS Driving assistance Systems

LAS lane keep assist system

LIDAR Light Detection and Ranging

NHTSA National Highway Traffic Safety Administration

RADAR Radio Detection and Ranging

Chapter 1

Introduction

Recently, the development of advanced driver assistance systems (ADAS) has facilitated people's daily life from comfort to safety. However, these systems are complex [5], utilizing vehicle parameters, environmental observations, and traffic patterns to assist the driver. These systems are added cost-to-ownership due to the added expense of sensors and computing hardware needed to perceive the environment, especially in real-time monitoring. Thus, further development in this area is needed to improve reliability, performance, and decrease costs.
This work describes a driver assistance system based on computer-vision techniques.

1.1 Background and Motivation

According to the World Health Organization (WHO) [3] around 1.3 million people die each year as a result of road traffic accidents, in addition to 50 million serious injuries. This cost most countries 3% of their gross domestic product.In 2016

The report also highlights More than 90% of road traffic deaths occur in low- and middle-income countries. Road traffic injury death rates are highest in the African region. Even within high-income countries, people from lower socioeconomic backgrounds are more likely to be involved in road traffic crashes.

Although current "*passive*" and "*active*" safety systems [10] can reduce the impact of traffic accidents, only a few car accidents are caused by bad weather and unsafe road infrastructure while most by human fault [1], such as: [3]
-Speeding
-Driving under the influence of alcohol and other psychoactive substances
-Nonuse of motorcycle helmets, seat-belts, and child restraints
-Inadequate law enforcement of traffic laws

According to [4] the most likely causes of car accidents are: the driver may lose concentration on the road when driving, drivers falling asleep at the wheel, driver fatigue, or driver distraction, no matter the driver is experienced or not. A study in the United States by the National Highway Traffic Safety Administration (NHTSA) [2], confirms that almost 80% of all types of vehicle accidents involve driver fatigue, driver drowsiness, or driver distraction (in general, distracted driving), with the high speed, may cause the driver to have no time to realize the road status, which leads to car accidents.

These shocking statistics highlight the importance of research and development of advanced driver assistance systems (ADAS) focusing on *"Driver Monitoring"* by driver behavior analysis as well as *"Road Monitoring"* by road hazards detection.

Various driving assistant systems have been developed in automotive engineering, the U.S. National Highway Traffic Safety Administration (NHTSA) defined six levels of automation from level 0 to level 5, which describes the relationship from no autonomous driving to fully autonomous driving in automotive engineering, see 1.1 .

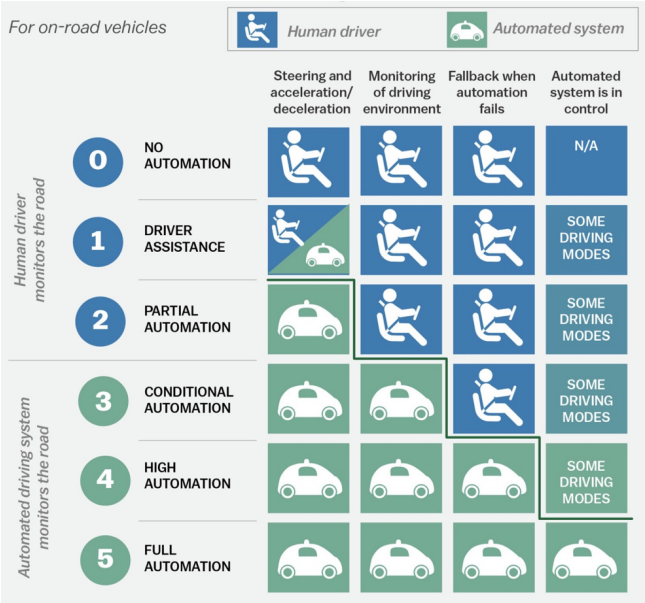

Figure 1.1: The Evolution of Automated Safety Technologies

According to the figure 1.1, in the first level, the driver needs to drive the vehicle and focus on the road to react as soon as possible. In levels 1 and 2, driving automation applies to vehicles with (ADAS) that can take over steering, acceleration, and braking in specific scenarios. But, even though level 1 driver support can control these primary driving tasks. In level 3, the system detects the environment to decide whether the driver needs to drive the vehicle, which is called conditional automation. Level 4 and level 5 indicate high automation and full automation respectively, which means the system will fully control the vehicle.

Among these levels, an (ADAS) is considered to be the basic and important component. Generally, An *ADAS* is an electronic system in a vehicle that uses advanced technologies to assist the driver [7]. It can include many active safety systems, such as [8] lane keep assist system (LAS), blind-spot monitoring (BSM), driver attention alert (DAA), and many other systems that work together to increase the safety of drivers, passengers, pedestrians, and other road users.The objective is to recognize critical driving situations by perception of the vehicle and the divers as *internal parameters*, road as *external parameters*, and the weather and lighting condition as *additional parameters*.

To collect these parameters. ADAS and autonomous driving functions feed off a continuous stream of information about the environment surrounding the vehicle, and it's the sensors' job to provide that [9] see the figure 1.2.

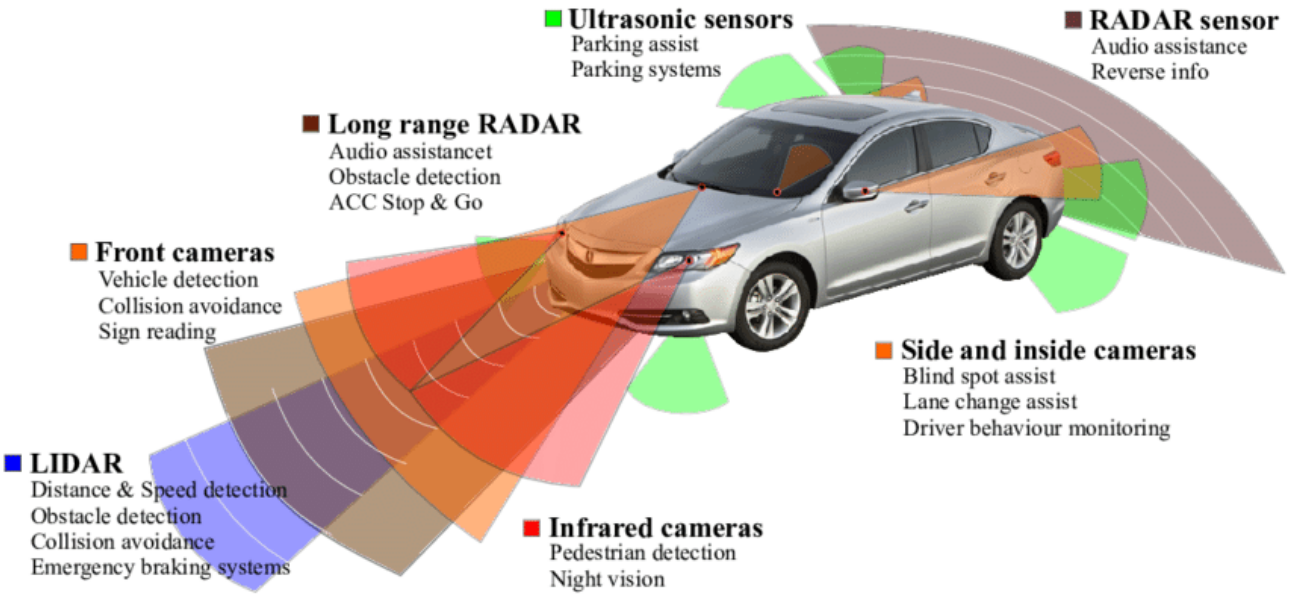

Figure 1.2: Typical types of sensors for ADAS

The most common sensors used in DAS and autonomous driving are [9]:
Ultrasonic sensors [6], RADAR, LIDAR, Cameras.

Ultrasonic sensors operates by transmitting short bursts of sound waves and measuring the time taken for the sound to travel to a target object, be reflected, and return to the receiver, they are usually used for short-distance applications at low speeds, such as park assist, self-parking, and blind-spot detection.

1.2 Related Work

Bla Bla Bla

Bibliography

[1] Hazrat Bilal et al. "Real-Time Lane Detection and Tracking for Advanced Driver Assistance Systems". In: July 2019, pp. 6772–6777. DOI: 10.23919/ChiCC.2019.8866334.

[2] Charlie Klauer et al. "The impact of driver inattention on near-crash/crash risk: An analysis using the 100-car naturalistic driving study data". In: (2006).

[3] World Health Organization. *Road traffic injuries*. Fact sheet. 21 June 2021.

[4] World Health Organization. *World report on ageing and health*. Publications. 2015, 246 p.

[5] Kunal Patil. *Speeding Up the Development of ADAS Systems with Model-Based Development*. 2016. URL: https://www.dspace.com/fr/fra/home/news/engineers-insights/blog_inc_adas_1607.cfm.

[6] Paul Pickering. "Radar and Ultrasonic Sensors Strengthen ADAS Object Detection". In: (2017). URL: https://www.electronicdesign.com/markets/automotive/article/21805470/radar-and-ultrasonic-sensors-strengthen-adas-object-detection.

[7] Aptiv Website. *Mobility inside*. 2020. URL: https://www.aptiv.com/en/insights/article/what-is-adas.

[8] Mazda Website. *Active safety technology helping prevent accidents*. URL: https://www.mazda.com/en/innovation/technology/safety/active_safety.

[9] OXTS Website. *ADAS sensors*. 2020. URL: https://www.oxts.com/adas-sensors/.

[10] Wikipedia. *Automotive safety*. 2013. URL: https://en.wikipedia.org/wiki/Automotive_safety.