# Chapter 7
# Feasibility and Necessity of Affective Computing in Emotion Sensing of Drivers for Improved Road Safety

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## ABSTRACT

*The development of the automobile industry and civilian infrastructures improved the lifestyles of everyone in the world. In parallel to the rise in quality of life of everyone, the number of road accidents also rose. The major reason behind road accidents is emotional factors of the drivers. The emotional imbalance will influence the drivers to abandon the traffic rules, neglect speed limits, cross the signals, cross the lane, etc. Recently automobile industries have extended their researches to the development of emotion sensing systems and embedding them inside the vehicles using affective computing technology to mitigate the road accidents. These emotion sensing systems will be decisive and act as human-like driver-assistive systems in alarming the drivers. This chapter focuses on bringing out the feasibility and existing challenges of affective computing in sensing the emotional factors of drivers for improved road safety.*

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# 1 INTRODUCTION

We are currently through an information revolution during which technology improves people's work and daily activities, allowing them to be more productive; however, it is critical to assess whether the progress of technology is actually beneficial to people. In some circumstances, technology is not always effectively embraced; for example, if something new or novel is misappropriated, resulting in disinformation and misunderstanding, it could have the opposite effect. (Morley & Parker, 2013).

Emotions are important in almost every aspect of our everyday lives, including decision-making, motivation, and interpersonal interactions (Eyben et al., 2010), and driving is no exception (Jeon, 2016; Jeon et al., 2011). Some of the most common emotional triggers include a loss of control, journey delays, the risk of accidents, and the greater intellectual load required. Drivers who rely substantially on riding as a based-on job activity may be more susceptible to these triggers. (e.g., cab drivers, package transport). Although little stress might assist people in achieving their objectives, such as being on time at their destination, too many or too few factors can have a significant impact on driving effectiveness and general well-being (Ding et al., 2014).

As a result, future vehicles that can detect and respond to the emotional states of riders and drivers would be successful in improving not only highway safety but also mental health. Recent technological advancements, such as portable tech, have made it possible to investigate emotions in the real world, resulting in a slew of publications studying the harmful effects of particular emotions while driving.

## 1.1 Sensing and Pre-Processing

### 1.1.1 Face and Head

Facial and head actions are being used to infer driver sentiment, primarily by tentative facial expressions (e.g., laughing, scowling) and head signs (e.g., signals, angles) while driving. Traditional RGB cameras have been used in most of the experiments to capture expression and head information (e.g., (Ma et al., 2017; Paschero et al., 2012)). There are a few less commonly investigated techniques, such as thermal and ir cameras (Guo et al., 2014; Kolli et al., 2011), which may be more resistive to certain sorts of brightness variations. The world's most important way to accurately detect the image quality of facial emotions is to look at the driver from the front. In controlled laboratory investigations, researchers usually place the camera on high of a monitor or simulator to gain a frontal view (Agrawal et al., 2013; Moriyama, 2012). The sensor has been put on the vehicle top in far less regulated conditions, however it may partially obscure the driver's view (Cruz & Rinaldi, 2017). Another

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