Real-world measurement of driving impairments

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Summary

- There is a need to detect and monitor impaired driving to improve road safety
- Although physiological signals can be useful, real world driving is complex
- Existing literature can be used to inform the development of detection systems
- To create a robust, multi-sensor detection system, future considerations need to be prioritised

Introduction

- Impaired driving negatively impacts performance, which can result in increased crash risk.
- Physiological signals can be used to detect driver impairments however complexities arise when measuring impaired driving in the real world (vs simulated driving).
- **This work aimed to use existing learning to provide an overview of how five driving impairments** (alcohol, licit/illicit drugs, fatigue, stress, cognitive load) **are currently measured to determine fitness to drive.**

Method

- A **targeted literature review** was conducted (June 2021) to assess how, and with which tools, the five driving impairments can be **effectively detected and monitored**.
- Key dimensions considered were: literature source, transport mode, relevant indicators, equipment used.
- The work was conducted within the framework of the **PANACEA European Horizon 2020 project** (*Grant agreement 953426*).

Results

44 individual publications reviewed

Alcohol

- Reasonably established tools
- Embedded within systems
- Detect and inform authorities

Licit/illicit drugs

- Blood and urine analysis current quantified tests
- Saliva testing is a potential, more research needed to increase reliability and sensitivity

Fatigue/sleepiness

- Practicality of gold standard measures in real-world driving
- Ocular parameters well established, heart rate increasingly popular
- Options for detection before driving/at roadside
- Recommended use of non-intrusive measures

Stress

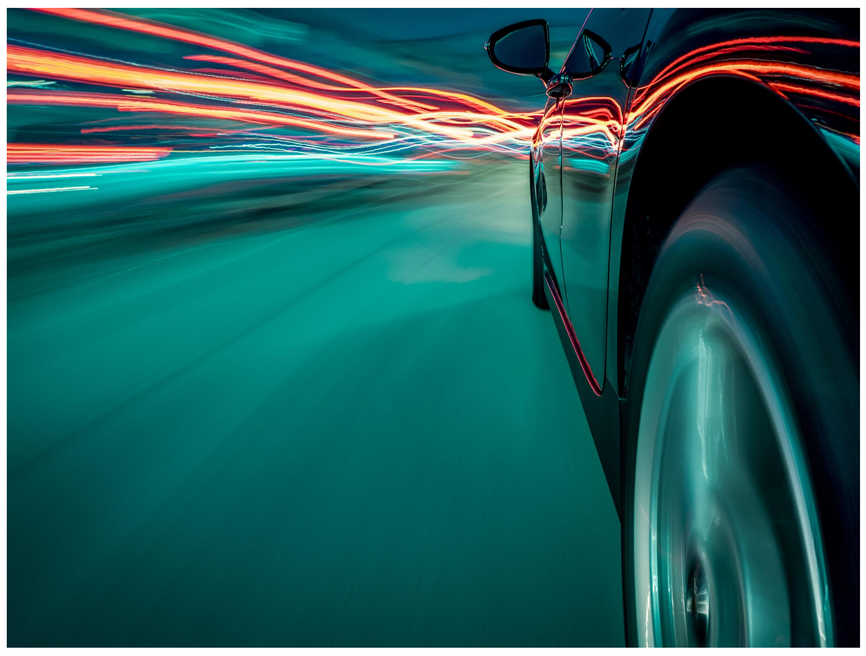
- Heart rate extensively used
- Embedded sensors
- Consideration of intrusiveness, practicalities of real-world driving, other factors, individual differences

Cognitive Load

- Pupil changes main method of detection, also ‘load’ questionnaires
- When detected, action needed to end distractions

Conclusions

- Driver state **can be** monitored using physiological signals to detect impairments.
- However **it is complex**. Each indicator has considerations to be addressed.
- Multiple sensors = a more robust system.
- When designing detection systems, important to consider **individual differences** and **contextual factors**.
- Future considerations:
    - Practical implementation, combining multiple signals into one detection system
    - Thresholds
    - Interdependencies
    - Prioritisation of sensors
    - Personalisation/training of models/systems/algorithms



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For more information about the PANACEA project, please visit **www.panacea-project.eu** and follow the project on Twitter **@EUPanacea**.

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