

Background

- **Comfort levels** influence the adoption of new vehicle technology
 - Motion sickness (MS) is prevalent (highly susceptible: 7.9%; mild to medium: 79.4%)
 - Passengers are more prone to MS compared to drivers
- New vehicle technologies can exaggerate MS
 - **MS is more severe in electric vehicles (EVs)** compared to fuel vehicles
 - The in-vehicle entertainment systems can **increase** the incidence of MS

Framework

Meta-analysis of motion sickness inducers

Guide

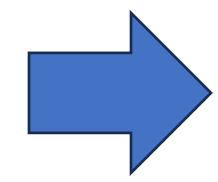
On-road experiment to quantify inducers of motion sickness

Data Collection

Motion sickness mitigation strategies

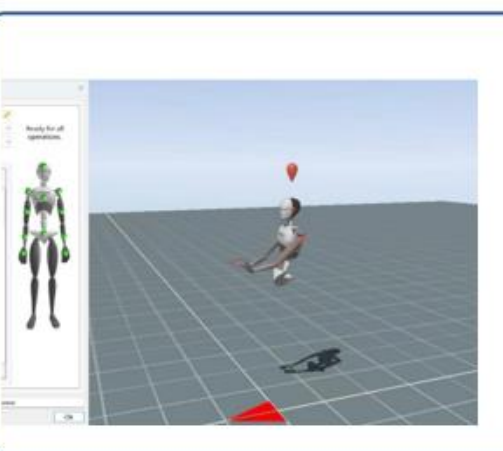
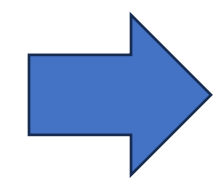
Motion sickness assessment algorithms

Motion sickness mitigation strategies



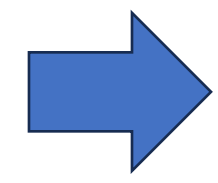
Quantifying the factors leading to motion sickness in smart cabin

Objective 1



Realtime assessment of motion sickness

Objective 2



Mitigation of motion sickness

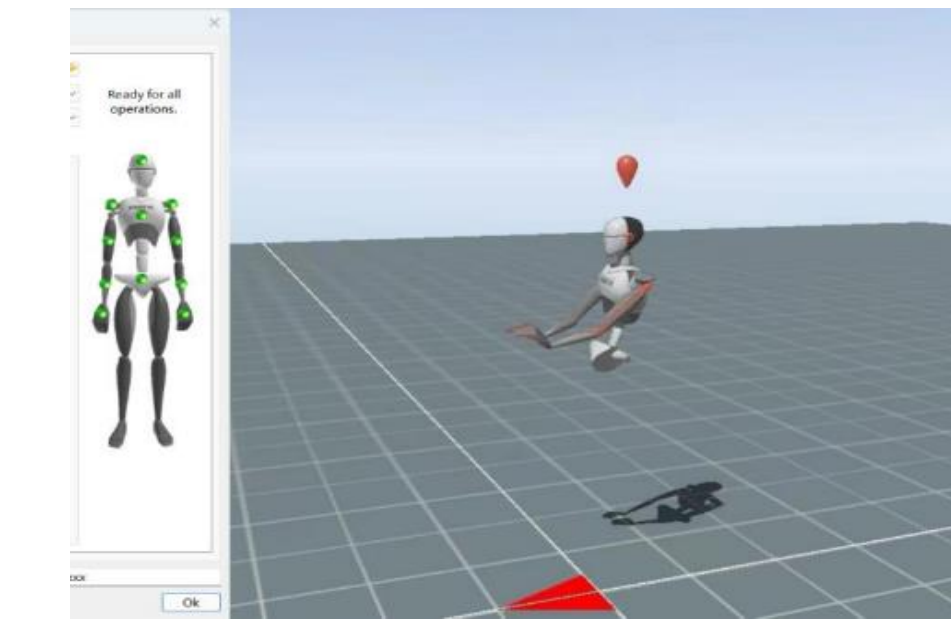
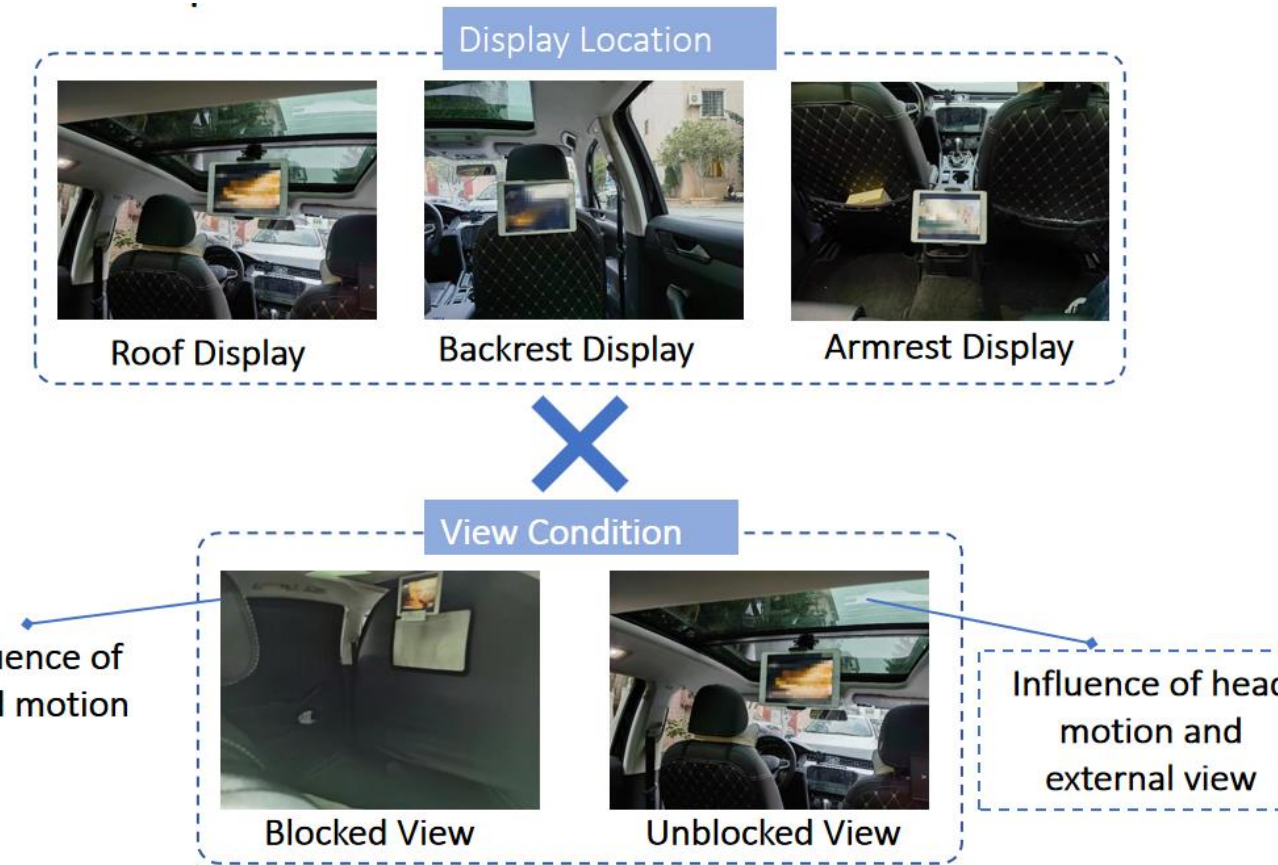
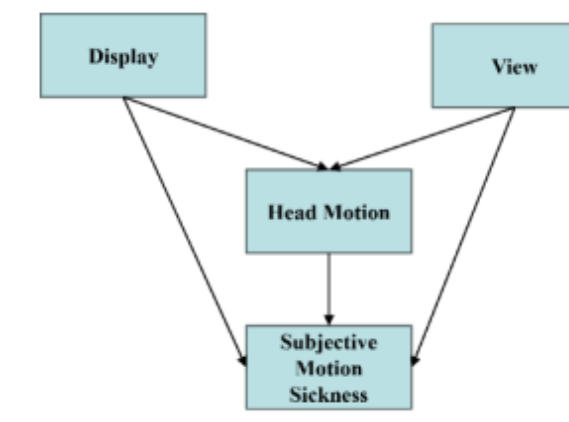
Objective 3

Objective 1.2

Identify the **optimal display location** to prevent MS for rear-seat passengers.

- The roof display led to less MS compared to the backrest and arm display

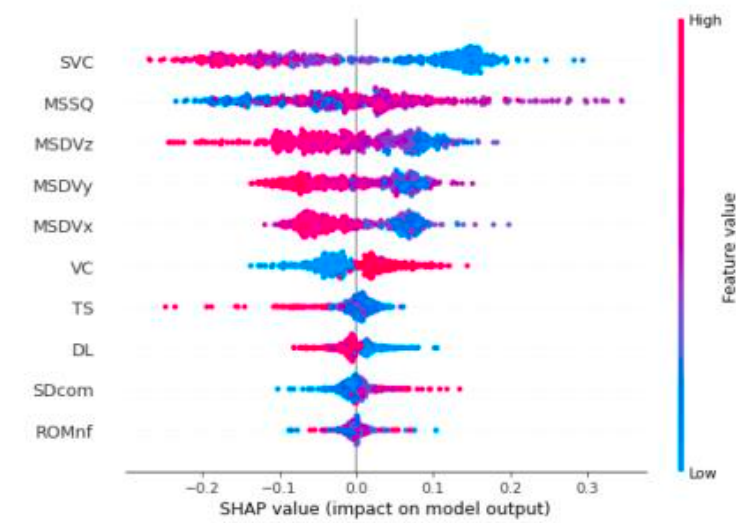
Explore the **mechanisms** behind variations in MS with different display positions.



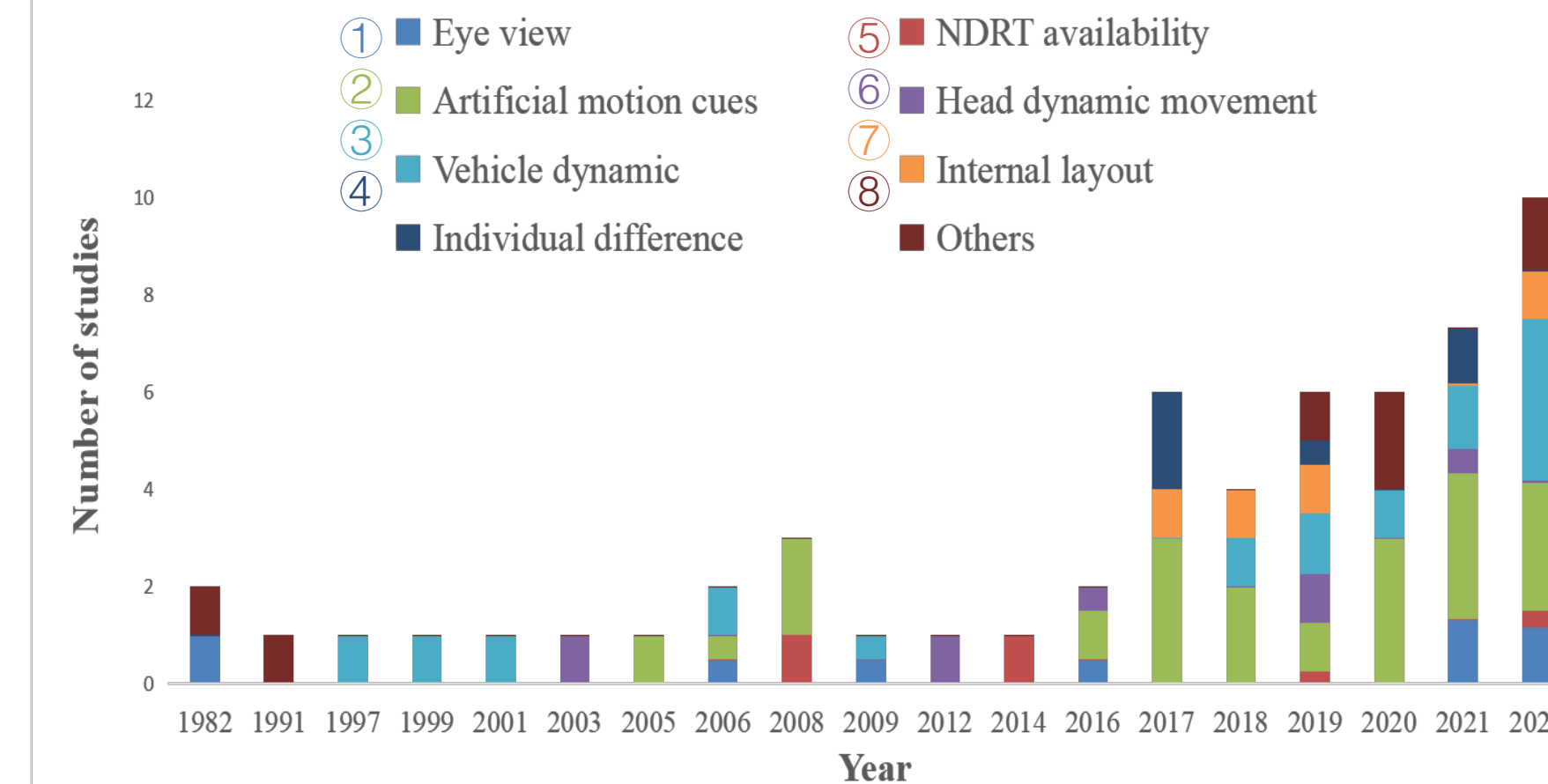
Objective 2.1

Real-time MS assessment using machine learning (ML) algorithms based on passengers' body-movement data.

- Accuracy of 86% with a 3-class classification problem
- MS is positively associated with body sway



Objective 1.1



A meta-analysis of motion sickness inducers

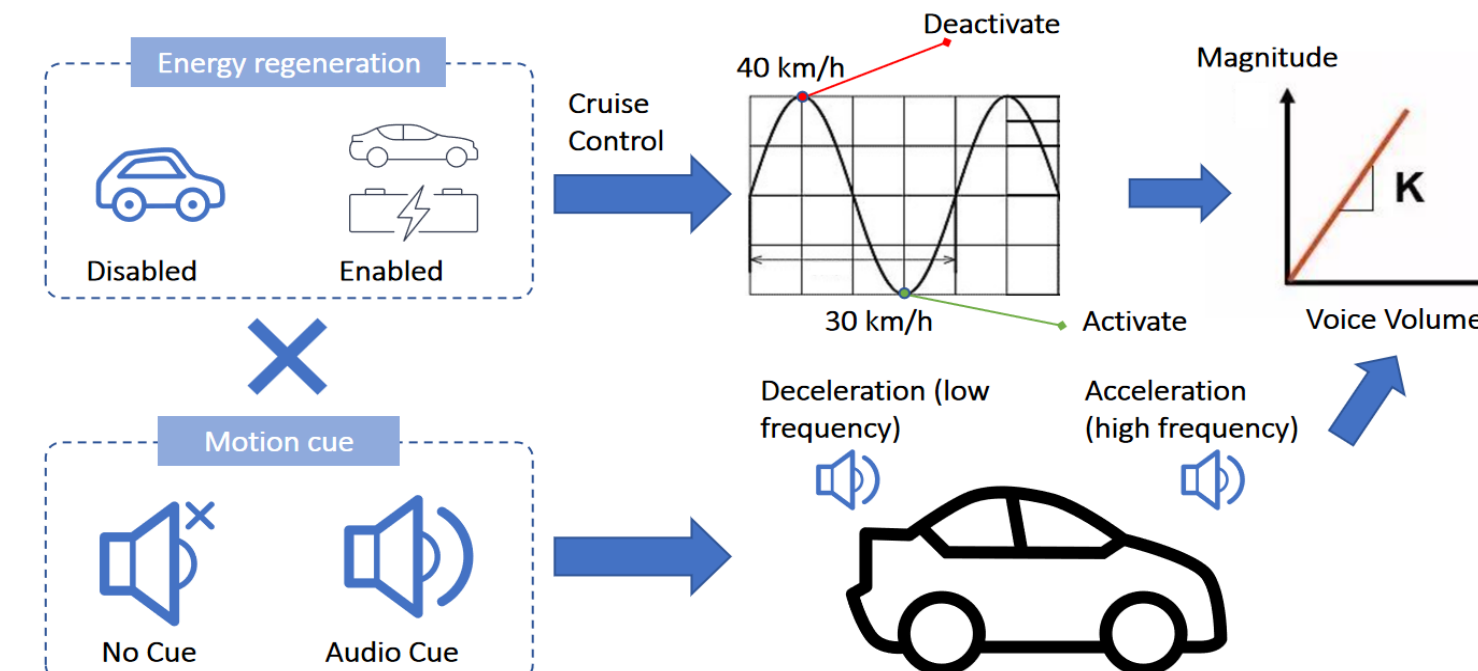
Objective 2.1 & Objective 3.1

Does **energy regeneration** in EVs exacerbate motion sickness?

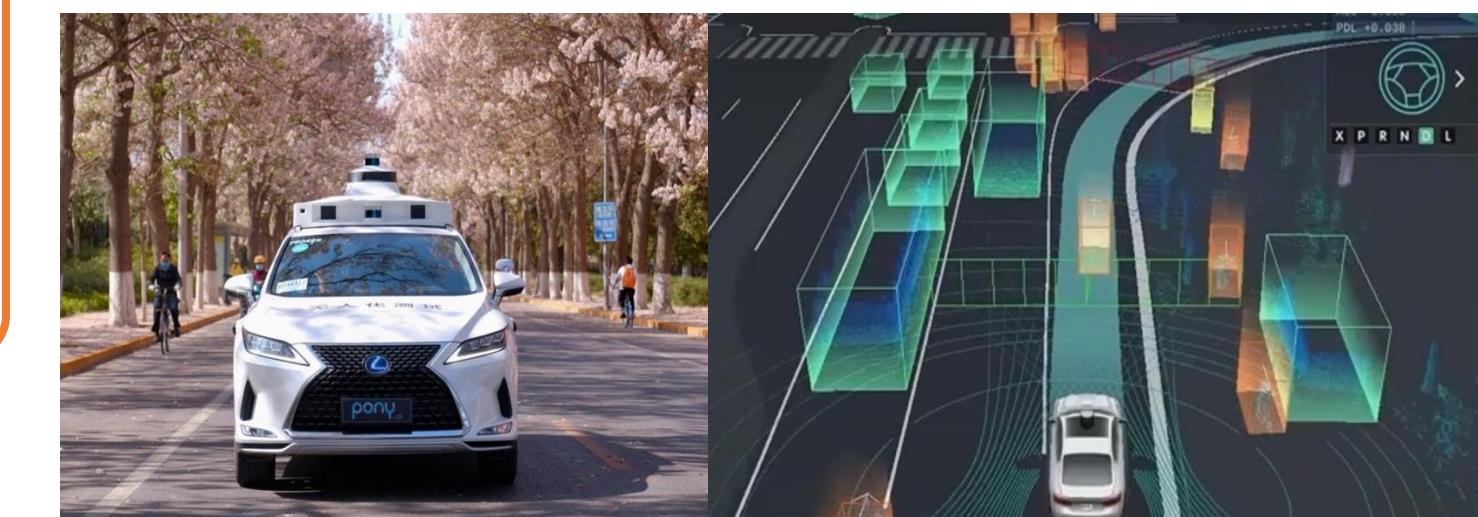
- High-level regenerative braking led to more severe MS

Can **audio motion cues** help alleviate MS?

- MS can be effectively alleviated under high-level regenerative braking



Objective 3.2



Can **providing planned vehicle trajectory** to passengers alleviate MS in fully autonomous vehicles (AVs) and enhance users' trust and acceptance of AVs?

- Trajectory information led to seemingly alleviation of MS, though insignificant
- Trajectory information led to a significant increase in trust