Improves Driver Drowsiness and Distraction During long-Distance Driving

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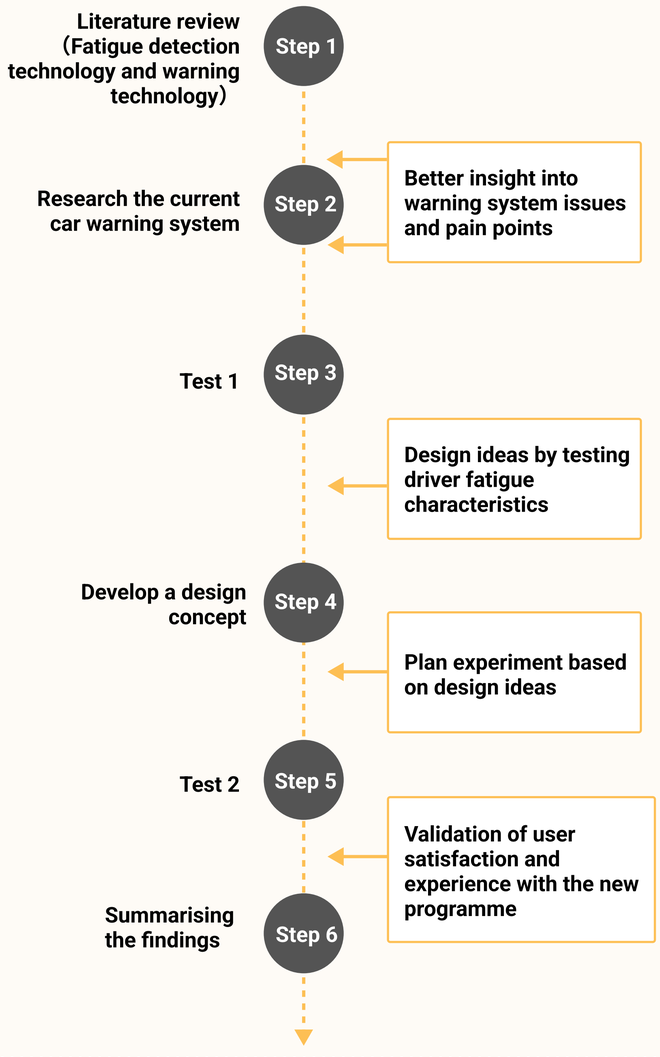
ABSTRACT

The aim of this project is to improve driver safety by improving the problems of drowsiness and distraction during long-distance driving. A literature review and research was first conducted. Through user research and testing, the indicators of different stages of drowsiness were refined and a multimodal warning system solution was proposed. After that, a test of the system design scheme was conducted to collect users' feedback on the system, which proved after data analysis that the content of the system helps to optimise the fatigue warning system, and that it is feasible to design different fatigue warning systems based on the refined indicators of sleepiness.

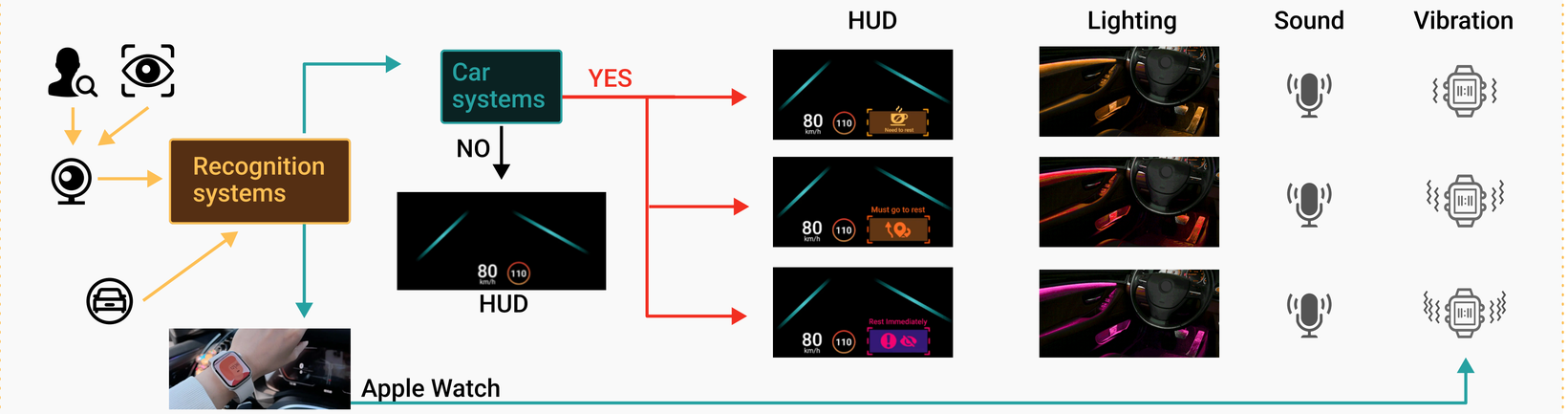
INTRODUCTION&BACKGROUND

In 2021, the number of fatigued driving deaths in the United States increased by 8.2 per cent from 632 in 2020. Driver fatigue accounts for 20 per cent of serious accidents on motorways and monotonous roads in the UK. Fatigued driving accidents are on the rise globally, posing serious risks to individuals and passengers. While automated driving systems have helped the safety of driving tasks to some extent. However, automated driving features have been found in a number of studies to similarly cause drivers to enter a state of passive fatigue, decreasing alertness, affecting the ability of drivers to fulfil their supervisory roles as well as affecting the responsiveness to take over the driving role. The adverse effects of fatigue on driving performance reinforce the importance of fatigue monitoring and timely intervention.

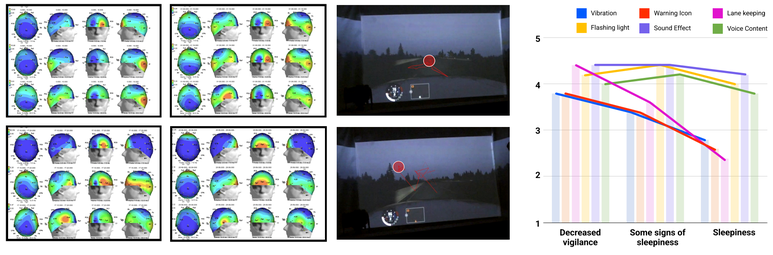
STUDY METHODOLOGY



DESIGN



TESTING & EVALUATION



Test 1：Refinement of different sleepiness indicators.
EEG as the main indicator of sleepiness, eye movements, facial expression features, yawning, head movements and other sleepy behaviours were observed by eye-tracker, and camera.

Test 2: To investigate the effectiveness and user perception of a multimodal warning system solution. Send different HUD warning interfaces, sound alerts, and watch emitting vibration alerts based on driver drowsiness characteristics.

RESEARCH RESULT

After data analysis it was demonstrated that the content of the system helps to optimise the fatigue warning system and that it is feasible to design different fatigue warning systems based on refined sleepiness indicators. Intervention of driver behaviour at the early stage of drowsiness is effective. In addition, visual-auditory-haptic multimodal warning forms are an area worthy of further research.

CONCLUSIONS&FUTURE WORK

After data analysis it was demonstrated that the content of the system helps to optimise the fatigue warning system and that it is feasible to design different fatigue warning systems based on refined sleepiness indicators. Intervention of driver behaviour at the early stage of drowsiness is effective. In addition, visual-auditory-haptic multimodal warning forms are an area worthy of further research.