Human Machine Interface Design for Enhanced Accessibility

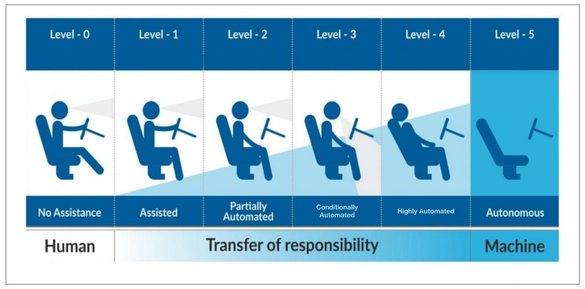
Anne Ye (Honors Capstone), Bradin Zaba (Honors Capstone), Jinxin Li, Bashar Zidan, Rosemary Chen, Zhanchen Huang
Faculty Advisor: Dr. Michael Nebeling

Our Project

We have researched and designed accessibility settings for Arriver's human machine interface specifically for drivers with accessibility issues in five target user groups: vision impairment, deafness, color blindness, mobility issues, and motion sensitivity. The HMI is targeted towards vehicles with level 2+ autonomy.

Levels of Autonomy

Our project is focused on in-vehicle interfaces for level 2+ vehicles, which includes semi-autonomous and autonomous vehicles.



Source: https://www.netapp.com/blog/how-to-build-a-data-pipeline-for-autonomous-driving/

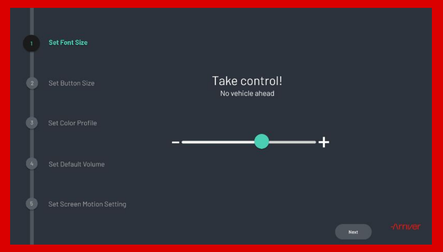
Problem

Interfaces for driver alert systems must be designed with the broader population in mind in order to be universally effective. This project explores this by diving into five accessibility user groups and developing accessible interface customization settings that can be applied to a level 2+ in-vehicle human machine interface (HMI). With our HMI design, we hope to achieve three main objectives:

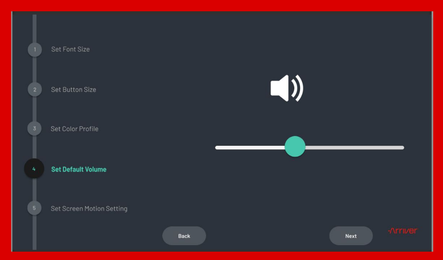
- Design for people with accessibility needs
- Expand on the original interface's driving customization
- Create an adaptive interface

In order for **safety critical** driver alert systems to be **universally effective**, they must be designed with the broad population in mind, including people with **accessibility needs**.

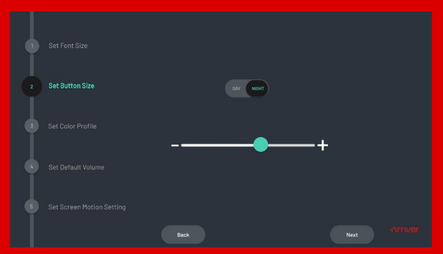
Vision Loss



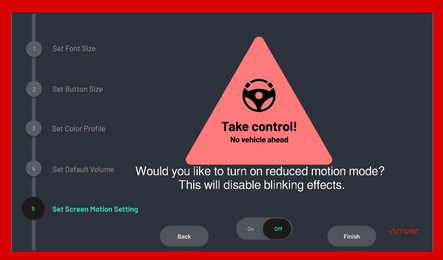
Hearing Loss



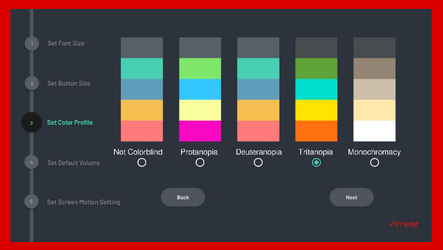
Mobility Issues



Motion Sensitivity



Color Blindness



Impact

Improved ADAS HMIs make autonomous vehicles safer and increase consumer adoption. According to the National Institute on Deafness and Other Communication Disorders, nearly 25 percent of people aged 65 to 74 and 50 percent of those who are 75 and older have disabling hearing loss. Additionally, about 1 in 12 men experience some form of colorblindness. As the driving population increases in the United States and autonomous vehicles become more mainstream, addressing accessibility issues in their human machine interfaces will become increasingly important.

Recommendations

- User profile system
- Voice commands for enhanced mobility
- More layout customization (e.g. ability to swap left and right panels)
- Consider using more generally understandable wording for colorblind modes
- Start text and button sizes larger
- Reduce animations in the vehicle surroundings section of interface

Conclusion

We have been able to successfully create an interface that is designed for people with accessibility needs, allows for driving customization, and is adaptive.

Scan to view our final recommendations in more detail

MULTIDISCIPLINARY DESIGN PROGRAM

ENGINEERING HONORS PROGRAM
UNIVERSITY OF MICHIGAN

Arriver