

Design of a human-machine interface for unmanned ground vehicles

This report presents the development and optimization of a Human Machine Interface (HMI) designed specifically for Unmanned Ground Vehicles (UGVs). The goal is to design a user interface that assists in both manual and autonomous driving of the UGVs, making a user-friendly and efficient HMI.

This thesis is motivated by the increasing importance of UGVs in areas like defence and security. In these areas, well-designed interfaces can significantly affect the success of the missions. By collaborating with experts and using academic resources, this project aims to align the design closely with the user requirements.

During research, initial interviews focused on the UGV purposes and requirements, which were followed by discussions on necessary features. Design experts contributed unique perspectives. The use case scenarios, including showing the HMI at exhibitions and demonstrations as well as using it for software testing, heavily influenced the goal of the HMI. The iterative design process emphasized a human-centred approach, beginning with user context understanding and evolving through continuous feedback and refinement. This ensured a functional, user-friendly HMI.

The ideation process started with initial rough layout sketches using Figma. These sketches highlight the important user interface components such as the camera, map and safety zone, which are crucial for the HMI. Medium-level ideation led to refining these layouts and creating more detailed features which will be included in the interface. Two final detailed concepts were developed, one focusing on a horizontal layout, and the other on a vertical layout. Finally, the horizontal concept was chosen because of the central camera position which makes manual driving more intuitive. After exploring various styles for the user interface, a style was chosen which was based on the style from the game "Halo", but changing a few shapes and colours. This style used Demcon's colour scheme and had modern, minimalistic elements.

A high-fidelity interactive prototype was developed to mimic the intended final product. This prototype was built in Figma and used modular components, allowing functions such as linking buttons to specific actions. Usability testing showed that the interface was easy to use, but a clearer and more intuitive design could enhance the experience for first-time users.

In conclusion, this thesis presents valuable findings and recommendations for further development of the HMI. The prototype serves as a foundation which will be developed by a future intern.