

Use Cases

SNOWGROOMER



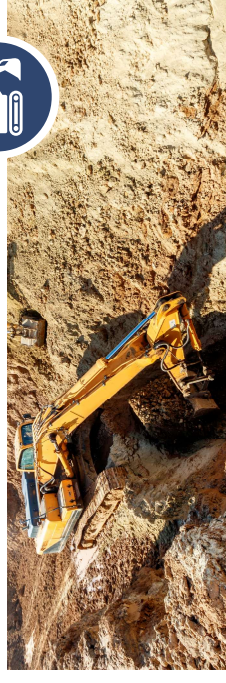
A snowgroomer needs to be operated in all conditions, even during "whiteout" (zero view of the environment). Sensors and visualization assistances support the operator in driving and controlling the machine.

REACHSTACKER



Harbour cranes, handling heavy items, are operated remotely. Thus, it is necessary to provide the human operator with an ideal perception of the task at hand and the context, that might vary from task to task. The extent to which a digital experience can support the human operator is to be investigated.

EXCAVATORS



Operators need to handle heavy excavators and similar machines safely. Mixed-reality technologies will aid the human operator in controlling the machine and efficiently navigating in the operating environment.

Consortium



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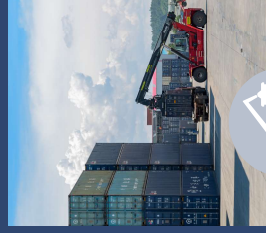
Making the Invisible Visible
for Off-Highway Machinery
by Conveying

Extended Reality Technologies

Snowgroomer



Reachstacker



Excavator





About the Project

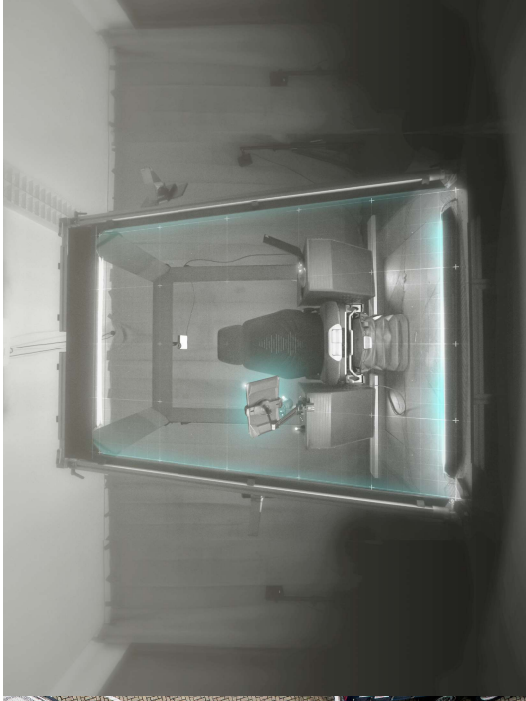
Extended Reality (XR) technologies have been on the rise in recent years. XR is an overarching term that describes a available set of immersive technologies such as augmented visualization, enhanced acoustics, or vibratory feedback. They enhance the perception of the human and adds additional digital information to the physical reality.



The Off-Highway Domain covers all transportation systems and mobile machinery that do not operate on main roads.

Many workplaces involving off-highway vehicles and machinery, such as snow grooming, agriculture, logistics, and construction, are highly demanding and dangerous for their human operators as well as the environment they are operated in. Even brief moments of inattentiveness or misjudgement of distances, velocities, or environmental conditions can lead to critical situations, putting human life or the integrity of machines, equipment, and cargo at risk. The increasing role of digital data and services in the industry leads to increased availability and complexity of information to be processed, e.g., complex process simulations, real-time sensor data and big data processing, digital twins, or interconnected product-service combining machine operation environments with scheduling, planning and communication apps.

What we are still missing is the proper integration of the available information and functionalities into the human-machine interfaces of the involved mobile machinery. But such advanced information and machine operation spaces will especially profit from advanced interaction modalities, that go beyond display-based user interfaces.



Project Objectives

THEIA^{XR} aims to design an off-highway machine workplace equipped with XR technology to positive work experiences of self-efficacy and meaningfulness, accomplished by the following objectives:

Obj #1: Increase of productivity, safety, responsibility, and perceived presence in demanding workplaces through experience design

Obj #2: Increase interaction quality through predictable and comprehensible machine behaviour and communication within an XR HMI

Obj #3: Development of advanced multi-modal interaction technologies (e.g., augmented and/or virtual reality, tactile/haptics, spatial acoustic, etc.) to convey seamless and persistent physical-digital experiences

Obj #4: Ensuring humane workplaces by regarding ethical, self-efficacious, and meaningful work conditions within an XR HMI

Obj #5: Design, implement, integrate, and validate a set of real-life use cases targeting new domains for eXtended Reality

