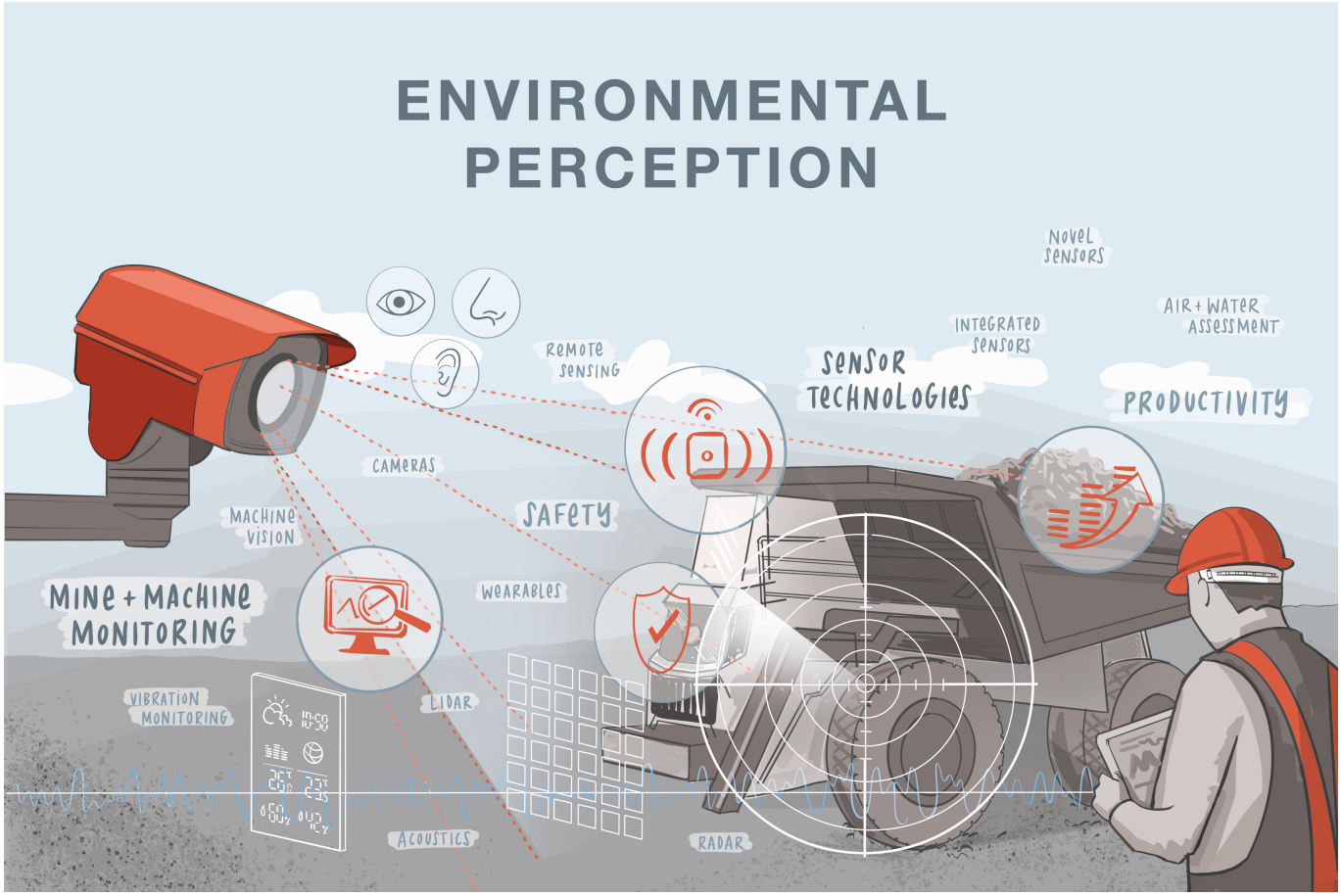
Environmental Perception



Various technologies are used as part of our research in the field of environmental perception. These include advanced 2D and 3D camera technologies in different frequency ranges, which enable the precise recording of environmental conditions and are therefore used for mapping and detecting people, among other applications. 3D cameras, laser scanners, radar sensors and other technologies are capable of creating spatial models of the surroundings and thus creating a better understanding of the working environment above and below the surface.

Furthermore, we use specialised sensor technologies for gas and air flow measurement, for example to detect hazardous gases at an early stage and thus comply with concepts for adhering to exposure limits. In our research activities in this field, we pay particular attention to two aspects: 1. the use of unconventional or innovative sensors and measuring devices and 2. the implementation of automated measurements in close cooperation with the ‘Mine Communication’ and ‘Robotics’ research areas.

Another important aspect of our research is conventional measurement technology, which is used in combination with modern technologies to provide accurate measurement data. By conventional measurement technology, we mean temperature measurements with probes, load measurements using strain gauges as well as vibration analyses using structure-borne sound sensors and related methods. We additionally use sensors to capture high-frequency vibrations (acoustic emissions) in various areas. All of the aforementioned sensors are crucial for carrying out performance measurements, monitoring the condition of machines and preventing damage to systems.

In addition to these established technologies, other novel sensor technologies are constantly being tested or,

alternatively, known technologies are being trialled in novel applications.

Through our research, we enable machines to see, hear, feel and smell under the challenging environmental conditions of the raw materials industry. This is essential for safe and efficient automation and digitalisation in raw materials extraction and helps to make processes not only safer but even more efficient.

Topics and current projects:

- Testing AE sensor technology for the detection of microcracks in steel (AKUSTAHL)
- Recording environmental data and testing sensor technology for safe autonomous driving (AREA.AI)

Completed projects:

- Testing of sensor technology (ARTUS)
- Testing of sensor technology for adaptive process control during underground anchoring (Automated Bolt Reload)
- Testing of thermal imaging cameras (BCMS)
- Testing of AE sensor technology for the differentiation of materials for customized process control (Blue Harvesting)
- Testing of AE sensor technology for differentiation of materials (Blue Nodules)
- Test of thermal imaging cameras for safe belt tracking in hard coal mining (BUSDUCT)
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- Sensory measurement of gas concentrations for the safe operation of underground machinery (HEET 2)
- Testing sensor technology and sensor integration for material detection (LEX)
- Test site for sensor tests to evaluate the robustness of sensors (Living Lab Nivelstein)
- Testing AE sensor technology for differentiation of materials (OMMA)
- Testing thermal imaging and stereo cameras to differentiate between slag and steel (PAM 4.0)
- Test of thermal imaging cameras (Real Time Mining)
- Testing thermal imaging cameras and AE sensors for secure robbery (SCALE SENSE)
- Test of thermal imaging cameras for material and crack detection for efficient and safe underground raw material extraction (SIMS)
- Testing conventional measurement technology to increase the service life of machines (TS4.0)
- Testing sensor technology for underground positioning and navigation (UPNS 4D+)

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