Current Research Projects

Here you will find an overview of our current research projects, grouped by Smart Services according to the data information value chain, which you will find in the overview of our main research areas.

AUTOMATION

SUSTAINABLE INTELLIGENT MINING SYSTEMS (SIMS)

The aim of the project SIMS (Sustainable Intelligent Mining System) is to sustainably improve mine safety through a higher degree of digitisation, automation and robotics, to reduce the environmental impact of mining and to increase the overall efficiency of mining operations. In addition, SIMS aims to identify direct and measurable factors influencing sustainable mining and to sensitise the wider population to the need for mining.

Learn More!

AUTOMATED BOLT RELOAD

The aim of the project Automated Bolt Reload is to develop a robust automated system for reloading the magazine with anchors. This process is still carried out manually today. The monitoring of the reloading process as well as the anchor setting will be done with a sensor system. This will pursue three overarching goals: 1) Higher safety and improved working conditions, 2) Increased efficiency through the execution of parallel activities and the shortening of anchorage cycles and 3) Simple implementation of the automated process and integration into existing work processes.

Learn More!
The project UNDROMEDA (Underground Robotic System for Monitoring, Evaluation and Detection Applications) aims at the development of a robotic underground measurement system for autonomous 3D mapping and monitoring. The system is based on a mobile, wheel-driven platform, which is additionally equipped with a flying drone, in order to access particularly unknown, inaccessible or dangerous areas in underground mines and other underground environments, such as tunnels or canal systems. UNDROMEDA is a milestone project in the current development of the springboard for the "invisible, pollutant-free, intelligent, safe and fully autonomous" mine and will enable us to meet the associated challenges for future mining in terms of social and ecological acceptance and economic efficiency.

Learn More!

The aim of the ARTUS project (Autonomous robust transport system for hybrid, environmentally friendly raw material extraction based on articulated special vehicles) is to develop a system for operating a fleet of autonomously operating special vehicles for hybrid, i.e. surface and underground mining environments. This will enable a more environmentally friendly and sustainable extraction of mineral raw materials, as the utilization of the individual machines will be improved, consumption and wear reduced and the productivity of the entire system optimized.

AMT's goal is to implement an open, manufacturer- and interface-neutral communication system for a comprehensive machine-to-machine communication as part of the ARTUS project.

Learn More!

MATERIAL IDENTIFICATION

CUTTING DRUM 4.0
As part of the project Cutting Drum 4.0, an intelligent cutting drum is being developed that is equipped with sensors suitable for mining. Acoustic emission signals (AE signals) are to be evaluated at the cutting tool. For the first time, this enables material recognition directly during the cutting process. By distinguishing between coal and secondary rock during the cutting process, efficient extraction is to be made possible. For the development of such a cutting drum, the relationships between different material classes and the AE signals must first be identified.

Learn More!

MINE SAFETY

INCREASING EFFICIENCY AND SAFETY IN MINING TRANSPORTATION

The project INESI (Increasing Efficiency and Safety Improvement in Underground Mining Transportation Routes) has three project objectives, in which sensor methods developed at AMT are used:

- to increase safety in underground mines by using a precise Ultra-Broadband Radio Localisation System (UWB)
- to increase efficiency by determining the position of monorails and the resulting optimisation of transport logistics using ultra wideband radio technology.
- to enable the detection of persons on belt conveyors in hazardous areas by means of infrared thermography (IR)

Learn More!

SAFE AND INNOVATIVE MINE TRANSPORTATION

The aim of the project BUSDUCT (Increase of mines efficiency and health protection through the
innovative transport system based on BUSDUCT) is to develop a prototype of a suspended monorail locomotive (SML) which is powered with electrical energy via a busduct. This electrically powered locomotive is designed for the use in potentially explosive areas of the Polish coal mining industry. The electric drive enables the SML to run at higher speeds, which increases the efficiency of the mine's logistic processes.

Learn More!

PREDICTIVE MAINTENANCE
MAINTAINED MINE AND MACHINE

The goal of the project MaMMa (Maintained Mine & Machine) is to improve the availability, efficiency and safety of machines and mines through the use of an intelligent, integrated and holistic maintenance system. Unexpected and unplanned machine and infrastructure failures are the main cause of costly underground failures and are to be minimized by the software system developed in the MaMMa project. At the same time, the system enables employees and consultants to better and more efficiently plan maintenance work based on real-time data on the condition of machines and equipment underground.

Learn More!

DEEP SEA MINING
BLUE HARVESTING

The aim of the Blue Harvesting project is to develop a hydraulic collector for manganese nodules from the deep sea. The collector is one of the core components for the industrial mining of manganese nodules, the use of which can contribute to securing the long-term supply of raw materials. In the Blue Harvesting project, a special focus is placed on the development of a collector with the lowest possible impact on the deep-sea environment.

Learn More!
As part of the Blue Nodules project, the Institute for Advanced Mining Technologies (AMT) is developing a concept for characterizing the material flow using acoustic emission technology. Acoustic emission sensors have so far been used, for example, in the condition monitoring of pressure vessels and bridges. In the first preliminary tests at the AMT Institute, the physical phenomenon of acoustic emissions was used to characterize the material flow of bulk material. The AE signals recorded during transport and impact processes are evaluated with regard to characteristic parameters. Characteristic values are calculated and compared with already recorded characteristic values from previous reference measurements. The aim here is to determine differences and thus characteristic parameters for different materials. This concept has now been adapted for use in the deep sea to characterize the material flow of manganese nodules and overburden. The results will be used to determine the process efficiency and, if necessary, to control the process.

Learn More!

The aim of the CDIO II project is to raise awareness of the principles of good, contemporary teaching in modern raw materials education. CIDO, an international framework program with 12 standards, stands for Conceive Design-Implement-Operate and thus for what engineers should be able to do after their training, namely to solve and overcome problems and challenges in a real, complex, industrial and international environment.

The project is the first to apply the principles to European raw materials education. Faculty Development courses will take place at the participating universities, joint project courses with industry participation will be offered, a worldwide overview of the use of laboratories in the training of mining engineers will be developed, and guidelines for innovative laboratories as learning environments will be developed.

Learn More!