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UNEXMIN GEOLOGY AND RAW MATERIALS:
A NEW WAY TO EXPLORE, MAP AND OBTAIN GEOSCIENTIFIC INFORMATION FROM FLOODED UNDERGROUND MINES

TECHNOLOGY
- Autonomous underwater geo-exploration
- 3D Structural mapping
- Geoscientific and mineralogical data

TARGET GROUPS
- Mining and mineral exploration companies
- Raw materials community
- Geoscience and mining consultants

UPDATE

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During its missions, our robot UX-1 will carry a wide range of tailor-made scientific instrumentation for: pH measurement, water sampling, electrical conductivity measurement, multispectral imaging, UV fluorescence imaging, magnetic field measuring, sub-bottom profiling and natural gamma ray activity measurement.

The instruments are specifically designed together to obtain the maximum amount of geoscientific and environmental data which can be obtained in flooded mines, hand-in-hand with necessary equipment such as batteries, computers and thrusters to control the robot. Detailed geometry of tunnels and other openings will be obtained through laser scanning which is a key part of the navigation subsystem (generating 3D maps with mm to cm accuracy).

General layout of the UX-1 robot (CAD models)

UX-1 characteristics:
- Shape: spherical
- Size (diameter): 0.6m
- Autonomy: 5 hours
- Max operational depth: 500m
- Operating speed: 1-2 km/h

Post-processing and data analysis tools are being prepared specially for UX-1 to obtain and make interpretations of the recovered geological data. With that we hope to improve geological models and better understand ore genesis and post-genetic structural and geochemical processes. A unique outcome will come in the form of virtual reality 3D visualisations of the recorded data.

Pre-operational tests will be held in four mines across Europe: Kaatiala pegmatite mine (Finland), Urgeiriça uranium mine (Portugal), Idrija mercury mine (Slovenia) and Ecton copper mine (England). These mines present progressively more difficult environments for the UNEXMIN technology. Tests intend to prove that the robot can deliver useful and relevant geo-information from different flooded mine layouts and conditions.
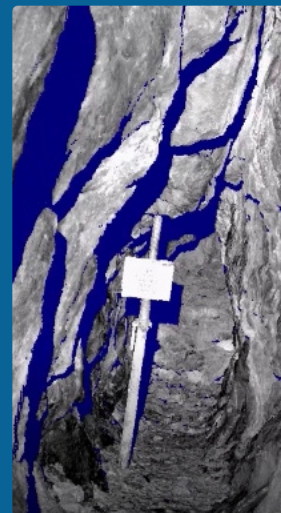
UX-1 developers

Our new multi-robotic system solution will be able to explore and map flooded mines, obtaining geoscientific data (pH, conductivity, water geochemistry, etc.), gather information on mineralogy, petrology, and geological structures. Other data is expected in the form of the layout of the mine, rock mechanics, and geophysics. By using non-invasive methods, UX-1 will be able to fully operate without damaging the environment or any structure.

The geology community as well as the raw materials sector will benefit greatly from the technology being developed in the UNEXMIN project. One of the most important outcomes will be reduced exploration costs and increased investment security for future mining operations due to the specific geoscientific data that the UNEXMIN technology will produce.

Possible application of UNEXMIN technology in different geological fields:

• Bringing information about ores and industrial mineral deposits that cannot be currently obtained, opening new exploration scenarios

• Create better drilling exploration plans

• Make improved geological models (geological environment, reserves and resources, raw materials identification), giving access to new and better geological data necessary to understand Earth's processes and development

• Supporting information for other areas such as civil engineering, energy efficiency, waste management and water supply

Laser scan point cloud image