Trials at the Urgeiriça flooded underground mine are a success

The UNEXMIN project is developing a technology capable of autonomous exploration and mapping of flooded mines. The robotic platform uses non-contact methods to gather geological, mineralogical and spatial data without major costs or risks associated. The field trials help the team to access the platform development and make improvements to the unique technology.

UNEXMIN has finished its third trial, at the Urgeiriça mine, Portugal, where it tested two robots to explore and map the galleries and tunnels of the flooded underground mine. Robots UX-1a and UX-1b were tested at different times with positive results.

The Urgeiriça trials were divided in two parts. The first run from 6th to 15th March. Here, the UX-1a robot was tested extensively at the same time as some of UX-1b's instrumentation. The second part of the trials was held from the 1st to 7th April. The period inbetween was used to calibrate and improve the robots' functionalities and equipment at INESC TEC's laboratory.

The first part included testing with the robot with dives up to 104 m water depth. The entrances of the first four levels within the Urgeiriça mine were mapped (1st level at 30 m, 2nd at 60 m, 3rd at 85 m and the 4th at 110 m, below surface level). The entrance chamber of the 1st level is partially collapsed, so only a few metres were investigated. The 2nd level is collapsed after few metres so it could not be searched. The 3rd level is in good condition; this level was used in multiple test dives to trial different instruments. On the entrance of the 4th level, a granite wall with black veins was recorded by the multispectral camera.

During the second part, dives with the robots focused on their movement, navigation and mapping capabilities. These included tests involving pitch and roll movements, use of Structured Light Systems with UV-light – from where the team could identify some present mineralogy -, multibeam and other scientific instrumentation of relevance.

The UNEXMIN team is now channeling all its efforts to the preparation of the Ecton mine trial, in May 2019, the one that will ultimately prove the operability of the UNEXMIN technology in flooded mines. The outcomes of the research efforts will be presented during the project's final conference in Brussels, on 26th September 2019.
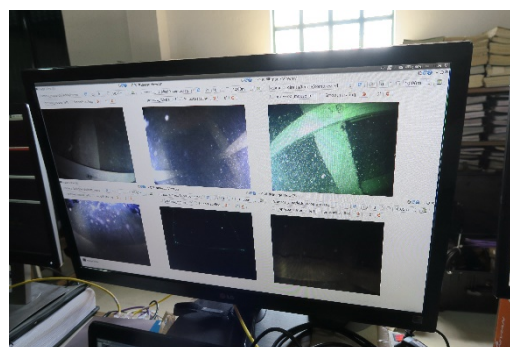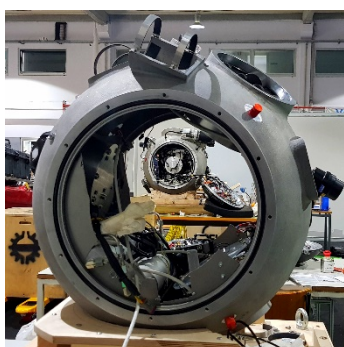
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Background

→ The EU is currently dependent on the import of many mineral raw materials
→ Within EU borders there are around 30,000 closed mine sites, many of which with relevant mineral resources still to be exploited
→ Abandoned deep underground mines are becoming more interesting
→ Most of these are currently flooded, making their exploration and assessment a difficult process. There is a lack of information on their status and layout

UNEXMIN develops a novel robotic system for the autonomous exploration and mapping of Europe's flooded mines. The robotic platform, made by three robots, uses non-contact methods for 3D mine mapping to gather geological, mineralogical and spatial data that can be used to consider new exploration and exploitation scenarios for European mineral resources.

UX-1 ROBOT CHARACTERISTICS

→ Maximum operational depth: 500m
→ Spherical shape
→ Diameter: 0.6m
→ Weight: 112Kg
→ Energy consumption: 250-400W
→ Maximum velocity: 1-2Km/h
→ Autonomy: up to 5 hours
→ Neutral buoyancy
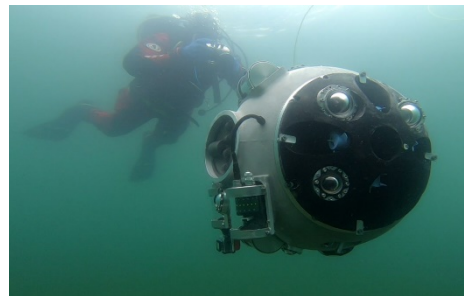
Key facts

→ EU funded Horizon 2020 project (RIA: Research and Innovation Action)
→ 12 partners / 7 countries
→ 45 month duration (February 2016 – October 2019)
→ Funding: 4.87 million Euros

Dissemination channels:

Website: www.unexmin.eu

Social media: @UNEXMIN [Facebook](#) – [Twitter](#) – [LinkedIn](#) – [YouTube](#)

Videos:

[Ecton Salts level - Faro scans](#)
[Point Cloud from Salts Level, Deep Ecton](#)
[UX-1 Plastic Proto Stability Tests](#)
[UNEXMIN: Underwater Explorer for Flooded Mines](#)
[UNEXMIN software testing - Universidad Politecnica de Madrid (UPM)](#)
[UNEXMIN Project overview](#)
[UNEXMIN field trials at Kaatiala mine](#)
[UNEXMIN UX-1 robot assembly in Porto](#)
[UNEXMIN Idrija tests](#)
[UNEXMIN Idrija field trials video](#)

Images:

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Press releases:

[July 2016](#)
[November 2016](#)
[February 2017](#)
[July 2017](#)
[February 2018](#)
[May 2018](#)
[July 2018](#)
[October 2018](#)
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UNEXMIN partners:

Universidade of Miskolc, Hungary
Geological Survey of Slovenia, Slovenia
Tampere University, Finland
Universidad Politécnica de Madrid, Spain
La Palma Research Centre, Spain
INESC TEC – Institute for Systems and Computer Engineering, Technology and
Science, Portugal
Resources Computing International Ltd (4dcoders), UK
Ecton Mine Educational Trust, UK
European Federation of Geologists, Belgium
Geo-Montan, Hungary
Empresa de Desenvolvimento Mineiro, S.A., Portugal
Idrija Mercury Heritage Management Centre, Slovenia

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