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A new mining life for non-feasible mineral deposits?

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ROBOMINERS is developing an innovative approach for the exploitation of currently non-feasible mineral deposits. The approach entails the use of a robot-miner - a bio-inspired reconfigurable robot with a modular nature - in a new mining setting where the activities are nearly invisible and where mining presents less socio-environmental constraints, thus contributing to a more safe and sustainable supply of mineral raw materials.

The main aim is to design and develop a robotic prototype that is able to perform mining related tasks in settings including both abandoned, currently flooded mines not accessible anymore for conventional mining techniques; or places that have formerly been explored, but whose exploitation was considered as uneconomic due to the small-size of deposits, or their difficulty to access.

ROBOMINERS' innovative approach combines the creation of a new mining ecosystem with novel ideas from other sectors, particularly robotics. At this point, work has been done to understand the best methods for the robotminer's development in 1) biological inspiration, 2) perception and localisation tools, 3) behaviour, navigation and control, 4) actuation methods, 5) modularity, 6) autonomy and resilience, and 7) the selective mining ability. All these aspects combined aim to provide the robotminer XXI Century tools for mineral exploration and exploitation of (currently)

unfeasible deposits.

At the same time, for the vision of a new vision of a mining ecosystem, work is involving studies on 1) developing computer models and simulations, 2) data management and visualisation, 3) rock-mechanical and geotechnical characterisation studies, 4) analysing ground/rock support methods, bulk transportation methods, backfilling types and methods, and 5) sketching relevant upstream and downstream mining industry analogues for the ROBOMINERS concept.

After design and development, based on the previously mentioned studies, the robot-miner is set to be tested at targeted areas representatives which include abandoned and/or operating mines, small but high-grade mineral deposits, unexplored/explored non-economic occurrences and ultra depth, not easily accessible environments. Possible candidates for testing purposes include mines in the regions of Cornwall (UK), mines in the Kupferschiefer Formation (e.g. Poland) or coal mines in Belgium.

When compared to usual mining methods the ROBOMINERS approach shows: 1) no presence of people in the mine, 2) less mining waste produced, 3) less mining infrastructure, 4) less investment, 5) possibility to explore currently uneconomic resources and 6) new underground small-sized mines, practically "invisible". Altogether, ROBOMINERS can contribute to solve some of the main issues that make mining's social license to operate so difficult to get in Europe: land-use, environmental limitations, and socio-economic aspects.