Virtual Reality Meets Mathematics: Innovative Teaching Modules for Geometry

Challenges and results of the Math3DgeoVR project

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Math3DGeoVR project

The **Math3DGeoVR** project (Mathematical Models for Teaching Three-Dimensional Geometry Using Virtual Reality) (https://www.math3dgeovr.p.lodz.pl/#) is a European initiative (2021-1-PL01-KA220-HED-000030365), under the action **Partnerships for Cooperation (Erasmus+ program).**

The project's duration: 01.12.2021 - 30.11.2024

This project is designed for students and academics involved in teaching and studying various Mathematical and Engineering disciplines, as well as experts in Education.
A dedicated international consortium of educators and IT developers—experts in Mathematics, Management, Informatics, and Education from five European universities (Poland, Estonia, Slovakia, and Portugal)—has collaboratively developed this cutting-edge teaching method.
By integrating immersive VR experiences, the project aims to make complex geometric concepts more tangible and accessible, enhancing students' comprehension and engagement. Similar initiatives, such as VRMath and GeoGebra 3D, have demonstrated the potential of VR in mathematics education, showing significant improvements in learning outcomes. Building on this foundation, Math3DGeoVR aims to develop classroom-ready VR activities and a suite of 12 teaching modules, each addressing different geometric problems. These outcomes will equip both students and educators with cutting-edge tools, preparing them for technology-driven careers in a rapidly evolving world.
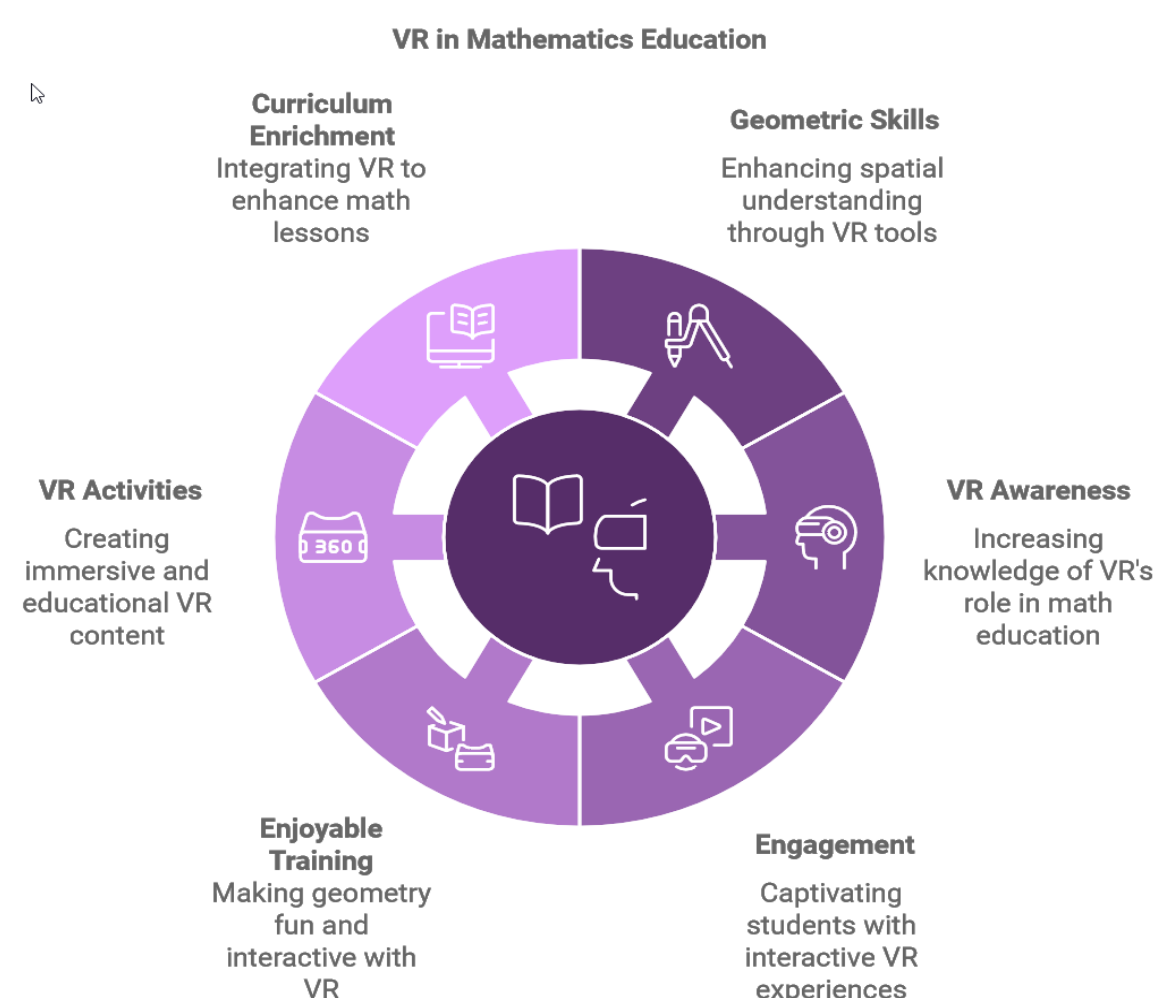
The partners

Lodz University of Technology, Poland (coordination);
University of Aveiro, Portugal;
University of Zilina, Slovakia;
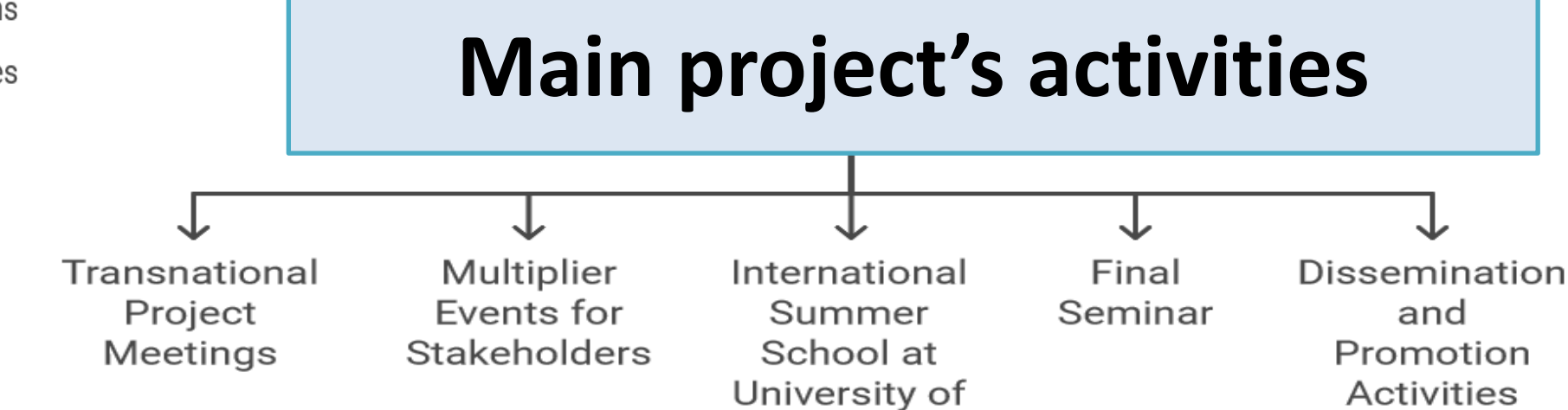University of Silesia, Poland;
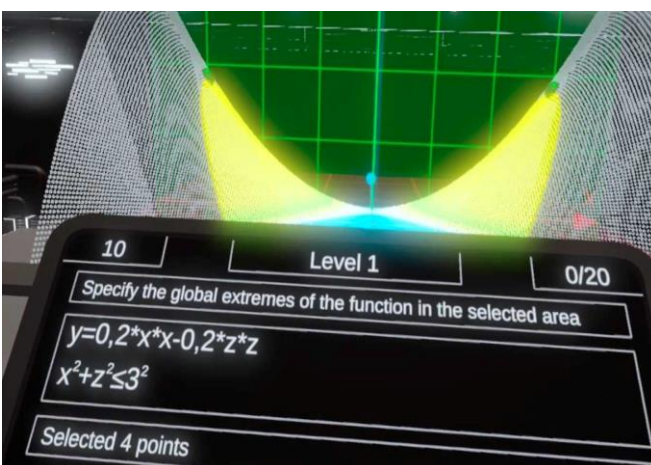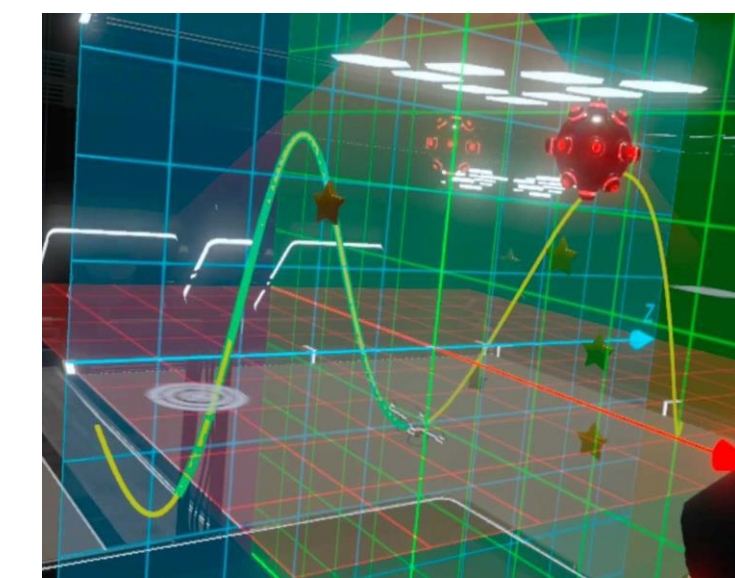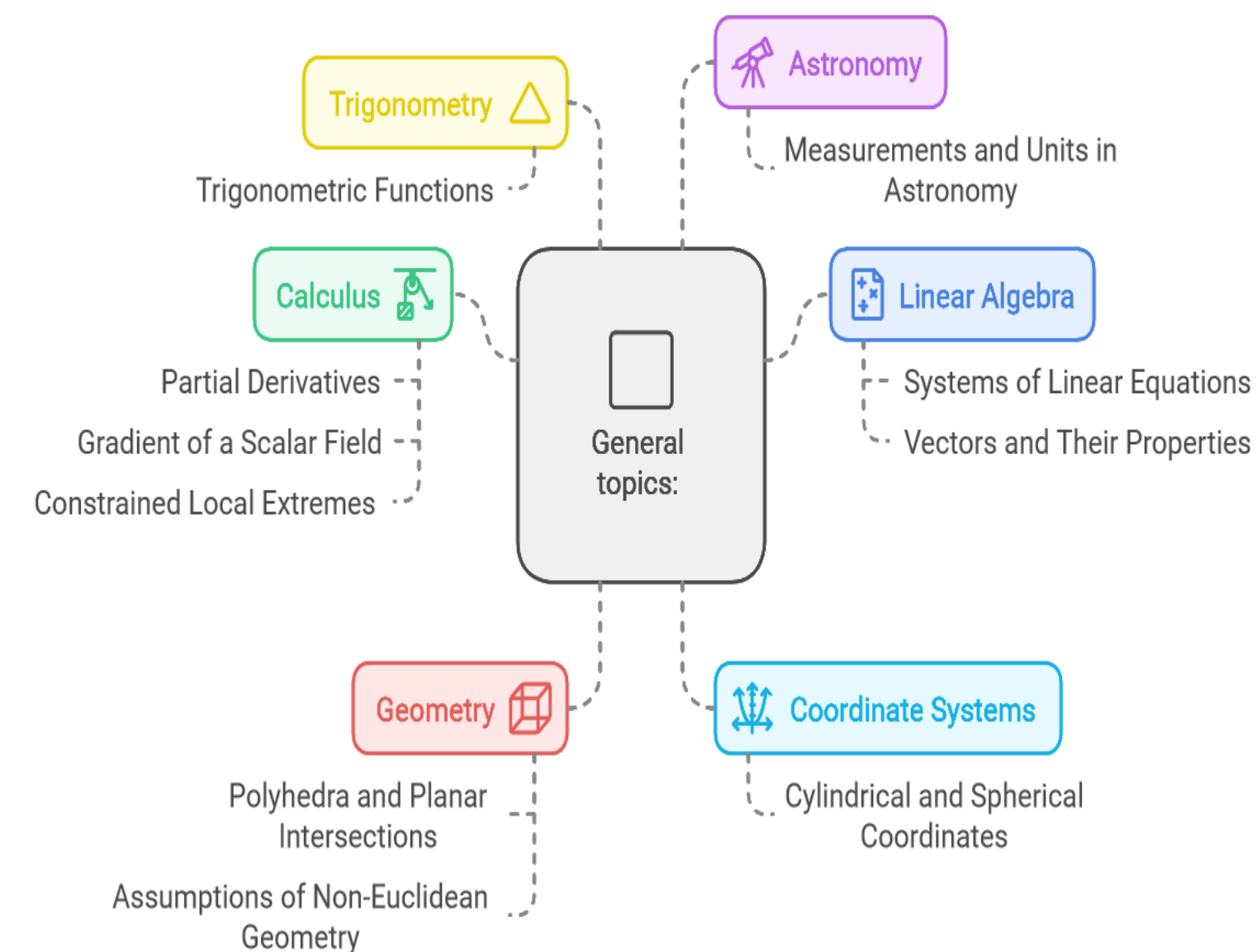Tartu Unicool, Estonia

The VR technology

Using Meta Quest 2 headsets, a fully 3D- environment is developed that completely isolates users from the real world, enhancing focusing and engagement. Unity3D 2021.3.46f1 game engine is used to develop and deploy the application. Inside the app, 14 scenes are programmed for specific Math module' realization. All scripts are written in C#, with custom shaders and animation workflows employed. To handle interactions, Meta XR Interaction SDK for Unity.

All 3D- models and sounds assets used inside the app, are custom made by our team. Through intuitive controllers, users can navigate the app and explore a variety of modules covering topics such as trigonometry, geometry, derivatives, and advanced mathematics. The VR environment enables interactive learning, offering visualizations and hands-on practice that traditional methods cannot provide.

The innovative approach aims to make mathematics more accessible, engaging, and effective for learners of all levels.

Learning Topics/Modulus

Project's outcomes

Main project's activities