



NEOTRIE VR, NEW GEOMETRY IN VIRTUAL REALITY

A new VR scenario to create, manipulate and play with 3D geometrical objects, as never before.



Aims:

NeoTrie VR is a new software package which is currently being developed by Virtual Dor and the University of Almería, that enables pupils to create, manipulate, and interact with 3D geometrical objects and 3D models in general, of several types. It is being tested in several

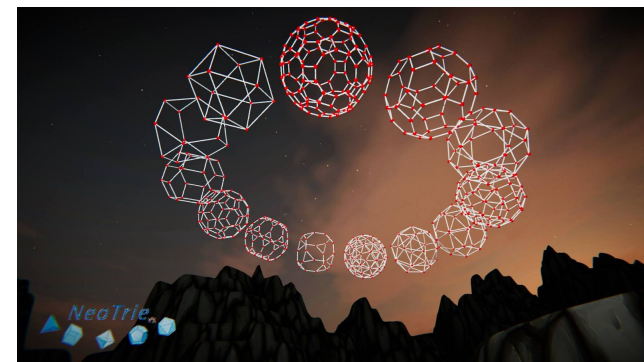
schools. The objectives of the project are the following:

- To examine aspects of plane geometry visible through the eyes of a third dimension.
- To introduce 3D geometry and modelling meant for 3D printing.
- To develop handicrafts and 3D visual skills.
- To stimulate deductive and inductive reasoning skills.
- To highlight cooperative work and positive interdependence.
- To motivate pupils by means of recreational, collaborative and competitive games.

Subjects

We plan to implement gaming activities and lesson plans for distinct ages and levels, covering the following subjects:

- 2D geometry: parallels, perpendiculars, measures of lengths and angles, etc.
- Projections of 3D figures using light bulbs.
- Construction of polyhedra (Platonics, pyramids, prisms, antiprisms, Archimedean, Johnson, Kepler, etc.).
- Basic operations of polyhedra: duality, truncation, rectification, extension,....



- Curved bodies (sphere, cone, cylinder, torus, etc.) by movements in space.
- Parametrized curves and surfaces.
- Metric calculations on 3D figures: angles, lengths, areas, volumes, Euler characteristics, etc.
- Spatial symmetries of 3D figures: translations, rotations, reflections.
- Homotheties.
- Geometric 3D fractals, such as the Sierpinski tetrahedron or the Menger sponge
- Generation of crystalline networks from fundamental cells.
- Euler 3D graphs (Seven Königsberg bridges problem).
- Hamiltonian graphs (Salesman's problem).
- Coloring graphs (based on Four colours theorem)

Featured tools:



- **Galleries** of hundreds of pre-designed geometric figures.
- **Speech Recognition System** to insert figures in the scenario.
- **File system** to load and save scenes created by users online.
- **Multiplayer** that enables users to create, play and learn together in common scene.
- **Photo camera and video recording** inside the VR scene.
- **Lesson recording system** for educational purposes (alpha version).
- **Exporting-importing** from other 3D geometric softwares (alpha version).
- **3D printing** from STL files made by NeoTrie (alpha version).
- **Multiplatform:** Available for VR headsets HTC Vive, Oculus Rift (others in process Windows Mixed Reality Platform, Google Cardboard,...).

Exhibitions:

NeoTrie VR is playing an innovative and attractive role in science fairs, divulgative exhibitions, congresses of mathematics teaching.



Forthcoming exhibits:

- *CAGDME: Conference on Digital Tools in Mathematics Education*, Coimbra, June 26-29th, 2018.
- *XVII CEAM, Congreso de Enseñanza y Aprendizaje de las Matemáticas*, Almería, Spain, July 4-6th, 2018.
- *BRIDGES: Mathematics, Art, Music, Architecture, Education, Culture*, Stockholm, Sweden, July 25-29th, 2018.

Project team:

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Organizers:



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More information is available at:

<http://virtualdor.com/en/NeoTrie-VR/>

<https://www.facebook.com/neotrie/>