



Game Engines - die Zukunft von 3D GIS?

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3D GIS - «State of the Art»





3D Games - «State of the Art»





Gaming-Industrie

- **Jahres-Umsatz Game-Industrie 2020:**
~ 140 Mrd. US\$
- **Deutschland 2019: 6.2 Milliarden Euro**



Game Engines – Top 3

› Unreal Engine

- › Epic Games
- › Free to use (5% royalty, >\$3,000 per quarter)

› Unity

- › Unity Technologies
- › Free for personal use. Plans from \$35/month

› Godot

- › Open Source
- › Software Freedom Conservancy
- › Community, 9 funded developers



Godot

GODOT Features News Community More Download Learn Assets **BECOME A PATRON** 91% \$15,000.00 **GodotCon 2021!**

The game engine you waited for.

Godot provides a huge set of common tools, so you can just focus on making your game without reinventing the wheel.

Godot is completely free and open-source under the very permissive MIT license. No strings attached, no royalties, nothing. Your game is yours, down to the last line of engine code.

[Download 3.2](#) [Learn more](#)

<https://godotengine.org/>



Godot Features 1/2

- › **GUI mit graphischen u. texbasierten Editoren**
 - › Linux, macOS, Windows und BSD
 - › 30MB Binary
- › **Knoten-/Szenensystem**
- › **2D + 3D rendering**
- › **Animationssystem**
- › **Programmierbar**
 - › GDScript (Python-ähnlich)
 - › GDNative: C#, C++, u.a.
 - › Visuelles Skripting



Godot Features 2/2

- **Logging, Debugging, Profiling**
- **XR Support**
 - Augmented und Virtual Reality
 - OpenVR, OpenXR, Oculus SDKs, ARKit, u.a.
- **Export auf verschiedene Plattformen**
 - Linux, Mac + Windows
 - Android + iPhone
 - Web (WASM)



Godot Live-Demo





Geodaten in Game Engines

- › **Rasterdaten → Sprites, Texturen**
- › **Vektordaten → Meshes (OBJ, glTF, ...)**
- › **Point clouds → Meshes, 3D Tiles**
- › **Styling → Material (Texturen, Parametrisiert)**
- › **Container (Szenen): glTF, ...**

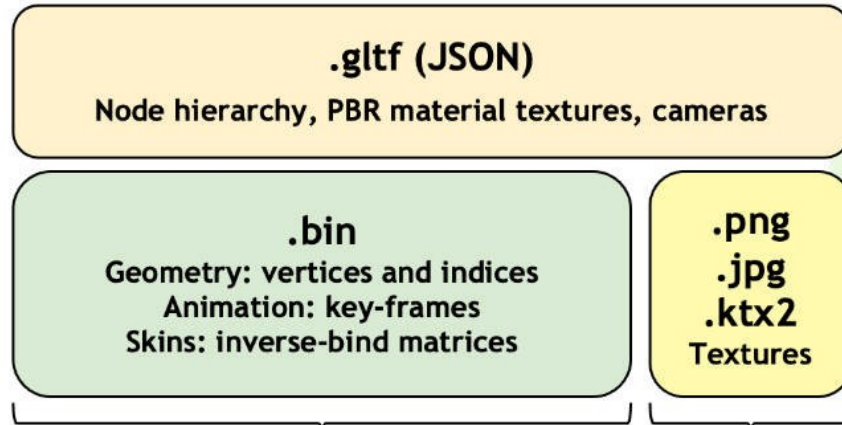


OGC (Community) Standards

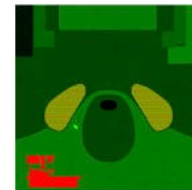
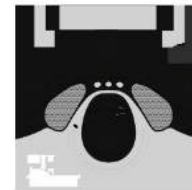
- **CityGML**
- **Indexed 3d Scene Layer (I3S)**
 - ESRI
 - OGC Community Standard
- **3D Tiles**
 - Cesium
 - OGC Community Standard



Scenenformat glTF 2.0



Geometry



Texture based PBR materials

PBR stands for
“Physically-Based Rendering”

Mandatory Metallic-Roughness Materials
Base Color (Albedo) | Metalness | Roughness
Emission | Normal Map | Baked Ambient Occlusion

Optional Specular-Glossiness Materials
Diffuse | Specular | Glossiness

➤ Khronos group (OpenGL, etc.)



 <https://www.blender.org/>



Godot vs. Blender

› Blender

- › Scene creation, Sculpting
- › High quality rendering
- › Animations
- › Endprodukt: Bild oder Animationsfilm

› Godot

- › Programmable → interactive
- › VR + AR Applications
- › Runtime for multiple platforms
(Desktop/Mobile/Web)
- › Endprodukt: Interaktive Anwendung



- › **Anzeige von 3D Daten (Meshes, Point Clouds)**
- › **Verarbeitung von 3D Daten**
- › **Import + Export von Szenen-Formaten**



Aktivitäten

- › **ESRI**
 - › ArcGIS Maps SDK for Unity
 - › ArcGIS Maps SDK for Unreal Engine

- › **Cesium GS**
 - › Cesium for Unreal

- › **OGC**
 - › Revision of I3S Community Standard
 - › Rfc CityJSON (CityGML 2.0)
 - › Rfc CityGML 3.0
 - › Interoperable Simulation and Gaming Sprint



Geodaten in Godot

› DEM.Net Elevation API

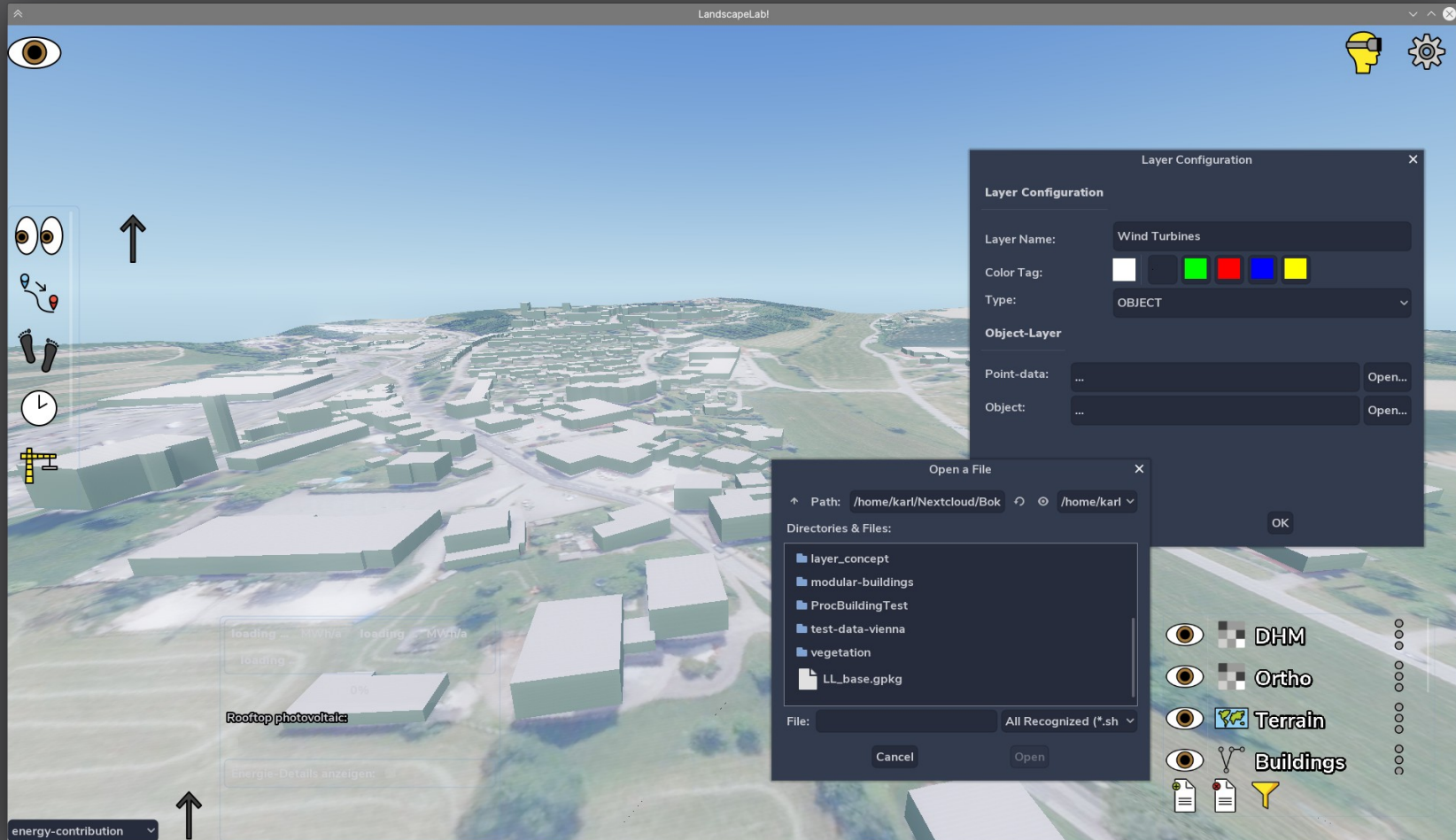
- › Webapplikation + Standalone
- › Terrain + OSM als Szenen-Export
- › <https://elevationapi.com/>

› HeightMap Terrain Plugin

- › Optimierte Meshes aus Terrain-Daten
- › Shader für Landschaftsdarstellung (Gras, Fels, etc.)
- › `gdal_translate -of ENVI -ot UInt16 srtm.tif srtm.raw`
- › https://github.com/Zylann/godot_heightmap_plugin



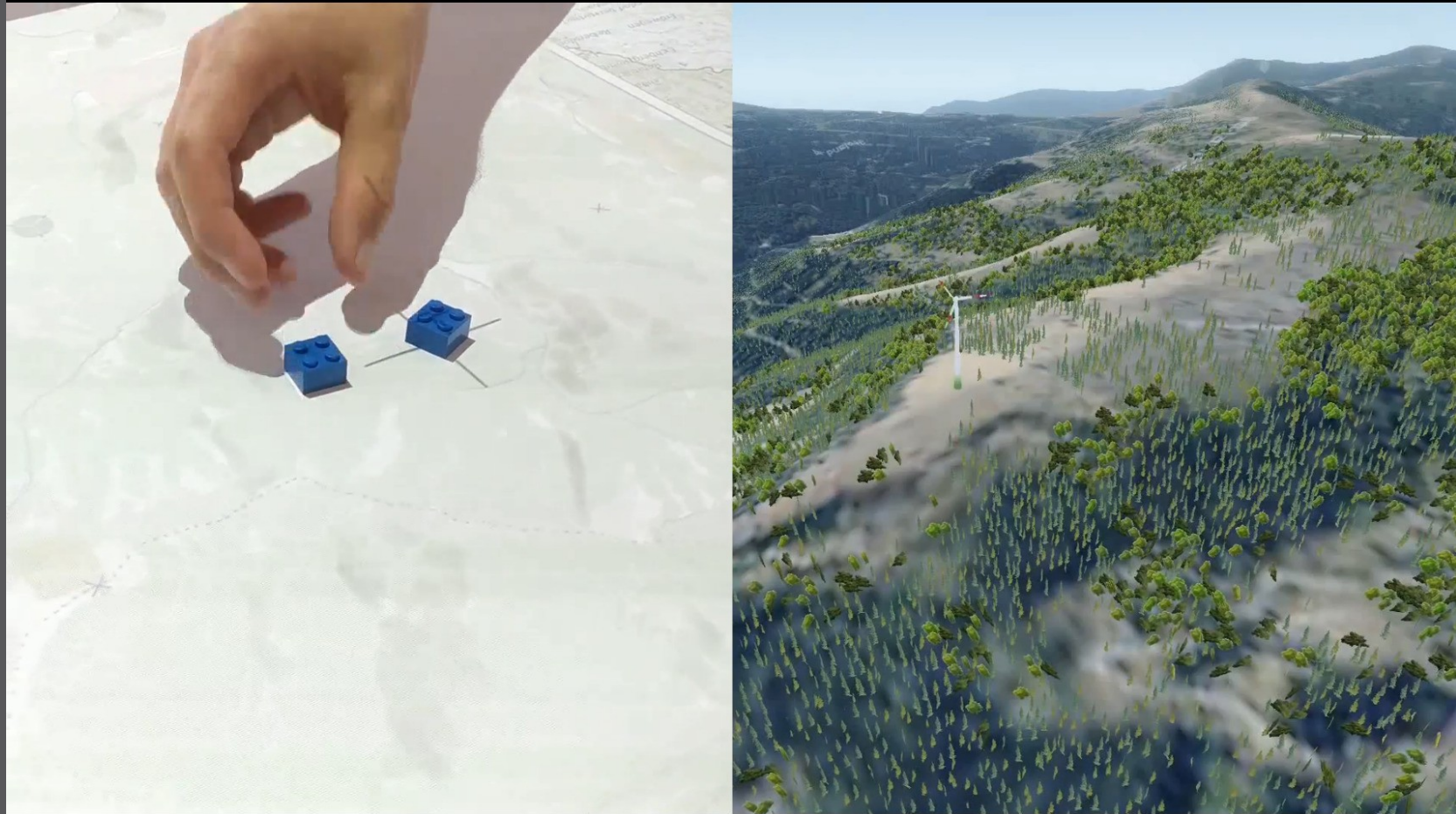
Godot plugins: Geodot / LandscapeLab



<https://github.com/boku-ilen/geodot-plugin>



Godot plugins: Geodot / LandscapeLab



<https://landscapelab.boku.ac.at/>



› Godot

- › Weitere Formate:

 - › FlatGeobuf, (COG)Geotiff, GPKG, PostGIS

- › 3D Tile Support

- › CAD / BIM Formate

› CityGML Converter

› OSM data preparation pipeline

› Prozedurale Stadtmodelle

› Austausch von Modellen/Texturen (Vegetation, Verkehr, etc.)



Anwendungsgebiete

- › **Landschaftsplanung**
- › **Stadtplanung**
- › **Verkehrsplanung**
- › **Indoor-/Outdoor-Navigation mit AR**
- › **Historische Daten**
- › **GIS mit User-Interaktion via VR**
- › **Messen, Schatten-, Sichtbarkeitsanalysen (AR, VR)**
- › **GPU-unterstützte GIS-Berechnungen**



Danke!



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