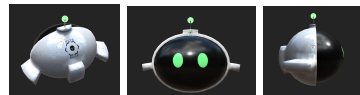# Relocation Unit Terraforming H(umanoid)bot - R.U.T.H.

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How To	When the exe is started the demo loads, after a few seconds the demo starts with an introduction text (10 seconds) and then switches to the rendering demo. The lights, geometry and the camera are loaded from a gltf-file (json + bin). The textures are assigned in the C++ framework. For the camera, the animation is loaded from the gltf-file and can handle different types of interpolations. There are three different types of lights (directional, point and spot). Volumetric lighting is only implemented for point and spot lights, which can be seen throughout the demo. Particles are triggered at every flower, varying in colour and density (between 500 and 6000) every few seconds. In the cave (end of the scene), particles reach 100k. Additionally, there are omnidirectional shadow maps (also shadow mapping for spot and directional light), bloom, PBR, IBL and a skybox. Also, there is music and an orthographic camera for the introduction and credits. The window can be closed with the esc-button. The music can be muted with the m-button.	Tested on: - Nvidia RTX 3090 - Nvidia RTX 3090 TI
Story	Humankind is looking for additional planets they can inhabit and explore. R.U.T.H. is a humanoid robotic exploring unit equipped with high end terraforming supplies and advanced AI. R.U.T.H. 2022 is sent to a small planet located in the orbit of Kepler-452 1402 lightyears away from earth to investigate if terraforming would be possible.	
Scene	As R.U.T.H arrives on the planet's surface, she sees plants and vegetation, but all dead and covered in darkness. She continues to explore her surroundings. On her journey she discovers a cave and enters. Inside, she comes upon three living, blooming flowers. With her scanner she confirms her suspicion and takes off to report her findings to her mission supervisors on earth.	

Effects	Complex Effects	
	Volumetric Lighting We want to use this effect in a sense depicted Image 1: Light coming inside (in our case from outside into the ruins where R.U.T.H finds the one living plant) Also used as "fog" outside with point lights (around flowers). Image source: https://github.com/SlightlyMad/VolumetricLights	Sources: - Tuwel PDF Revision Course Volumetric Lighting (+further Sources provided in thisPDF)
	GPU particle systems with at least 100.000 (a hundred thousand) particles	Sources: - Tuwel PDF Revision Course GPU Particle Systems (+further sources provided in this PDF) - https://developer.nvidia.com/gpugems/gpugems3/part-v-physics-simulation/chapter-30-real-time-simulation-and-rendering-3d-fluids
	Additional Effects	
	Shadow Mapping	Sources: - Tuwel PDF CGUE Shadow Mapping SS19 - Gersthofer
	PBR+IBL	Sources: - https://learnopengl.com/PBR/Theory

Technical Basis	Programming Language	C++
	Graphics API	OpenGL
	Framework	Refactored ECG/CG Framework (WS2019)
	Libraries	Irrklang (Sound) (Source: https://www.ambiera.com/irrklang/downloads.html) tiny_gltf (Model Loading) (Source: https://github.com/syoyo/tinygltf, https://registry.khronos.org/glTF/specs/2.0/glTF-2.0.html#buffers-and-buffer-views)