Contribution ID: **111**   Type: **Oral Presentations**

A relativistic simulator in python

Thursday 10 July 2025 18:25 (15 minutes)

We present a 3D simulator developed using the Ursina Engine, inspired by sandbox-style games like Minecraft. The simulator incorporates core principles of special relativity—such as time dilation, length contraction, and the relativistic Doppler effect. It is designed as PoV game, in which
both the player and the surrounding objects can move; this allows phenomena as the Terrell rotation [1], [2] to be explained in an intuitive manner.

The main elements of theory which are illustrated in our simulator are presented in the documentation that accompanies code.

Our simulator can serve as an educational tool for university or high school students. The software is modular and designed for extensibility, allowing future integration of general relativistic effects, as well as elements from related fields like particle physics.

[1] Terrell, J. Invisibility of the Lorentz contraction. Phys. Rev. 116, 1041–1045 (1959).

[2] R. Penrose, The apparent shape of a relativistically moving sphere. Math. Proc. Camb. Philos. Soc. 55, 137–139 (1959).

Primary authors: Prof. BOCA, Madalina (University of Bucharest); BOBOACA, Maria Alexandra (University of Bucharest)

Presenter: BOBOACA, Maria Alexandra (University of Bucharest)

Session Classification: Physics Education, History and Philosophy of Physics

Track Classification: S09 –Physics Education, History and Philosophy of Physics