IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
Lift Off - Secondary Space Education (2)

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ISS-BORNE EARTH OBSERVATION SENSORS IN AUGMENTED REALITY APPLICATIONS FOR SECONDARY EDUCATION

Abstract

The app "Columbus Eye" is an Augmented Reality (AR) app using Earth Observation (EO) from the ISS and other satellites in a total of 11 different topics of various STEM school subjects, from the physics of gravitation in the "Earth-Moon System" to the biology of hyperspectral "Algal Bloom" distinction in the respectively named parts. Potentials and challenges of bringing EO through AR into school lessons in a curriculum-oriented and competence-fostering way were analyzed and improved upon. This contribution will talk about lessons learned and the latest app parts implementing these considerations.

The app is developed in Unity using the Vuforia extension. Vuforia provides image recognition while the superimposed digital materials, like videos, 3D animations, or game elements in AR, are implemented in Unity with C custom scripts. The images to be recognized are part of worksheets including tasks built on current education principles, like the sequential use of operators, inquiry-based active and collaborative learning in a moderate-constructivist approach, and other methods to further media and scientific literacy. The worksheet tasks and materials are built around topics from the German curriculum and how to use satellite imagery to analyze and solve a problem. Teacher materials with a lesson plan, sample solutions and background information are provided. The app parts are designed without the use of streaming to be used by students independently from socioeconomic status or the quality of the infrastructure of the school.

The latest app parts are:

- "Satellite Systems", in which a 2D view of Earth is turned into a 3D Earth with day/night cycle and a multitude of EO satellites, including the ISS, in its orbit. An equirectangular map of Earth their ground tracks in the UI. The orbiting satellites display information about them and their imagery on touch. Physics and geography lessons can benefit from this app.

- "Image Processing" utilizes DESIS data to convey educational content about image processing. The application deals with the fundamental principles of digital color display and manipulation and compression algorithms. It is designed for computer science classes in the last 2 years of high school.

- "Mining Data" utilizes a model of the Hambach lignite mine in Germany, derived from GEDI and Sentinel-2 data. The worksheet itself is about calculating areas and volumes in math lessons, in this case in and around the mine, but also tasks the students with discussing their findings in the context of environmental issues and climate sciences.