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Open AR-Sandbox: a Haptic Interface for Geoscience Education and Outreach

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Augmented Reality Sandboxes are a valuable tool for science outreach and teaching due to their intuitive and haptic interaction-enhancing operation. Most of the common AR-Sandboxes are limited to the visualization of topography with contour lines and colours, as well as water simulations on the digital terrain surface. However, many geologists will intuitively want to use this system to visualize geology and literally “dig deeper”, to see how geological units change below the surface. In fact, if we consider the AR-Sandbox in its bare essential, as a 2.5-D haptic dynamic interface to a 3-D or 4-D system, then many more potential applications come to mind: from geological education and outreach, over the representation of geophysical fields, to dynamic simulations.

In this contribution, we present an open-source implementation of an AR-Sandbox system with an interface in Python, which enables simple access to this tool. This implementation allows for creative and novel applications in geosciences education and outreach in general. With a link to a 3-D geomodelling system, we show how we can display geologic subsurface information such as the outcropping lithology, creating an interactive geological map for structural geology classes. The relations of subsurface structures, topography and outcrop, can be explored in a playful and comprehensible way. Additional examples are geoelectric fields and the propagation of seismic waves, as well as simulations of landslides at the surface. We further extended the functionality with an implementation of ArUco marker detection to enable interactive cross-section generation, among other examples. Many other implementations can be envisaged for the use of this system, and we look forward to creative contributions to geoscience education.