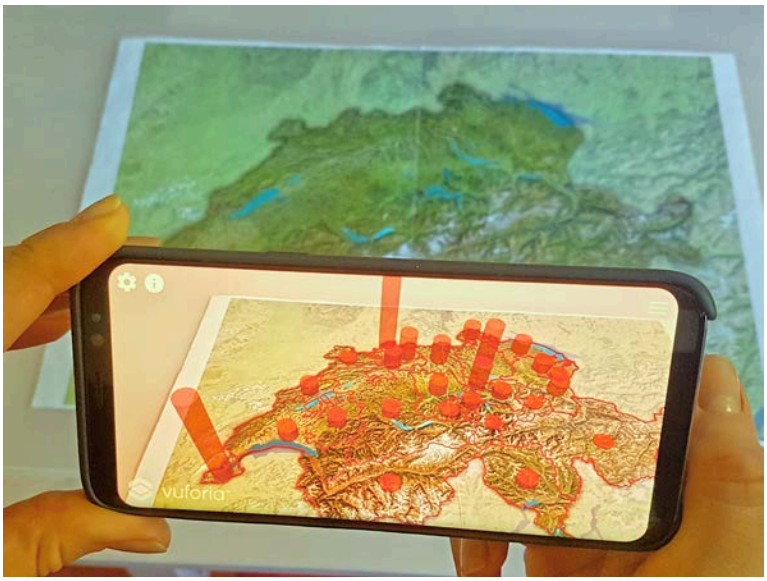
Fachhochschule Nordwestschweiz
Hochschule für Architektur, Bau und Geomatik

MASTER OF SCIENCE IN ENGINEERING

Exploiting Large Scale GIS Vector Data in Unity-Based AR Applications

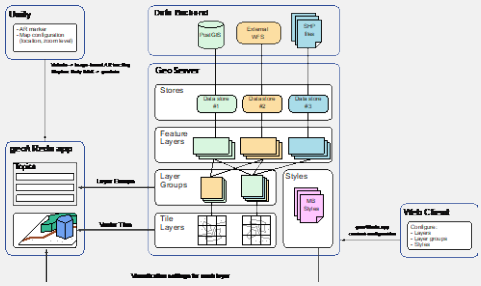
This thesis investigates the opportunities of using geospatial (GIS) data in Unity-based augmented reality (AR) applications. The basis for the AR app is the existing "swissARena" application created for Swiss Museum of Transport. Its thematic content has to be extended in order to use the application for education. A possible source of new content is 2D GIS data. A geoARedu framework that allows to integrate GIS data into AR application has been developed. The geodata is downloaded on demand from the GeoServer backend and is transformed on the fly into 3D virtual objects. The content can be modified using the GeoServer web admin client or the dedicated geoARedu web client without rebuilding the application in Unity.



geoARedu app: small-scale orthophoto overlaid with virtual content

Application Architecture

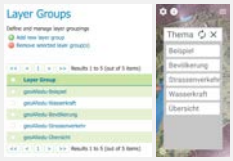
The geoARedu application is implemented in Unity. The AR plugin Vuforia allows to determine the camera position and orientation relative to an image marker: small or large-scale orthophoto. A modified version of the Mapbox Unity SDK reads geodata from the GeoServer and transforms 2D vector layers into 3D virtual objects. The virtual content (amount of objects and level of detail) adapts to the scale of the orthophoto. The content is configured using the GeoServer web client or the dedicated geoARedu client.



Content Configuration

Topics

The Layer Groups in the GeoServer web client and the corresponding Topic list in the geoARedu app.



Topic content

The "geoARedu-Übersicht" Layer Group configuration in the GeoServer web client.

Visualization settings

In the geoARedu web client and as a raw MBStyle file.

Topic content in geoARedu app

Cantonal (red) and municipal (yellow) boundaries, lakes and rivers, mountains and mountain passes.

Data: swisstopo

Examples

Population density

Population density per canton (small-scale marker)

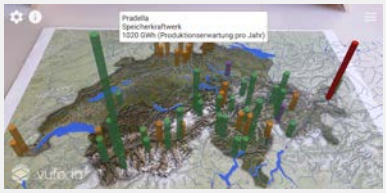
Population density per municipality (large-scale marker)

Data: swisstopo, Bundesamt für Statistik

Hydropower

Switzerland's most important hydropower plants. Pillar's height corresponds to the annual electricity production.

Yellow: run-of-the-river power plant (Laufwasserkraftwerk)
Green: conventional dam (Speicherkraftwerk)
Purple: pumped-storage power plant (Pumpspeicherkraftwerk)



Data: swisstopo, Bundesamt für Energie

Author: Maria Schönholzer
Examiner: Prof. Dr. Pia Bereuter
Expert: Prof. Dr. Stephan Nebiker

Master Research Unit Geoinformationstechnologie

FHNW GEOMATIK