Hochschule Karlsruhe
Technik und Wirtschaft
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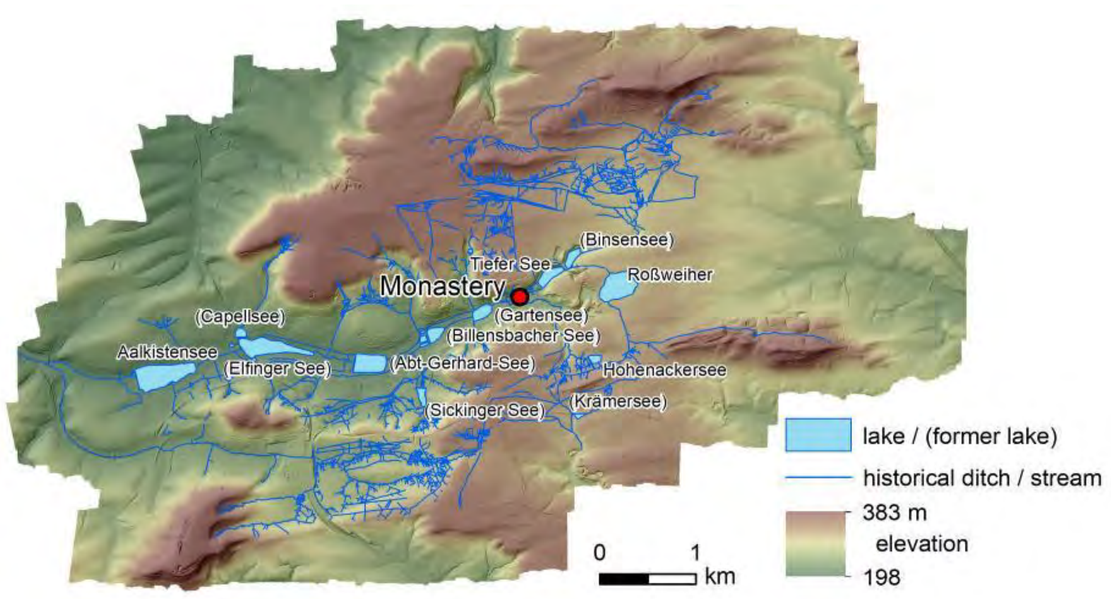
Näher dran.

Potential of different remote sensing techniques for detecting ditches of the Maulbronn Monastery water management system

Maulbronn Monastery is one of the best preserved Cisterian monastery complexes north of the Alps. It was built in the 12th century and includes a complex water management system which was used for various purposes, like fish farming and water management. It included many surrounding lakes which were connected with each other and the monastery buildings by a complex ditch network. Parts of this ditch network are still present in the surrounding terrain of the monastery. The whole complex earned therefore an architectural and landscape heritage which is protected by the UNESCO as a World heritage since 1993.

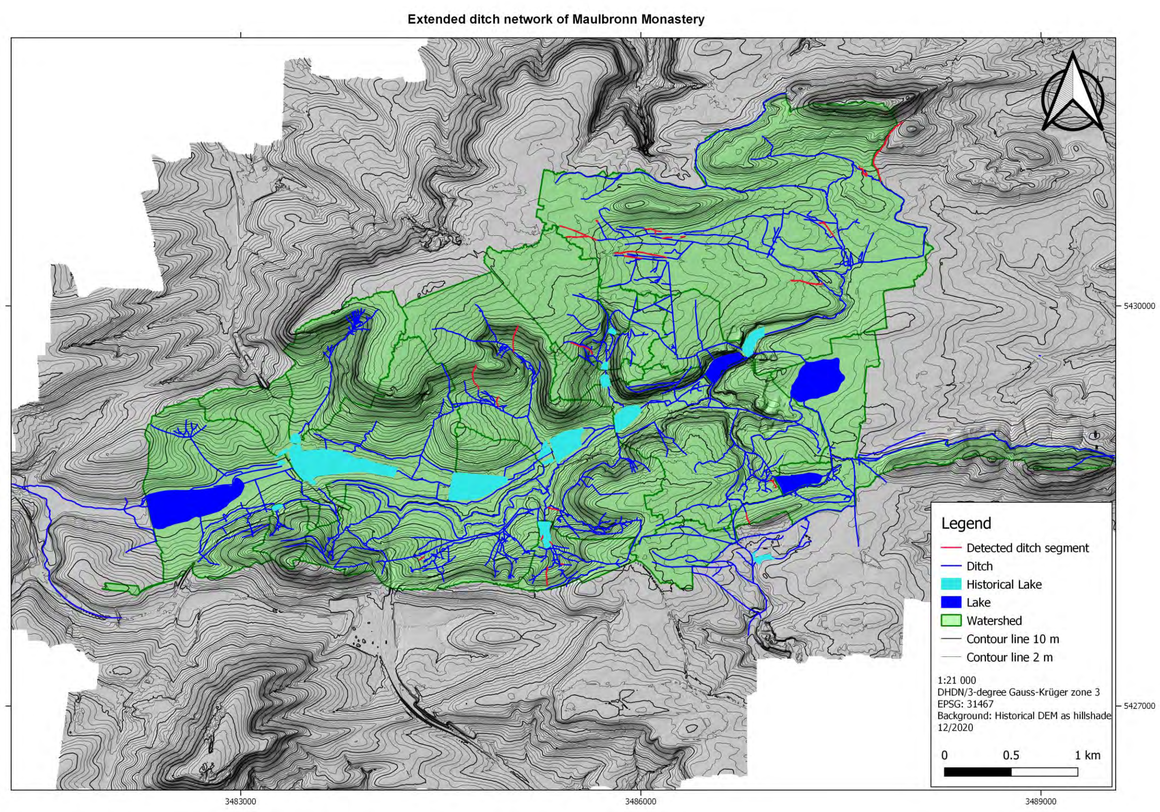


DEM representation of the Maulbronn region with historical ditches and lakes (Saler et al. 2016).

The uniqueness of the system lies in the fact that it was designed and built in 12th century and is an astounding testimony to the hydraulic engineering at the time. To fully understand how this system worked in detail and to preserve and protect the remains in the surrounding area, the courses of the ditches have to be mapped. Many of these have already deteriorated and the landscape has changes since then. Until today not all remaining ditches are detected and mapped, particularly in the forested areas.

This study assesses the potential of two different remote sensing approaches for detecting ditches, especially in forested areas. One, spectral, uses different Vegetation Indices (VIs) and principal component analysis (PCA) on acquired aerial imagery. The other makes use of geomorphological properties of the digital elevation model (DEM) with a 25 cm resolution obtained by aerial light detection and ranging (LiDAR) survey. Both approaches are applied on a representative testing area.

As the geomorphological approach yields more promising results, it is applied to the whole study area, which encompasses contributing watersheds to the Maulbronn water management system. This approach uses the relative elevation attribute (REA) to extract potential ditch lines and filters out those which do not fit the typical properties of already known ditches. The ditch network could be extended by nearly 3000 meter of new ditches.



Map of the extended ditch network representing the new detected ditch segments.

The study concludes the successful detection of ditches in the forested areas working with a geomorphological approach. The potential of a spectral approach for detecting ditches in forested areas is considered as low.

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