COULD A SPATIAL DATABASE OF HISTORICAL PHOTOGRAPHS BE USED FOR RURAL TOURISM PROMOTION?

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Abstract
Historical photographs contain valuable information about the past state of a municipality and its surroundings. Over time, old structures and land patterns in the landscape become untraceable or indistinguishable, and determining the exact location from which a historic photograph was taken becomes complicated or impossible. People who are unfamiliar with the history of the location are unable to pinpoint where the photographs were taken or what it depicts. This reduces the informative value of historical photographs and prevents their wider use. To conserve photographs, along with their localisation and direction, a spatial database was created based on historical property records maps, digital elevation model, and panoramas from Seznam.cz. The study was carried out in the Luková cadastral area, located in the Czech Republic. Overall, 395 photographs were acquired, of which 225 were historical photographs ranging from 1845 to the 1980s. The remaining photographs were taken in 2015. All acquired photographs primarily capture rural buildings and sacred objects. From photographs, the historical rural character of the municipality could be determined, as well as objects of interest for rural tourism. In a comparison of photographs of buildings from the 1980s and 2015, loss of local architecture and traditional gardens can be seen.

Key words: spatial database, countryside, Sudetenland, rural identity, photograph

Introduction

Historical photographs are highly valuable as they contain a high density of valuable information about the past (Maiwald et al., 2017; Bruschke et al., 2018a; Bayr, 2021) and capture details that cannot be found on historical topographic maps (Skokanová et al., 2021). From the 1930s onward, aerial photography became more common, but ground photographs are still an important source of information, as they capture the landscape and objects from the human perspective (Bayr, 2021).

The first photographs began to appear in the first half of the 19th century. At the beginning, this technology was not as widely available as it is today, primarily due to cost. This led to scarcity of the oldest photographs, making them valuable for various fields of research. Historical photographs are usable, for example, for architectural research (Bruschke et al., 2017; Bruschke et al., 2018a; Palupi, 2021), for evaluation of land use and land cover changes (Lacina and Halas, 2015; Skokanová et al., 2021; Bayr, 2021), for evaluation of landscape aesthetics or landscape heterogeneity (Ferreira and Sánchéz-Martín, 2022), for examining tourist perceptions of destinations (O'Donoghue et al., 2020), for landscape preference studies (O'Donoghue et al., 2020) or for studying tourist behaviours (Zhong et al., 2020).

Landscape aesthetics and landscape heterogeneity influence the recreational potential of the area (Ferreira and Sánchéz-Martín, 2022) and are also closely related to ecosystem stability and the provision of various ecosystem services. Diverse cultural landscapes with high aesthetic value are preferred for rural tourism due to their cultural aspects (O'Donoghue et al., 2020; Ferreira and Sánchéz-Martín, 2022; Zheng et al., 2022). O'Donoghue et al. (2020) also highlight the importance of animals in the landscape as an element of interest for rural tourism. On the other hand, intensively utilised landscapes lower tourist interest (Ferreira and Sánchéz-Martín, 2022). Promotion of traditional and sustainable agricultural practices could become an opportunity to boost local rural tourism and enhance the aesthetic value of the landscape, together with a boost to landscape heterogeneity (Ferreira and Sánchéz-Martín, 2022).

The landscape, together with urban areas, is under constant development, making old photographs hard to localise in the space. This lowers their informative value and usability, as some landscape features or objects no longer exist. Spatially-oriented photographs enable comparison with present or past topographical maps or photographs (Skokanová et al., 2021) and significantly enhance their legibility. Retaking historical photographs in the same location enables researchers to perform detailed analyses of the landscape, cityscape, or building changes across different time periods (Lacina and Halas, 2015; Bruschke et al., 2018b). If the repeat photography is done precisely, it can be effectively used for communication with a broad audience (Bayr, 2021), graphically illustrating changes

in the landscape or new proposals still in the planning stages. Historical photographs can also be used for conservation or restoration of typical local character, as they contain information about the placement of old features, such as roads with alleys, hedgerows, or other landscape features typical for the area. Also, they could contain information about typical vernacular or rural building characteristics (Palupi, 2021).
The aim of this article is to promote the creation of spatial databases with historical photographs that can be easily accessed.

Material and methods
The Luková cadastral area was selected (12.78 km^2) as a study site. The Luková cadastral area is part of the Luková municipality located in the Lanškroun District in the Pardubice Region, Czech Republic (Fig. 1). Luková is an old municipality first mentioned in 1304 (Celý, 2017), and its name, Luková, indicates its Czech origin. Despite that, the municipality was mainly inhabited by ethnic Germans (89%) in 1930, before their expulsion from 1945–48. The municipality of Luková and its surrounding land were part of the German-language region known as *Schönhengstgau*.
The urban area of the Luková municipality was characterised by farms with enclosed yards. In 1622, the *meierhof* of the Lichtenstein family was built here, with associated fields in the southeastern part of the Luková cadastral area and a large Lukovský pond with a water area spanning 100–120 hectares. The Lukovský pond was probably drained in the first half of the nineteenth century before the railroad was built. Today, as land in the municipality is mainly used by a large agricultural cooperative, the primarily agricultural character of the urban area is disappearing. The buildings are slowly being rebuilt into family houses, though some buildings associated with agricultural use are being demolished.

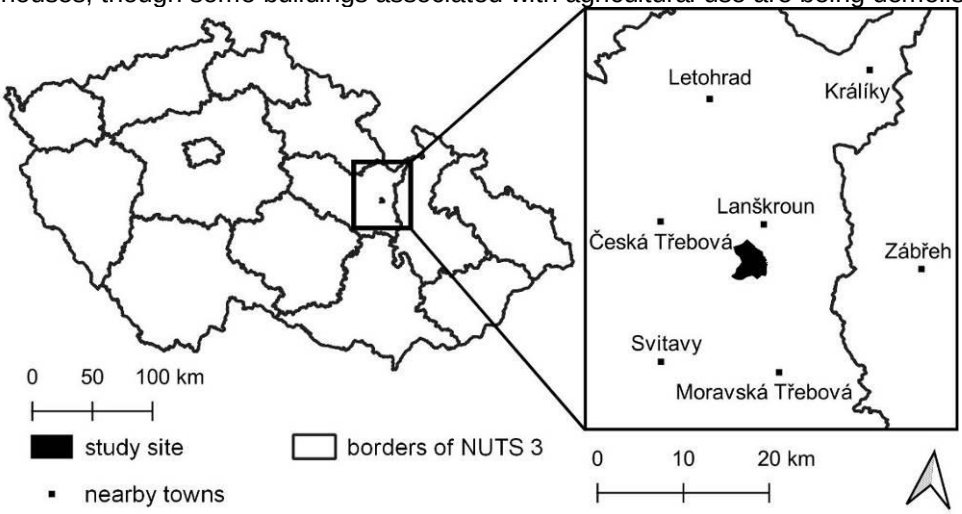

Fig. 1: Location of the Luková cadastral area in the Czech Republic.

A spatial database of historical photographs was created from 395 images, of which 225 date from 1845–1984. The remaining photographs were taken in 2015. Most of the photographs are from 1984 and were captured by Jan Němeček, former Luková municipal historian. Those photographs capture every building existing at the time. The present historian and photographer, Ing. Stanislav Vimr, recaptured all those buildings after 30 years from the most similar spot possible. The rest of the photographs were from publicly available sources, the Luková municipal website and the collection of Ing. Stanislav Vimr.
To find the location where the photographs were originally taken, a digital elevation model (DEM), historical property record maps in vector format (Revised Cadastre, Cadastre of Lands and Real Estate Registry), and a Seznam.cz panorama view were used. The method of location and orientation determination using DEM and historical property record maps (Cadastre of Lands) is shown in Figure 2. In this case, three landmarks were used: the church of Saint Margaret, the wooded hillside of the Červený hill, and a now non-existent wooden building with house number 26.

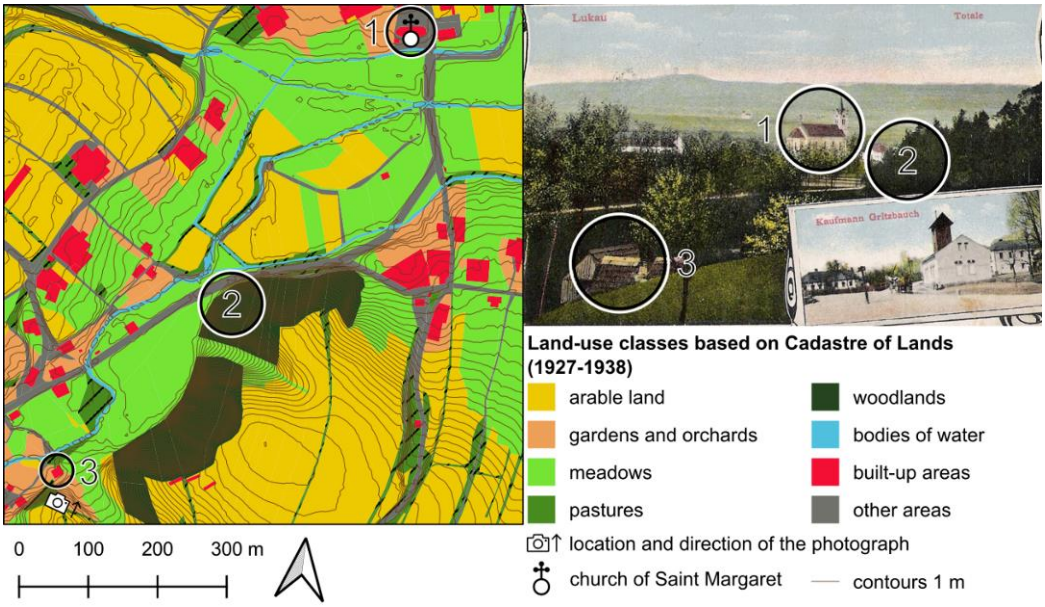

Fig. 2: The process of determining the location and orientation of a historical photograph (captured before the year 1940) using DEM and Cadastre of Lands map.

Results and discussion

From the available photographs, a spatial database was created and both location and direction were determined. The process proved to be robust and simple despite the lack of detailed knowledge of the area, as all the available photographs were localised.

Spatial databases of historical photographs can be used for a variety of purposes, but they have added value in terms of tourism. They capture historical features of the landscape that can be restored or conserved, preserving landscape character and promoting tourist interest on a local scale. Also, those photographs, together with the re-photographing method, could be used to create informative tables in key locations in the municipality or in the surrounding land, such as the water mill near the *meierhof*, the dam of the former Lukovský pond or the church of Saint Margaret, which was long ago surrounded on three sides by the Lukovský pond. Information from historical photographs could also be used as a source for spatial planning activities at the municipal, not just for tourism.

Residents of the municipality could use this spatial database to compare the current state of their property with its past state or use those photographs for building reconstructions if they wish to preserve the historical character of their property while also preserving the rural identity of the place. This primarily applies to areas where the building's character is not regulated.

Historical photographs could be analysed using various photogrammetric methods. For example, by using structure-from-motion (SfM) evaluation, a point cloud could be created (Bruschke et al., 2017), which could be further used for building reconstruction (Maiwald et al., 2017). The SfM evaluation could also be used to automatically determine points where the photographs were taken (Bruschke et al., 2018b). Both uses described above require a set of several photographs that capture the same object from different angles and sides (Bruschke et al., 2018b), preferably from the same time period. From all the photographs, not a single object in the whole Luková municipality does not have sets of photos capturing all its directions and sides. Broader use of this method is limited and practical only for highly popular structures.

Next, we highlight digital monoplotting, which enables photographs to be transformed into coordinate systems, enabling the digitalisation of information captured by the historical photographs. Bayr (2021) used digital monoplotting to monitor forest expansion based on historical and current photographs. This could be used in later research, for example, to locate alley trees, old roads, or for determining the extent of fields.

The photographs were not deeply analysed using a uniform approach, but from brief inspection we can see that some reconstructions were inconsiderate, overlapping or destroying vernacular symbols typical for this area. Another negative development is the disappearance of fruit trees at the expense of ornamental non-native species. This could be clearly seen by comparing photographs from 1984 and 2015. This has a significant impact on the perception of urban areas or their aesthetic value, as traditional gardens in the past were composed mainly of native species, incorporating both productive and ornamental aspects.

Usage of spatial databases of photographs is common and there are many publicly available, such as Google Maps and Flickr (Bruschke et al. 2017), but the most favourable way is to place spatial databases on municipal geoportals or map viewers. Following completion of this research, this database will be imported into the geoportal of the Luková municipality.

Conclusion

Placing historical photographs in a spatial database greatly increases their legibility and usability. The database can be continuously updated and thus help with the conservation of photographs. It is important to emphasise the importance of historic preservation, as images are mainly in the possession of elderly people or in municipal archives, which are not always easily and freely accessible to the public. Placing a spatial database in a public space enables everyone to interact with it for research or other purposes.

Spatial databases of historical photographs can also be used for rural tourism promotion as they contain information about the past that could be conserved, restored, or highlighted, thus increasing the attractiveness of the locality. The re-photographing method can be used for the creation of informative tables located in the key locations of the municipality.

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Souhrn
Historické fotografie zachycují a uchovávají informace o minulosti obce a jejího okolí. Postupem času se stávají staré objekty a krajinné tvary v krajině nedohledatelné nebo nerozeznatelné a určení přesné pozice, odkud byla historická fotografie pořízena, se stává komplikované až nemožné. Osoby, které neznají historii obce, nedokážou určit odkud byla fotografie pořízena, eventuelně co zachycuje. To snižuje informativní hodnotu historických fotografií a znemožňuje jejich širší využití. Proto byla v rámci tohoto výzkumu vytvořena prostorová databáze historických fotografií, která uchovává místo a směr pořízení fotografií. Místo a směr pořízení bylo určováno na základě historických map majetkoprávních evidencí, digitálního modelu terénu a panoramat od Seznam.cz. Prostorová databáze byla vytvořena pro katastrální území Luková, které se nachází v České republice. Obec byla původně součástí německého jazykového regionu „Schönhengstgau," s převažujícím podílem německých obyvatel.
Historické fotografie jsou primárně v osobním vlastnictví lidí, v obecních archivech nebo je vlastní obecní kronikáři, proto je důležité historické fotografie schraňovat a uchovávat tak, aby nedošlo k jejich ztrátě nebo zničení. Navíc nejsou jednoduše a volně dostupné pro veřejnost. Obzvlášť komplikovaná je situace v obcích, které spadaly do Sudet a měli primárně německé obyvatelstvo. Celkově bylo získáno 395 fotografií, z nichž 225 je historických fotografií pořízených mezi lety 1845 a 80. lety 20. století. Zbylé fotografie byly pořízeny v roce 2015 Ing. Stanislavem Vimrem. Fotografie primárně zachycují vesnické stavby a sakrální objekty, pouze pár jich je zaměřeno na okolní krajinu obce Luková.
Z historických fotografií lze určit historický vesnický charakter obce a také objekty potenciálně zajímavé z hlediska venkovské turistiky. Prostorová databáze může být také využita pro podporu venkovského turismu, jelikož historické fotografie obsahují informace o prvcích v krajině nebo objektech, které mohou být zachovány nebo obnoveny, což ve finále může zvýšit atraktivitu lokality. Historické fotografie lze využít i k informačním a propagačním účelům, např. v kombinaci s využitím metody pořizování fotografií ze stejného místa. Při porovnání historických fotografií budov v 80. letech 20. století a v roce 2015 je patrný úbytek znaků místní architektury na venkovských stavbách a také úbytek zahrad s ovocnými stromy.

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