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*Editorial*

# GIScience and Historical Visual Sources: A Promising Look at Past Scenarios and Sceneries

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The discipline of historical geography evolved rapidly in the 20th century [1,2] and has been applied in many studies worldwide. The main difference between historical geography and historical studies is that the former investigates past scenarios from a geographical point of view [3]. For this task, it utilizes spatial approaches to interrogate textual and written sources as well as various cartographic material. The prominent themes of historical geography include landscape and cityscape reconstructions, rural and urban development, past regional demographic examinations, and historical trends associated with geographic locations. Over the years, the discipline has seen great popularity, but lately, it seems that its growth has somewhat slowed down in parallel to the developing discipline of environmental history [4,5]. Generally speaking, one can claim that historical geography is seeking new conceptualizations and theories in order to rise again [6,7].

The introduction of GIS (geographic information systems) and GIScience (geographical information science) have revolutionized the way scientists analyze spatial data. To date, GIS serves as a framework for a wide range of spatial applications [8]. Using GIS, one can perform cartographic analyses [9–11]; create deep maps [12]; leverage geographic information using geodesign approaches [13]; inspect narratives using map stories [14]; and conduct place-based studies using platial GIS [15]. GIS is also used to create new forms of virtual knowledge [16]; perform 2D or 3D landscapes reconstructions [17–22]; and resolve complex scenarios of past phenomena [23–25]. The GIScience sub-discipline defining historical analyses using GIS is referred to as HGIS (historical GIS) [26]. Similar to other GIScience sub-disciplines, HGIS is evolving and being integrated significantly with historical geography [27,28].

The study of historical scenarios benefits from written accounts but also from visual sources such as drawings, maps, early photographs, and air-photos. Until GIScience was introduced, much of the interrogation of these sources was qualitative in nature. Moreover, occasionally, it overlooked vast amounts of information and geographic features one might extract from these sources. GIScience can bridge this gap and offers a wide range of approaches to interpret and analyze historical visual sources that are of relevance to historical geography as well as other social sciences and humanities. In my opinion, the potential of using GIScience in historical geography studies is enormous and can be the "game changer" that historical geography is desperately looking for [29].

The aim of this Special Issue entitled "Geographic Information Science (GIScience) and Geospatial Approaches for the Analysis of Historical Visual Sources and Cartographic Material" is to address the exploitation of historical visual sources for resolving past scenarios and sceneries. With the theoretical and methodological contributions made in this Special Issue, it is possible to shed some light on the potential benefits of using GIScience in conjunction with such visual sources, leading to promising perspectives of the past.

The Special Issue includes eight published papers. The publications are equally divided into methodological and theoretical contributions. The first group of publications

contains tools, techniques, and approaches for a quantitative interpretation of various visual sources as well as deriving spatial insights of their creators. This corpus includes a visual graph-based framework for matching geographical areas through time [30]; assessing the impact of the cartographer's position and topographic accessibility on the accuracy of the extracted historical land use information [31]; measurement analysis of urban spatial layouts using the square grid method [32]; and coupling historical maps and LiDAR data to identify man-made landforms [33]. The second group includes analyses and examinations of past scenarios: GIScience and historical cartography for evaluating land use changes and resulting effects on carbon balance [34]; geospatial analysis of the non-surveyed (estimated) coastlines in Inoh's Map, 1821 [35]; agricultural land-use changes in the Judean region from the end of the Ottoman Empire to the end of the British Mandate [36]; and the historical Vltava River Valley–various historical sources within web mapping environment [37].

These studies emphasize the enormous amount of information one can extract from old visual sources using GIScience. Seemingly, such studies are being conducted for ages, but the road is still long, and there is much more to be discovered as the interrogation of the available visual sources is far from being complete. In a broader context, GIScience has a crucial part in fostering the historical geography discipline as well as developing other digital humanities domains by facilitating research, education, public outreach, and data dissemination. I hope that this SI and the included papers have contributed a little to achieve that goal.

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## References

1. Darby, H.C. Historical Geography. In *Approaches to History*; Herbert, P.R., Ed.; Toronto University Press: Toronto, ON, Canada, 1962; pp. 127–156.
2. Sauer, C.O. Foreword to historical geography. *Ann. Assoc. Am. Geogr.* **1941**, *31*, 1–24. [CrossRef]
3. Ben-Arieh, Y. The Nature of Historical Geography from the Geographical View. In *A Land Reflected in Its Past. Studies in Historical Geography of iIsrael*; Aharonson, R., Lavsky, H., Eds.; The Hebrew University Magness Press: Jerusalem, Israel; Yad Izhak Ben-Zvi Press: Jerusalem, Israel, 2001; pp. 35–57.
4. McNeill, J.R. Observations on the nature and culture of environmental history. *Hist. Theory* **2003**, *42*, 5–43. [CrossRef]
5. Cronon, W. The trouble with wilderness: Or, getting back to the wrong nature. *Environ. Hist.* **1996**, *1*, 7–28. [CrossRef]
6. Colten, C. The Values of Practicing Historical Geography. *Hist. Geogr.* **2018**, *46*, 1–31. [CrossRef]
7. Travis, C.; Ludlow, F.; Gyuris, F. *Historical Geography, GIScience and Textual Analysis*; Springer: Cham, Switzerland, 2020.
8. Sui, D. Emerging GIS themes and the six senses of the new mind: Is GIS becoming a liberation technology? *Ann. GIS* **2015**, *21*, 149–156. [CrossRef]
9. Jenny, B.; Hurni, L. Studying cartographic heritage: Analysis and visualization of geometric distortions. *Comput. Graph.* **2011**, *35*, 402–411. [CrossRef]
10. Zohar, M. Follow the road: Historical GIS for evaluating the development of routes in the Negev region during the twentieth century. *Cartogr. Geogr. Inf. Sci.* **2019**, *46*, 532–546. [CrossRef]
11. Zohar, M. A land without people? The GIScience approach to estimating the population of Ottoman Palestine towards the end of the 19th-century. *Appl. Geogr.* **2022**, *141*, 102672. [CrossRef]
12. Bodenhamer, D.J.; Corrigan, J.; Harris, T.M. *Deep Maps and Spatial Narratives*; Indiana University: Bloomington, IN, USA, 2015.
13. Goodchild, M.F. Twenty years of progress: GIScience in 2010. *J. Spat. Inf. Sci.* **2010**, *2010*, 3–20. [CrossRef]
14. Mennis, J.; Mason, M.J.; Cao, Y. Qualitative GIS and the visualization of narrative activity space data. *Int. J. Geogr. Inf. Sci.* **2013**, *27*, 267–291. [CrossRef]
15. Quesnot, T.; Roche, S. Platial or locational data? Toward the characterization of social location sharing. In Proceedings of the 2015 48th Hawaii International Conference on System Sciences, Kauai, HI, USA, 5–8 January 2015; pp. 1973–1982.

16. Knowles, A.K. *Placing History: How Maps, Spatial Data, and GIS are Changing Historical Scholarship*; ESRI Press: Redlands, CA, USA, 2008.
17. Davie, F.M.; Frumin, M. Late 18th century Russian Navy maps and the first 3D visualization of the walled city of Beirut. *e-Perimetron* **2007**, *2*, 52–65.
18. Georgoula, O.; Stamnas, A.; Patias, P.; Georgiadis, C.; Fragkoulidou, V. Historical coastal urban landscapes digital documentation and temporal study with 2D/3D modeling functionality: The case of Thessaloniki, Greece. *J. Cult. Herit.* **2013**, *14*, 396–402. [CrossRef]
19. Nakaya, T.; Yano, K.; Isoda, Y.; Kawasumi, T.; Takase, Y.; Kirimura, T.; Tsukamoto, A.; Matsumoto, A.; Seto, T.; Iizuka, T. Virtual Kyoto Project: Digital Diorama of the Past, Present, and Future of the Historical City of Kyoto. In *Culture and Computing*; Shida, T., Ed.; Lecture Notes in Computer Science; Springer: Berlin/Heidelberg, Germany, 2010; Volume 6259, pp. 173–187.
20. Rubinowicz, P.; Czyńska, K. Study of city landscape heritage using Lidar data and 3D-city models. In Proceedings of the 36th International Symposium on Remote Sensing of Environment, Berlin, Germany, 11–15 May 2015.
21. Schaffer, G.; Levin, N. Mapping human induced landscape changes in Israel between the end of the 19th century and the beginning of the 21th century. *J. Landsc. Ecol.* **2014**, *7*, 110–145. [CrossRef]
22. Zohar, M. A city hit by an earthquake: An HGIS approach to reconstructing the damage in Tiberias (Israel) in 1837. *Int. J. Geogr. Inf. Sci.* **2017**, *31*, 81–99. [CrossRef]
23. Bender, O.; Boehmer, H.J.; Jens, D.; Schumacher, K.P. Using GIS to analyse long-term cultural landscape change in Southern Germany. *Landsc. Urban Plan.* **2005**, *70*, 111–125. [CrossRef]
24. Katz, O.; Crouvi, O. The geotechnical effects of long human habitation (2000 < years): Earthquake induced landslide hazard in the city of Zefat, northern Israel. *Eng. Geol.* **2007**, *95*, 57–78.
25. Verhagen, J.; Jeneson, C.F. A Roman Puzzle. Trying to find the Via Belgica with GIS. In *Thinking Beyond the Tool. Archaeological Computing and the Interpretive Process*; Chrysanthi, A., Flores, A.M., Papadopoulos, C., Eds.; British Archeological Reports: London, UK, 2012; pp. 123–130.
26. Gregory, I.N.; Healy, G.R. Historical GIS: Structuring, mapping and analysing geographies of the past. *Prog. Hum. Geogr.* **2007**, *31*, 638–653. [CrossRef]
27. Knowles, A.K. Historical Geographic Information Systems and Social Science History. *Soc. Sci. Hist.* **2016**, *40*, 741–750. [CrossRef]
28. Bailey, T.J.; Schick, J.B.M. Historical GIS: Enabling the collision of history and geography. *Soc. Sci. Comput. Rev.* **2009**, *27*, 291–296. [CrossRef]
29. Zohar, M. Advancing the historical geography of late Ottoman and British Mandate Palestine using GIScience. A Review. *Trans. GIS* **2020**, *24*, 1464–1481. [CrossRef]
30. Khokhlova, M.; Abadie, N.; Gouet-Brunet, V.; Chen, L. GisGCN: A Visual Graph-Based Framework to Match Geographical Areas through Time. *ISPRS Int. J. Geo-Inf.* **2022**, *11*, 97. [CrossRef]
31. Ostafin, K.; Pietrzak, M.; Kaim, D. Impact of the Cartographer's Position and Topographic Accessibility on the Accuracy of Historical Land Use Information: Case of the Second Military Survey Maps of the Habsburg Empire. *ISPRS Int. J. Geo-Inf.* **2021**, *10*, 820. [CrossRef]
32. Musiaka, Ł.; Nalej, M. Application of GIS Tools in the Measurement Analysis of Urban Spatial Layouts Using the Square Grid Method. *ISPRS Int. J. Geo-Inf.* **2021**, *10*, 558. [CrossRef]
33. Terrone, M.; Piana, P.; Paliaga, G.; D'Orazi, M.; Faccini, F. Coupling historical maps and lidar data to identify man-made landforms in urban areas. *ISPRS Int. J. Geo-Inf.* **2021**, *10*, 349. [CrossRef]
34. Manniello, C.; Cillis, G.; Statuto, D.; Di Pasquale, A.; Picuno, P. GIScience and Historical Cartography for Evaluating Land Use Changes and Resulting Effects on Carbon Balance. *ISPRS Int. J. Geo-Inf.* **2022**, *11*, 179. [CrossRef]
35. Iwai, Y.; Murayama, Y. Geospatial Analysis of the Non-Surveyed (Estimated) Coastlines in Inoh's Map, 1821. *ISPRS Int. J. Geo-Inf.* **2021**, *10*, 580. [CrossRef]
36. Schaffer, G. Agricultural Land-Use Changes in the Judean Region from the End of the Ottoman Empire to the End of the British Mandate: A Spatial Analysis. *ISPRS Int. J. Geo-Inf.* **2021**, *10*, 319. [CrossRef]
37. Krejčí, J.; Cajthaml, J. Historical Vltava River Valley–Various Historical Sources within Web Mapping Environment. *ISPRS Int. J. Geo-Inf.* **2022**, *11*, 35. [CrossRef]