Program and Abstracts

19th International Conference
Geoinformation and Cartography

Zadar and online
7-9 September 2023

www.kartografija.hr

Organizers

Sveučilište u Zadru
Universitas Studiorum
Jadertina | 1396 | 2002 |

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Under the Auspices of

International Cartographic Association

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Introduction

By organizing this conference, The Croatian Cartographic Society, the Faculty of Geodesy of the University of Zagreb, the Department of Geography of the University of Zadar and the Croatian Geographic Society – Zadar wish to contribute to the development of geoinformatics, cartography, geodesy, geography and associated fields with special emphasis on new achievements. A wide range of themes offered, and renowned invited lecturers guarantee interesting lectures and a contemporary approach.

Suggested Themes

- AI, machine learning and robotics
- Big data visualization
- Education in cartography and geoinformation science
- Climate changes and risk management
- Covid-19
- Geodiversity
- Geoheritage and cartoheritage
- Geoinformation and cartography in education
- Geospatial technologies for local and regional development
- GIS and ecology
- Location-based services and web mapping
- Map projections
- Maps for autonomous vehicles
- Maritime, military and topographic cartography
- Remote sensing and cartography
- Satellite technologies in cartography
- Spatial data visualization and analysis
- UAV – unmanned aerial vehicles

The Organizing Committee is going to consider proposals of other themes from fields connecting cartography, geography, geodesy, geoinformatics and related professions.

Conference program, lecture abstracts and presentations are going to be published at the Croatian Cartographic Society website.

Keynote Speakers

Prof. h. c. Univ.-Doz. Dr. Peter JORDAN was born 1949 in Hermagor/ Carinthia [Kärnten], Austria; studied geography and ethnology at the Vienna University, PhD 1979; 1998 habilitation at the Klagenfurt University; 1977-1988 map editor at the Atlas of the Danubian Countries; 1989-2014 editor-in-chief, Atlas of Eastern and Southeastern Europe with 30 instalments published; 1994-1998 project manager, Resources and Environment - World Atlas; 1997-2001 deputy director, 2002-2005 director, Austrian Institute of East and Southeast European Studies; from 2007 at the Institute of Urban and Regional Research, Austrian Academy of Sciences. Research fields: Cultural and Political geography of eastern Europe, geography of tourism, toponomastics, geolinguistics, geography of transportation, atlas cartography, theoretical cartography. Teaches at the universities of Vienna, Klagenfurt and Cluj-Napoca (Romania); more than 410 scientific publications and 379 paper presentations.

Prof. Dr. ir. Joep CROMPVOETS is full professor and research manager at KU Leuven Public Governance Institute (Belgium) holding the chair on ‘information management in the public sector’, and secretary-general of EuroSDR – a European spatial data research network linking national mapping agencies with research institutes, universities and private companies for the purpose of applied research in the domain of geospatial information management, and chairing the EuroSDR Commission on Business Models and Operation. He held faculty positions at Wageningen University (The Netherlands) and Melbourne University (Australia) and was employed by CSIC IRNAS research institute in Seville (Spain). He has been involved in numerous (inter)national projects related to spatial data infrastructures, GIS, public sector innovation, digital transformation and e-governance. He wrote more than 400 publications in the fields of geo-information science (with emphasis on spatial data infrastructures), public information management, e-governance, digital transformation in the public sector and soil science and is member of editorial boards of several scientific journals.

19th International Conference on Geoinformation and Cartography

First day program, Thursday, 7 September 2023

Location:

Ceremonial Hall of the University of Zadar, Obala kralja Petra Krešimira IV No. 2, Zadar
44.11131N, 15.22589E

Zadar has a centuries-old university tradition, the longest in Croatia: following the tradition of ecclesiastical education, first mentioned in the 10th century, a Dominican higher education institution Studium generale, later known as the Universitas Iadertina, was founded as early as 14 June 1396. The town of Zadar was not chosen as a university centre by chance: at the time, it flourished as the most important naval point in the Austro-Hungarian Empire.

Today, the University of Zadar is the largest integrated University in the Republic of Croatia, which includes 27 university departments.

9:00–10:00 Registration

10:00–10:30 Opening Ceremony

Prof. Dr. Lena Mirošević, Chair of the Local Organizing Committee
Prof. Dr. Josip Faričić, Chair of the International Scientific Committee
Josipa Zanki, Prof., Croatian Geogaphic Society – Zadar, Vice-President
Prof. Emer. Miljenko Lapaine, Croatian Cartographic Society, President
Prof. Dr. Dijana Vican, Rector fo the University of Zadar
Assist. Prof. Dr. Dušan Petrovič, member of the ICA Executive Committee
Mrs Maja Pupačić, Deputy Director General of the State Geodetic Administration

Music program: *Kud plovi ovaj brod* (Radojka Šverko) and *Fly me to the moon* (Frank Sinatra) / performed by Tajna Zorica accompanied by Dražen Habuš on the piano and Marin Perović on the saxophone

10:30–11:00 Keynote Lecture

Peter JORDAN	How to Optimize Toponymy on Modern Maps?

11:00–12:00 Session 1

Josip FARIČIĆ, Tome MARELIĆ, Julijan SUTLOVIĆ	Pitfalls of Uncritical Reproduction of Geographical Content on Nautical Charts of the Adriatic Sea
Zlatko HORVAT	Međimurje on Cartographic Representations in the late 18th and Early 19th Century with a Special Focus on the Work of Geometer János Tomasich (Ivan Tomašić).
Ludovico MAURINA, Silvia E. PIOVAN	Disclosing a Cartographic Heritage of the Suburbs of Padova (Italy) for the Dissemination of Geohistorical Awareness

12:00–12:30 Coffee Break

12:30–13:30 Session 2

Tome MARELIĆ	How Much Did Late Medieval Cartographers Really Know About the Geometry of Portolan Charts?
Roel NICOLAI	Who Mapped Africa on the Nautical Charts of the Age of Discovery?
Marina VILIČIĆ, Emilia DOMAZET	Interdisciplinary Approach to the Processing of the Volume VII of the Valvasors Graphic Collection of the Archdiocese of Zagreb

13:30–14:30 Lunch at the Barbakan Restaurant

Ruđera Boškovića Street 5, 44.11175N, 15.22667E

A barbican, from Old French *barbacane*, is a fortified outpost or fortified gateway, such as at an outer defense perimeter of a city or castle, or any tower situated over a gate or bridge which was used for defensive purposes.

19:00 Openning of the ***Old Atlases – New Stories*** exhibition

Exhibition hall of the Research Library of Zadar, Ante Kuzmanića Street 3, 44.11243N, 15.22820E

The organizers of the exhibition are Research Library of Zadar, State Archives Zadar, Croatian Cartographic Society and the University of Zadar. The exhibition of old atlases from Zadar's libraries and archives is an opportunity to present these valuable cartographic works, which, along with encyclopaedias and dictionaries, were the most important compendia of knowledge. Atlases were often books in which authors had the opportunity to present in one place the latest knowledge about space as well as their cartographic techniques, so they had an important informative, educational, and methodological function. In addition to this utilitarian function, they also had an aesthetic function, so they reflect cartography as a complex discipline in which science and art are intertwined. Therefore, it is always possible to approach any old atlas with new approaches and to invent new stories about it.

20:00

Dinner at the Barbakan Restaurant

Second day program, Friday, 8 September 2023

Location:

Ceremonial Hall of the University of Zadar, Obala kralja Petra Krešimira IV No. 2, Zadar

9:30–10:00 Presentation

Dušan PETROVIČ	International Cartographic Association (ICA) – Mission and Activities

10:00–11:30 ICA Commission on Map Projections

Krisztián KERKOVITS	The Origin of the Apian Map Projections
Michael T. GASTNER, Nihal Z. MIAJI, Adi SINGHANIA, Nguyen Phong LE	Topology-Aware Line Densification for Reprojected Curves on Maps
Miljenko LAPAINE	On the Definition of Standard Parallels
Krisztián KERKOVITS	ICA Commission on Map Projections

11:30–12:00 Coffee Break

12:00–12:30 Keynote Lecture

Joep CROMPVOETS	Introduction to Geospatial Technology Hype Cycle

12:30–13:30 Lecture and Poster Session

Robert ŽUPAN, Željka MOLAK ŽUPAN, Branko MANOJLOVIĆ, Stanislav FRANGEŠ	The Future of Cartography Within AI
Arli LLABANI, Namik KOPLIKU	An Accuracy Assessment Between UAV Photogrammetry and Terrestrial Laser Scanning for the Documentation of Cultural Heritage Areas
Eduart BLLOSHMI, Gezim GJATA	Comparison of Current Models of Planimetric Transformation Between References ETRF2000 and ALB-1986
Bledar SINA, Gezim HASKO	Comparison of the Current Models of Transformation of Ellipsoidal to Orthometric Heights

13:30–14:30 Lunch at the Barbakan Restaurant

18:00–20:00

Zadar Guided Tour and Sightseeing

Start in front of the the University of Zadar building, Obala kralja Petra Krešimira IV No. 2 at 18:00

20:00

Dinner at the Barbakan Restaurant

Third day program, Saturday, 9 September 2023

Island of Pag Guided Tour

Pag belongs to the north Dalmatian archipelago, and it extends northwest–southeast along the coast, forming the Velebit Channel. Pag is a fascinating island with unique geographical features, a colourful vibrant community, rich cultural heritage, and an exciting tourist offer. It is home of eponymous cheese, lamb, and lace, all universally acknowledged, appreciated, and celebrated around the globe!

Pag is an island in the Northern Dalmatian Island group. Its area is about 280 km^2 and it has a population of about 8500. The island is hilly and composed of limestone and flysch. The Novalja-Pag Valley stretches between two hills and contains the Pag Bay. The island's landscape varies greatly. A large part of the island, especially the one exposed to bora is rocky, while a smaller part is sheltered from bora and composed of maquis shrubland and oak forests. Olives, grapevine, vegetables and fruit are cultivated on the island. People all over the island keep sheep and produce cheese and other dairy products. Settlements with greatest populations on the island include Pag, Novalja and Povljana. A bridge over Ljubačka Doors connect Pag with the continent.

8:45 Departure by bus at the parking place in the immediate vicinity of the Department of Geography, University of Zadar, F. Tuđmana 24i (*novi kampus*) 44.11368N, 15.23685E. Driving to Lun known for its extensive olive garden, which contains thousands of ancient olive trees, including one that is claimed to be 2000 years old and another that is claimed to be 1600 years old. The garden also includes one of the world's largest collections of wild olive trees. After that, we will go to Kolan, where we will visit the famous Gligora Dairy. There will be a welcome to guests with an introductory story about Pag cheese (*paški sir*), the most famous and awarded Croatian cheese, sightseeing of Sirana Gligora (cheese museum 6 m below the ground and cheese packing house) with explanation by an expert guide in protective clothing and shoes and tasting world-award-winning Gligora cheeses in the upstairs tasting room, with a beautiful view of the northern part of the island of Pag. This is followed by a tour of the town of Pag and visiting the Salt Museum. The tour of the island of Pag will end with lunch in a famous restaurant. The return to Zadar is expected in the evening.

19th International Conference
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Abstracts

Comparison of Current Models of Planimetric Transformation Between References ETRF2000 and ALB-1986

Eduart BLLOSHMI[1], Gezim GJATA[2]

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Abstract

For connection of the State Geodetic Network with the Global (ITRSxx/ ITRFxx) or European Reference System (ETRS89/ETRF2000) several GNSS campaigns carried out in Albania. The best parameters of the transformation between the references ETRF2000 and ALB1986 are based on the results of the GNSS campaign autumn 2007 - spring 2008. The transformation results enabled by the two current planimetric transformation models developed by Military Geographical Institute of Firenze (Italy) and Department of Geodesy of the Faculty of Civil Engineering at the Polytechnic University of Tirana are compared/ tested in the field. Aim of this study is to present the different planimetric transformation models, as well as the test results of the transformation models in different areas of Albania.

Keywords: GNSS, ITRF/ETRF/ALB reference, transformation

Introduction to Geospatial Technology Hype Cycle

Joep CROMPVOETS

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Abstract

EuroSDR – the European Spatial Data Research network linking national mapping and cadastral agencies (NMCAs) with academic institutions across Europe for doing applied research – has been working on the Geospatial Technology hype cycle based on Gartner Hype Cycle approach. The Gartner hype cycle is a graphical presentation developed, used and branded by the American research, advisory and information technology firm Gartner to represent the maturity, adoption, and social application of specific technologies. The hype cycle claims to provide a graphical and conceptual presentation of the maturity of emerging technologies through five phases (Technology Trigger, Peak of Inflated Expectations, Trough of Disillusionment, Slope of Enlightenment, and Plateau of Productivity). The model is not perfect and research so far shows possible improvements for the model (Steinert, 2021). EuroSDR had the ambition to tailor the concept of the Gartner Hype Cycle specifically for geospatial technologies in Europe. Representatives of 20 European NMCAs tried to position key geospatial technologies on the graphical presentation, such SPL/Geiger-mode LiDAR, Linear-mode LiDAR, Oblique cameras, High-resolution stereo satellites, SAR/InSAR, Dense Image Matching, Digital Twin, GeoBIM, True orthophoto, Automated LOD2 city modelling, Unmanned Aerial Vehicles (UAV), RTK-PPP Georeferencing, AR/VR for geodata, AI for 2D/3D geodata, Blockchain, Cloud services, etc. The intention of the keynote is to present the latest (2022) version of the Geospatial Technology Hype Cycle and provide interpretations for possible geospatial technology trends.

Steinert, Martin (2021) "Scrutinizing Gartner's hype cycle approach". ResearchGate. IEEE Xplore.

Keawords: EuroSDR, Gartner Hype Cycle

Pitfalls of Uncritical Reproduction of Geographical Content on Nautical Charts of the Adriatic Sea

Josip FARIČIĆ, Tome MARELIĆ, Julijan SUTLOVIĆ

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Abstract

Thanks to its importance in the maritime-geographical system of the Mediterranean, the Adriatic Sea was depicted on many nautical charts in the Middle Ages and early modern period. It would have been expected that the reliability of the spatial data would gradually improve significantly, but the authors of nautical charts of the Adriatic Sea rarely changed the geographical content to any great extent, especially with regard to the representation of the coastline and islands. Major changes occurred only with the more detailed descriptions of individual islands and harbours published in isolarios and, from the 18th century onwards, in various nautical atlases, and a complete change occurred with the organisation of hydrographic surveys at the beginning of the 19th century. The reason for the century-long stagnation was uncritical reproduction, which European cartographers resorted to because they did not know the area depicted well enough, regardless of whether they were interested in it and whether they could obtain relevant geographical and oceanographic data about it. Good examples of the adoption and repetition of a kind of maritime cartographic pattern are the printed nautical charts of the Dutch cartographers W. Barents (1595), W. J. Blaeu (1621), P. Goos (1650) and H. Doncker (1655), the Italian cartographer F. M. Levanto (1664) and the English cartographer J. Seller (1677). Based on the cartometric analysis and the analysis of the geographical names, we concluded that W. J. Blaeu first generalised the contents of Barents' nautical chart of the Adriatic Sea, and then other European cartographers, who slightly modified the contents, especially in terms of their decoration, used Blaeu's nautical chart as a template. As a result of the uncritical reproduction, cartographers from various European countries adopted distortions and other deformations in relation to the representation of the Adriatic. Toponymy was also adopted in Barents' footsteps, including the Venetian name of the Adriatic Sea (Golfo di Venezia), which served as a side effect to subtly spread the Venetian political narrative throughout Europe (Venice considered the entire Adriatic as its area of interest).

Keywords: nautical chart, cartography, uncritical reproduction, Adriatic Sea, early modern period

This research is part of the activities of the scientific project IP-2020-02-5339 Early Modern Nautical Charts of the Adriatic Sea: Information Sources, Navigation Means and Communication Media (NACHAS), funded by the Croatian Science Foundation.

Efficient Topology-Aware Line Densification for Reprojected Curves on Maps

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Abstract

Many map features, such as administrative borders, coastlines, roads or rivers, are conventionally represented as polylines on a Cartesian plane. However, these objects are located on the curved surface of the Earth, necessitating an approximation when representing them as flat polylines. Ideally, the positions of vertices along each polyline should be chosen to represent the topology of mapped features accurately. For example, boundaries between adjacent geographic regions should have coincident vertices to eliminate gaps or overlaps.Yet, a topologically correct representation in one map projection does not guarantee that the same vertices will generate a valid polyline topology in another map projection due to the distortion of straight lines into curves. To restore a valid topology, it may be necessary to insert additional vertices before transforming the polylines from one map projection to another.

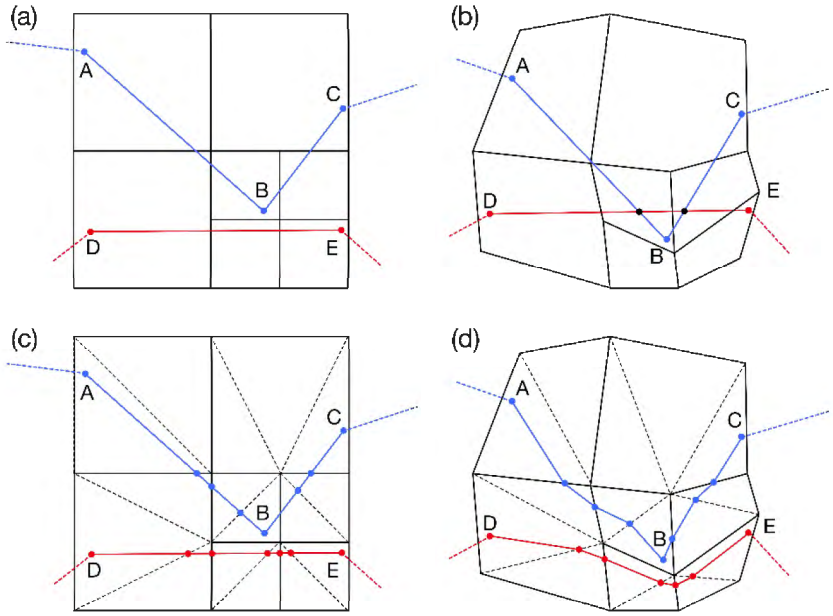

Figure 1: Illustration of the proposed algorithm for line densification. (a) In the original map projection, the vertices A, B and C in the blue polyline are all positioned above the red polyline, which contains vertices D and E. The horizontal and vertical black lines depict a quadtree with maximally one vertex per cell. (b) Upon projecting the vertices A, B, C, D and E and connecting them with straight lines, vertex B is below the red polyline, leading to an invalid topology. (c) A Delaunay triangulation of the quadtree corners is constructed (solid and dashed black lines), and additional vertices are inserted where the polylines intersect with the boundaries of the Delaunay triangles. (d) When applying the same projection used in (b) to the vertices in (c), the red and blue polylines no longer intersect, thus producing the correct topology.

Conventional methods insert a fixed number of equidistant vertices between the original consecutive vertex pairs or add vertices at the midpoints of line segments that exceed a predetermined distance threshold. However, these simplistic approaches significantly increase the vertex count and do not ensure topological validity. In this presentation, we introduce an alternative method where vertex insertion is responsive to the local polyline geometry, thus ensuring a valid topology. The algorithm employs an auxiliary quadtree and its Delaunay triangulation to insert vertices (Figure 1). After projecting all the vertices, topology-aware line simplification is applied to reduce the vertex count.

Keywords: map projection, polylines, topological accuracy, vertex insertion

Međimurje on Cartographic Representations in the Late 18th and Early 19th Century with a Special Focus on the Work of Geometer János Tomasich (Ivan Tomašić)

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Abstract

Međimurje is a historical Croatian region located in the northernmost part of Croatia. Today, it borders Hungary to the east, Slovenia to the west and north, and Varaždin County in Croatia to the south. During the 18th and 19th centuries, Međimurje was a part of the Habsburg Monarchy. From the year 1720 until 1918, except for two shorter periods, Međimurje was administratively part of the Zala County, which was located in the southwest of the Hungarian Kingdom. The first period was from 1785 to 1789 when it was part of Varaždin County and the second was from 1849 to 1861 when it was part of the Croatian Military Frontier.

From a cartographic point of view, this was a significant period when the first detailed maps of Međimurje were created. Also, the public administration demanded more orderly conditions. First, larger landowners, and then counties, began to employ geometers. In addition to determining the boundaries of the property, their task was also to assess the water and traffic conditions. In Hungarian archives, there is a lot of unexplored cartographic material of Međimurje, which is now accessible to professional and amateur researchers thanks to the Hungaricana project. During the mentioned period, the first, second, and third military surveys were conducted, along with the Franciscan cadastral survey, with the aim of establishing the so-called "stable cadastre." Considering the complex political circumstances of that time, the Franciscan cadastral survey began and concluded under the administration of the Viennese authorities. After 1861, Međimurje was once again incorporated into Hungary, leading to an intense process of Hungarian assimilation. This policy was manifested in various ways, including even the alteration of toponyms on existing maps. As a result, many places that previously had Croatian names were given Hungarian names. This change in toponyms aimed to foster the assimilation of the people of Međimurje into Hungarian society. Međimurje was not only a border area in terms of territorial authorities but also a border region in terms of spiritual influence. Ecclesiastically, throughout the entire period, Međimurje was a part of the diocese of Zagreb (since 1852 archdiocese).The work provides an overview of cartographic representations of Međimurje during the transitional period from the late 18th to the early 19th century, which are less known in professional and academic circles. Special emphasis is placed on the cartographic work of János Tomasich (Ivan Tomašić), the chief geometer of Zala County and a Croatian landowner, believed to originate from the Međimurje settlement of Novakovec. We believe that this work can serve as a foundation for further research into the cartography and cartographers of Međimurje.

Keywords: cartographic representations, cadastral survey, János Tomasich, Međimurje

How to Optimize Toponymy on Modern Maps?

Peter JORDAN

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Abstract

Toponyms or place names are not part of the cartographic symbol system, of the 'cartographic language', but important additional elements of a map that exert functions and have benefits such as facilitating map use, enabling the search for places or telling more about the character of a geographical feature than the cartographic symbol which can only indicate the feature category. Based on this, the paper enlarges on how to optimize place names for the various purposes of maps referring to the major divides between maps for a prevailingly domestic audience and maps for an international audience as well as between maps for the scientific community and popular maps like in school atlases. Major points of discussion are in this context the endonym/exonym divide related to features in other countries and transboundary features like oceans and seas, the use of conversion systems in cases of occurrences of more than one script in the area covered by the map (transcription or transliteration), the choice between vernacular and standard language name forms as well as the consideration of minority names. Finally, also issues of place-name standardization and their relevance for maps are addressed.

Keywords: toponyms, place names optimization, endonyms, exonyms, place names standardization

The Origin of the Apian Map Projections

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Abstract

This study aims to investigate whether Peter Bienewitz, known as Peter Apian could be the developer of his namesake map projections. Evidences suggest that these mappings should not have been named after Apian. The most likely inventor of the Apian I map projection is Amerigo Vespucci, and the Apian II projection was probably developed only 300 years later by François Arago. Given that the case of Apian map projections is not a single example when the map projection is not named after its real inventor and the original authorship of more mappings might be questioned in the future, the cartographic community should revise, whether it is a good convention to name map projections after their supposed inventor.

Keywords: map projections, Apian, history of cartography

On the Definition of Standard Parallels

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Abstract

There is no unique definition of standard parallels in cartographic literature. For some authors, a standard line is a line along which there is no distortion, and for others it is a line along which there is no distortion of length. At the same time, it is forgotten that the linear distortions at any point generally change and depend on the direction.

The presentation introduces equidistance in a broader sense. Equidistance is defined at a point, along a line and in an area, especially in the direction of the parallels and especially in the direction of the meridian. This enables our definition of standard parallels: parallel with zero linear distortion at all points and in all directions. In other words, Tissot's indicatrix or ellipse of distortion is a unit circle at all points of such a parallel (Figure 1).

Theoretical considerations are illustrated with examples of cylindrical projections.

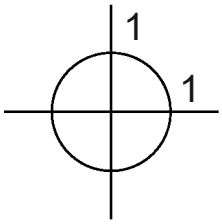

Figure 1. Tissot's indicatrix as a unit circle

Keywords: map projection, parallel equidistant in the direction of the parallel, parallel equidistant in the direction of the meridian, standard parallel

An Accuracy Assessment Between UAV Photogrammetry and Terrestrial Laser Scanning for the Documentation of Cultural Heritage Areas

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Abstract

The preservation and documentation of cultural heritage areas require accurate and efficient surveying techniques to capture intricate details and spatial information. This study presents a comparative analysis of accuracy between Unmanned Aerial Vehicle (UAV) photogrammetry and Terrestrial Laser Scanning (TLS) for the construction and documentation of Ministry of Environment building in Tirana, Albania. Both UAV photogrammetry and TLS have gained prominence in heritage preservation due to their non-invasive nature and ability to capture high-resolution data. In this research, a comprehensive assessment of accuracy is conducted by comparing the point cloud datasets generated from both UAV photogrammetry and TLS techniques. The evaluation encompasses various aspects such as point cloud density, spatial accuracy, and geometric fidelity.

The results of the comparison reveal nuanced insights into the strengths and limitations of each technique. UAV photogrammetry demonstrates its efficacy in capturing large areas quickly, while TLS excels in capturing intricate details with high precision. The results show that the use of the laser scanner technique is more accurate than the use of UAV technology. The accuracy offered by TLS ranges from 0.5−10 mm, while the accuracy achieved with UAV technology was 40 mm. Furthermore, this study underscores the importance of considering accuracy, efficiency, and the nature of the cultural heritage area when choosing between UAV photogrammetry and TLS for documentation and construction purposes.

Keywords: terrestial laser scanner, UAV, accuracy, photogrammetry, point cloud

How Much Did Late Medieval Cartographers Really Know About the Geometry of Portolan Charts?

Tome MARELIĆ

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Abstract

Although portolan charts have been studied continuously since the late nineteenth century, their remarkably accurate display of coastlines that (so far as is known) suddenly occurred in the late thirteenth century still represents a mystery. Seven portolan charts and three portolan atlases were selected for the research sample and cartometrically examined: anonymous Carte Pisane (c. 1275) and Cortona chart (c. 1300), Pietro Vesconte's chart (1311) and atlas (1313), anonymous Riccardiana chart (c. 1325), Angelino Dulcert's chart (1339), anonymous Rex Tholomeus chart (c. 1360), Francesco Beccari's chart (1403), Andrea Bianco's atlas (1436), and Battista Agnese's atlas (1538). Portolan charts were analysed in two ways: A) as individual units examined across the extents of the Mediterranean and Black Sea areas, and B) as divided into cartometrically determined subsections, while portolan atlases were analysed in three ways: A) as each atlas sheet treated separately, B) as a composite of atlas sheets (a single unit), and C) as a composite divided into cartometrically determined subsections as well. The research results revealed several significant outcomes. The accuracy of charts was not improved throughout the entire period – even the portolan atlases, in which the coastal areas were rendered in a larger map scale have not shown any accuracy improvements. Also, the distribution of displacement-vectors on charts and atlas-composites pointed out the existence of at least eight coastal subsections (sort of "building blocks") from which they were, most likely, initially pieced-together into the "portolan chart framework" during the late medieval period with the application of individual (and variable) scale-adjustments and rotations per section (which do not follow the contemporary distribution of magnetic declination). Overlaying the subsections of all the charts and atlases examined shows that the cartographic coastal renderings of each "building block" remained largely unaltered throughout the entire era of their production and that no significant improvements were added – at least not since the early fourteenth century and the appearance of Veconte's charts whose accuracy has not been surpassed on any later produced (both signed and anonymous) charts and atlases, although their authors accepted and copied much of the geometry and aesthetics of Veconte's coastal elements at the local level. The accuracy of each subsection detected in this research proved to be, on average, twice accurate as the Mediterranean and Black Sea areas treated as a whole. The inconsistency of coastal subsection scale-adjustments among charts implies that their authors were not aware of the size and orientation of these regions in reality and that all charts are more or less accurate copies of an unknown or as yet undiscovered cartographic template. Also, the management of the spatial extent of the coastal areas shown on the examined portolan atlas sheets implies that the cartographers who created them (including Veconte) were most likely unaware of the existence of these coastal subdivisions used to create the initial template.

Keywords: portolan charts, portolan atlases, cartometric analysis

Disclosing a Cartographic Heritage of the Suburbs of Padova (Italy) for the Dissemination of Geohistorical Awareness

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Abstract

The geohistory of the centre of Padova, the part of the city enclosed by the renowned Renaissance walls, has been explored in depth by numerous publications, events, and exhibitions and therefore is well-known to the public. However, our knowledge of the city blurs as we move to its suburbs, the part of the city that lies outside the walls. This is due to a lack of comprehensive works dedicated to these territories where the majority of the citizens lives nowadays.

The project “Quante Padove?” (How many Padovas?) has been conceived to contribute to filling this gap through the collaboration between the University of Padova, the municipality of the city, the local Rotary Club and the independent publisher Edizioni Bette.

From May 2021 to July 2023, a research team composed of both professors and students of the Department of Historical and Geographic Sciences and the Ancient World investigated four districts of different extents located in the suburbs of Padova, respectively northward, eastward, southward and westward of the city centre. The research relied on a geohistorical approach that combined cartographical, bibliographical and archival research with interviews, field surveys and repeat photography.

The project has produced two outcomes:

1. a cartographic bundle that includes a set of historical maps and remote sensing images of the four analysed districts from 1780 to 2021;
2. a collective book that explores some aspects of the territorial transformations of the four districts from antiquity to the present.

This presentation focuses on the creation of the cartographic bundle that is composed of four folders. Each folder is dedicated to one district and contains a set of seven representations of its territory in chronological order.
The following collections of historical maps and remote sensing images were selected as sources of the representations:

A. The map of the territory of Padova (1:20.000) drawn by the cartographer Giovanni Antonio Rizzi Zannoni in 1780.
B. The second Habsburg Military Survey (1:28.800) conducted in northern Italy from 1818 to 1829 with later minor updates.
C. The surveys of the Italian Geographic Military Institute (1:25.000) carried from 1890 to 1971.
D. The areal images acquired by the Veneto Region from 1981 to 1983.
E. The orthophoto of the municipality of Padova taken in 2021.

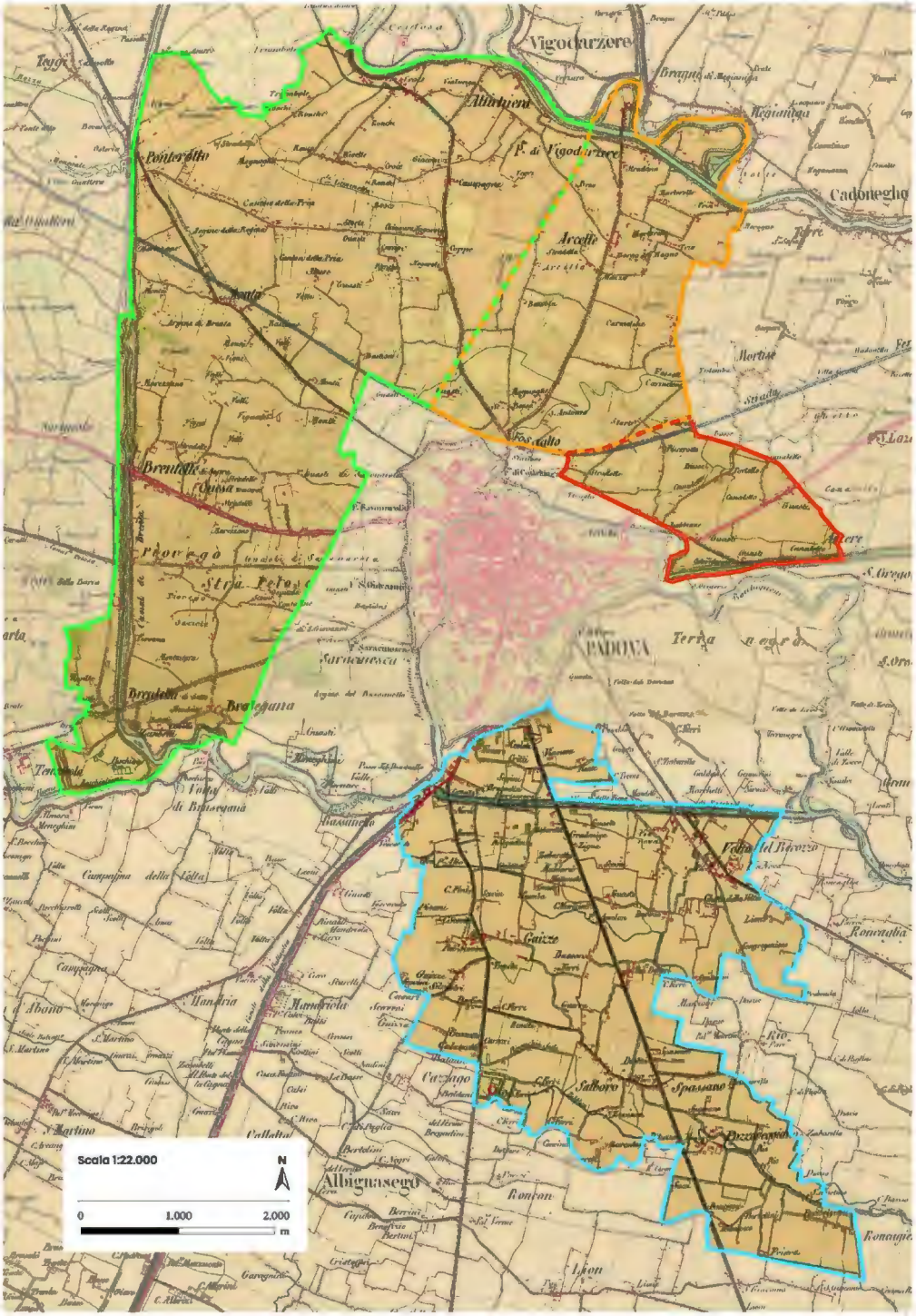

Figure 1. The boundaries of the four districts of the suburbs of Padova object of the research overlaying the mosaic of the georeferenced sheets of the Second Habsburg Military Survey.

Initially, all the sources were acquired in raster format. A large format scanner was used for the digitization of some historical maps available only in paper copies. Subsequently, the raster files were georeferenced in a GIS, mosaicked and arranged in map layouts whose scale was standardized according to the extent of the depicted districts. Finally, the map layouts were exported and refined by a graphic designer who took care of the project's graphic language, characterized by distinctive symbols and colours for each district.

The cartographic bundle that resulted from this process provides a simple and engaging glimpse into the changes of four districts of the Padova suburbs during the last two and a half centuries. We will illustrate how the contents of the bundle enable the reading of the territorial processes through some examples of interpretations of historical maps and remote sensing images.

Ultimately, this work aims to support the dissemination of the geohistorical awareness of the areas of the city where most of the inhabitants spend their daily life as well as to provide a tool for teaching purposes by disclosing a cartographic heritage that otherwise would be hidden among archives and databases usually accessible only by the specialists.

Keywords: historical cartography, historical GIS, public geography, suburbs, Padova

Who Mapped Africa on the Nautical Charts of the Age of Discovery?

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Abstract

The shape of Africa on Iberian nautical charts of the late fifteenth and early sixteenth century is surprisingly mature. The portrayal of the continental outline of Africa on the Cantino planisphere of 1502 is so good that it was not surpassed in the next two, possibly three centuries. Geodetic-cartographic numerical analysis reveals that the African coastline on the Cantino planisphere is a mosaic of accurate regional charts on the equidistant cylindrical projection, each with its own scale and orientation, as well as an enigmatic stretch in East-West direction, which is shared by all charts of that period depicting Africa. The shape of the parts of Africa shown on these regional charts was essentially correct on the oldest chart (c. 1471) and was copied onto later charts. This is at variance with the distortions that would have been produced by the Portuguese navigation and charting methods of that period, which are well-understood. While Portuguese pilots and cartographers appear to have contributed significantly to the optimisation of that mosaic, it is therefore highly unlikely that they were the original creators of the source charts. The early Iberian nautical charts share many characteristics with Mediterranean portolan charts, among which possibly a common pre-medieval origin.

Keywords: geodesy, numerical analysis, nautical cartography, age of discovery, history

International Cartographic Association (ICA) − Mission and Activities

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Abstract

Cartography is in period of technological and also semantical change, their use is being sprat around the human population more than ever before, for mobile navigation or for environment managing. The mission of the International Cartographic Association (ICA) is to promote the disciplines and professions of cartography and GIScience in an international context while its aim is to ensure that cartography and GIScience are employed to maximum effect and full potential for the benefit of society and science through promotion and representation of the disciplines and professions of cartography and GIScience internationally. Many cartographers don't know and understand the meaning and activities of the ICA and therefore lose opportunities to use its potential. In the presentation the mission and activities of the ICA will be presented, with focus on just finished 31st International Cartographic Conference in Cape Town, South Africa. Keynote lectures, scientific sessions, commission's meetings, children's map and national map exhibitions, commercial exhibitions, technical visits and also social activities offer participants their professional development supported by discussions and networking many cartographers and GIS scientists, producers and users all around the world. In midterm between the biannual conferences, other commissions activities, like workshops, but also ICA publications, regional conferences or newsletters bridges the time gap. Using ICA opportunities is even more important for the beginners at their careers.

Keywords: ICA, cartographic conference, commissions, exhibitions

Comparison of the Current Models of Transformation of Ellipsoidal to Orthometric Heights

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Abstract

The problem of height transformation continues to be widely addressed in the contemporary literature, where different authors propose different ways. Based on the latest GNSS measurement campaign of Fall 2007 − Spring 2008, the best relationship between ellipsoidal heights h and so-called geoidal (natural) H was found. Two models of transformation of h into H developed from Military Geographical Institute of Firence, Italy and Department of Geodesy are tested in the field. The lack of a precise gravimetric geoid for the territory of Albania has led to the impossibility of direct transformation of the ellipsoidal heights h into geoidal height H.

Aim of this study is to present the different transformation models of the ellipsoidal heights h into so-called orthometric heights H of the Albanian vertical system, as well as the results of test of the transformation models in different areas of Albania.

Keywords: GNSS, ellipsoidal and orthometric height, ITRF/ETRF/ALB reference, transformation

Interdisciplinary Approach to the Processing of the Volume VII of the Valvasors Graphic Collection of the Archdiocese of Zagreb

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Abstract

Cultural heritage confirms the existence of a particular nation, its identity, history, art and culture. Graphic collections represent a valuable body of artistic values preserved in the collections of cultural heritage institutions and require a special approach to storage, protection and restoration.
Graphic collections are the object of interest of various user groups (historians, art historians, architects, surveyors, curators, students, illustrators, etc.) who access the collections in different ways. For this reason, the main objective of the libraries is not only to collect and preserve the materials, but the libraries are also responsible for their processing, ensuring optimal access to the materials for users with specific needs. Graphic collections represent a kind of database of art data that contains a wealth of information useful for researching the past.

However, in order to process the material, it is necessary to read its content and formal information, the place and year of creation, the technique with which the graphic was made, the dimensions, information about the content of the work itself, which often contains various terms, etc. Considering the diversity of the material preserved in the graphic collection, its treatment requires special knowledge on the part of the cataloger, often requiring an exhaustive research work. For example, the title of the work, the place and year of creation are often not listed or are missing from the graphic sheet, so it is necessary to consult numerous data sources to obtain the necessary data, and the cataloger should be careful not to express his subjective views.

For the processing of the graphic material of the volume VII of the Valvasor collection, this paper presents the procedure for determining the numerical scale based on the drawn graphic scales for a total of 35 maps. The graphic collection of Valvasor is now in the Metropolitan Library of the Archdiocese of Zagreb of the Croatian State Archives in Zagreb. For the calculation of the numerical scale, the miles drawn on the maps and their lengths in relation to one degree of the meridian were examined. A total of 22 different miles were drawn on the examined maps, of which the German mile was the most common. After calculating the numerical scale, it was found that the largest scale of the analyzed maps was 1:220,000 and the smallest was 1:11,200,000. More than half of the maps have a scale of 1:500,000 to 1:1,000,000, and according to this scale the maps belong to the category of medium scale maps.

Keywords: graphic collection, Iconotheca Valvasoriana, Valvasor, Metropolitan Library of the Archdiocese of Zagreb, numerical scale, graphic scale

The Future of Cartography Within AI

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Abstract

The integration of Artificial Intelligence (AI) in cartography has revolutionized the field, presenting numerous applications and promising to shape its future. This abstract delves into the key applications of AI in cartography, along with the potential challenges that must be addressed for responsible and effective implementation. Applications of AI in cartography span various domains, enhancing traditional cartographic processes and opening up new possibilities. AI-driven automation streamlines data collection, analysis, and map generation, enabling faster and more accurate map production. Advanced visualization techniques, such as augmented reality (AR) and virtual reality (VR), facilitate interactive and personalized map experiences, empowering users to explore data intuitively. Moreover, spatial data analysis utilizing AI algorithms uncovers valuable insights from geospatial datasets, supporting informed decision-making, forecasting, and predictive modeling. AI has also played a pivotal role in exploring and mapping uncharted territories, including deep-sea and outer space missions, where autonomous systems equipped with AI capabilities efficiently collect data in hazardous environments. Despite the promising applications, the integration of AI in cartography also presents potential challenges that warrant attention. Ethical considerations are paramount, particularly concerning the privacy and confidentiality of geospatial data. Responsible data usage, access, and ownership must be ensured to prevent misuse and safeguard sensitive location-based information. Additionally, biases within AI algorithms demand careful scrutiny to avoid perpetuating unfair practices in cartographic representation. The ethical deployment of AI in cartography requires a delicate balance between technological advancements and preserving the privacy and rights of individuals and communities. Addressing the technical challenges is equally crucial, such as the complexity of AI algorithms, integration with existing cartographic systems, and the need for data standardization and quality assurance. Furthermore, cartographers and geospatial professionals must adapt to AI-driven methodologies, acquiring the necessary skills to harness AI's potential effectively. AI applications in cartography have transformed the field, revolutionizing mapmaking, analysis, and visualization. However, the implementation of AI in cartography necessitates responsible practices, considering ethical concerns and technical challenges. An overview of potential research topics for future research on the use of artificial intelligence in cartography are also presented.

Keywords: Artificial Intelligence, AI, cartography, applications, automation, data analysis, visualization, augmented reality

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