Narrative Cartographic Representations: Mapping the Spatiotemporal Complexity of Stories

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Narrative Cartography

An attempt to represent visually events which unfold over time at a certain geographic location.
From Cairo to Khartoum (The Graphic, 1884)
Maps can omit so much and still be perfectly suited to telling the story of the form itself.

Wonderground map of London Town (MacDonald Gill, 1914)
This map was not designed for navigation or any functional use but rather as a story of a range of countless incidental details of London’s attractions.

Amundsen’s South Pole Expedition (Gordon Home, 1911)
Maps produced around the time of the expeditions illustrated the stories, trials and tribulations of the famous treks to reach the South Pole.
**The Island** (Stephen Walter, 2008)

Entirely hand drawn, the space is filled with local information based on authors' knowledge, feelings and impressions of a place.

**Battle of Gettysburg** (Esri, 2013)

The use of preconfigured templates from Esri's Story maps has become one way in which people can author their stories as a narrative map.

**In the Shadow of Foreclosures** (New York Times, 2008)

The New York Times creates consistently high quality maps and graphics to tell their stories.

**They Would Not Take Me There** (Hermann and Pearce, 2008)

A map that traces the story of Champlain's journeys, an example of a literary geography being brought to life through cartography.
Narrative map, narrative cartographic visualization, literary map, story map, fictional cartography, geospatial storytelling

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Research question for the narrative cartography:

- How can authors design maps that allow users to simultaneously experience events and their importance in the space?
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Requirements for the narrative cartography:

- Mapping narratives requires the development of specific forms of cartographic representations that simultaneously present the diverse and complex spatiotemporal dimension of the narrative, as well as its geography (locations in the story) and geometry (relationships between story elements).
Narrative cartography: an attempt to represent visually events which unfold over time at a certain geographic location

### Materials and Methods:

- Selection 5 different forms of online narrative maps

- Comparative analysis of the selected examples
NARRATIVE CARTOGRAPHY: An attempt to represent visually events which unfold over time at a certain geographic location

MATERIALS AND METHODS:

- Selection 5 different forms of online narrative maps

- Comparative analysis of the selected examples

RESEARCH GOAL:

- To identify and describe the spectrum of techniques that today’s narrative cartographic representations are using for mapping the spatiotemporal complexity of stories.
WHERE FARMING BEGAN

The Fertile Crescent was the heartland of the Neolithic Revolution. Giškerti Tepe sat on the northern edge of this region that curves along the boundary between mountain and desert, rich in the wild grasses and game that became the first domesticated grains and livestock. By 6000 B.C. the transformation from hunter-gatherers to farmers was largely complete in this area. As selected sites on the map show, this shift—whether driven by religious rituals, environmental changes, or population pressures—happened in different places and at different times.

KEY TO MAP AND GRAPHICS

- Natufian culture
- Pre-pottery Neolithic A
- Pre-pottery Neolithic B
- Settlement
- Plant and animal domestication
- Monumental architecture
- Large man-made structure of earth or stone
- Ritual art
- Symbiotic representation of surroundings, such as animal carvings

Wild wheat: Plumper kernels distinguish domesticated grains from their wild ancestors. Wild kernels drop off when ripe, but domesticated strains hold their kernels, allowing a more predictable harvest.

Domesticated wheat: The rise of village life—Early hunter-gatherer settlements—some with several hundred people—were largely abandoned when the warming climate chilled again for 1,200 years. About 9600 B.C. temperatures rose and villages rebounded, with people still foraging for most of their food and sharing it. As farming took hold and village populations increased, individual families fed themselves.

In Natufian settlements (named for a site where they were first excavated) hunter-gatherers built stacked-stone huts, probably roofed with animal hides.

Estimated average community size, based on studies in the southwest Fertile Crescent:

- Natufian culture: 18 people
- Pre-pottery Neolithic A: 90 people

Villages of mud-brick huts included community food stores. Evidence of plant domestication is debated, but wild grains were cultivated.

Thousands lived in farming villages of linked, multiroom homes. Interior walls displayed ritual symbols such as bull horns and skulls of ancestors.

Grain domestication: Present-day grain cultivation is shown; the range of wild grains is thought to have been slightly larger.

Animal domestication: Wild sheep and goats were the first livestock tamed, about 8000 B.C. Pigs, then cattle followed, in the next thousand years.
Follow the Elk’s Perilous Journey
North American Elk Range

Elk were once ubiquitous in North America. Yet like bison, they were nearly hunted to extinction in the late 19th century. Elk have since rebounded and, thanks to better wildlife management, have recolonized much of their former range. In Wyoming, state and federal agencies keep elk numbers up by stocking select winter feeding grounds with hay.
Greater Yellowstone Ecosystem

This map shows the boundary used by the Greater Yellowstone Coordinating Committee, a federal partnership. Wildlife officials and researchers say that managing the region as a single ecosystem—an approach that's controversial with many nonfederal landowners—is key to increasing sustainability.
Greater Yellowstone Superherd

Nine discrete elk herds, totaling 10,000 to 20,000 individuals, compose what ecologist Arthur Middleton calls the Greater Yellowstone superherd. These herds spend their summers in the core protected area of the Greater Yellowstone Ecosystem. Their seasonal migrations—into the park each spring, then back out again in autumn—are among the most stable, the most arduous, and the most studied.
Winter

This map is one of the first to use GPS data from collared elk to depict all of the herds’ migration corridors—the veins and arteries of Yellowstone. Elk are shown here in their winter feeding grounds.

- Winter range

March
Narrative cartographic representation of a sequential structure with static and dynamic view-only maps

**Pulse of the Park**

The herds flow back out into the surrounding region when autumn snow begins to fall.

- Winter range
- Summer range

**August**
Narrative cartographic representation of a sequential structure with static and dynamic view-only maps

The Journey of Yellowstone Elk

This map shows the migratory routes of nine elk herds, each named for where it winters.

- Winter range
- Summer range

THE JOURNEY OF YELLOSTONE ELK (National Geographic, 2016)
The Cody Herd

About 6,000 elk comprise the Cody herd. Some spend winter along the Shoshone River, but the majority cluster near the Greybull. This group makes one of the world’s most dramatic migrations. To reach lofty, remote plateaus each spring, they traverse steep mountain passes and swollen rivers. On the return trek in fall, they must contend with hunters.
Narrative cartographic representation of a sequential structure with static and dynamic view-only maps

**Rugged journey**

To move from her wintering grounds to her summer habitat, Elk 22 travels 195 miles in 39 days. Her journey—traversing lofty peaks, raging rivers, and remote plateaus—is the equivalent of climbing up Mount Everest from sea level, then trekking back down again.

**THE JOURNEY OF YELLOSTONE ELK** (National Geographic, 2016)
Narrative cartographic representation of a sequential structure with static and dynamic view-only maps

THE JOURNEY OF YELLOSTONE ELK (National Geographic, 2016)
Narrative cartographic representation of a (non)sequential structure with dynamic and interactive maps

This animated thematic map narrates the spatial history of the greatest slave insurrection in the eighteenth century British Empire. To teachers and researchers, the presentation offers a carefully curated archive of key documentary evidence. To all viewers, the map suggests an argument about the strategies of the rebels and the tactics of counterinsurgency, about the importance of the landscape to the course of the uprising, and about the difficulty of representing such events cartographically with available sources. Although this cartographic narration cannot be taken as an exhaustive database—for instance, it does not examine major themes such as belonging and affiliation among the insurgents or the larger imperial context and interconnected Atlantic world—the map offers an illuminating interpretation of the military campaign’s spatial dynamics.

Slave Revolt in Jamaica, 1760-1761
A Cartographic Narrative

Vincent Brown
Principal Investigator and Curator
Charles Warren Professor of History and Professor of African and African-American Studies
Director, History Design Studio
Harvard University
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Slave Revolt in Jamaica (Axis Maps, 2016)
These circumstances show the great extent of the conspiracy, the strict correspondence which had been carried on by the Coromantins in every quarter of the island, and their almost incredible secrecy in the forming of their plan of insurrection; for it appeared in evidence, that the first eruption in St. Mary's, was a matter preconcerted, and known to all the chief men in the different districts; and the secret was probably confided to some hundreds, for several months before the blow was struck. -- Planter and historian Edward Long, History of Jamaica (1774)
Narrative cartographic representation of a (non)sequential structure with dynamic and interactive maps

April 7, 1760

Two Coromantee Negroes, Tacky and Jamaica, on Frontier Estate (belonging to Ballard Beckford, Esq.) having long been concerted a Rebellion with three other Chieftains of their country, who were each of them to have an Estate for his good Services, they fixed on Easter Monday Night for their rising.-- Letter from a Gentleman at St. Mary, 14 April 1760

"It is believed that the plan was laid for a general insurrection all over the Island by the Corromantee Negroes who are by much the most numerous & resolute; the time fix'd was the Witsun Hollidays but very fortunately the Negroes in St. Marys particularly those upon the Estate that now belongs to Crookshank Mr
Narrative cartographic representation of a (non)sequential structure with dynamic and interactive maps

April 8, 1760

Having at Midnight assembled about 90 others, at Mr. Bayly Estate, Trinity (from Esher, Whitehall, Ballard Valley, and other Plantations) they marched to Port Maria ... Killing the Centinel at the Fort, [they] took from thence four Barrels of Powder, a Keg of Musket Balls, and all the Small Arms in the Fort-- Letter from a Gentleman at St. Mary, 14 April 1760

"Being by this time joined by a number of their countrymen from the neighboring plantations, they marched up the high road that led to the interior parts of the country, carrying death and desolation as they went."

--Bryan Edwards, History of the West Indies

"At Day Light they appeared"
Narrative cartographic representation of a (non)sequential structure with dynamic and interactive maps

Maroons mobilize at Scot's Hall and Crawford Town

April 9, 1760

Map Legend

Size of Force

- = 100 people

Clash with Rebels

Troop locations

- Rebels
- Militia
- Army
- Navy
- Maroons
- Conspiracy
- Slave Court
- Uncertain location

SLAVE REVOLT IN JAMAICA (Axis Maps, 2016)
How Much Hotter Is Your Hometown Than When You Were Born?

As the world warms because of human-induced climate change, most of us can expect to see more days when temperatures hit 32 degrees Celsius (90 degrees Fahrenheit) or higher. See how your hometown has changed so far and how much hotter it may get.
Narrative representation of a sequential structure with static map supporting the event-driven interaction.

When you were born, the Zagreb area could expect about **5 days** per year to reach at least 32 degrees.
Narrative representation of a sequential structure with static map supporting the event-driven interaction

**Zagreb, Croatia**

**Birth year**

Today, the Zagreb area can expect **18 days** at or above 32 degrees per year, on average.

1981

Born

**HOW MUCH HOTTER...?** (The New York Times, 2018)
By the time you’re 80, models show there could be 33 of these very hot days. The likely range is between 22 and 40 days.
THE ZAGREB AREA is likely to feel this extra heat even if countries take action to lower their greenhouse gas emissions by the end of the century, according to an analysis conducted for The New York Times by the Climate Impact Lab, a group of climate scientists, economists and data analysts from the Rhodium Group, the University of Chicago, Rutgers University and the University of California, Berkeley. If countries continue emitting at historically high rates, the future could look even hotter.

The future projection shown here assumes countries will curb emissions roughly in line with the world’s original Paris Agreement pledges (although most countries do not appear on track to meet those pledges).

On the map below, you can see a global picture of how days at or above 32 degrees could increase by the end of the century.
Narrative representation of a sequential structure with static map supporting the event-driven interaction.
The Zagreb area averaged 5 days when temperatures climb to 32 degrees or higher in 1960, and could expect to see between 24 and 55 very hot days by the end of this century.
New Delhi, home to nearly 22 million people, could go from just under six months of 32-degree heat in 1960 to up to eight months by the end of the century.
Large relative increases in heat will be felt in more moderate climates, too. Madrid, which averaged 33 days of at least 32-degree heat in 1960, could see such very hot days double or triple by the end of the century.
High heat also affects food production (including lowering crop yields and dairy production) and can increase the demand for electricity. More frequent 32-degree days could also exacerbate drought and fire conditions in certain regions.

“More very hot days worldwide bring direct and dangerous impacts on people and the systems on which we depend,” said Cynthia Rosenzweig, head of the Climate Impacts Group at the NASA Goddard Institute for Space Studies. “Food, water, energy, transportation, and ecosystems will be affected both in cities and the country. High-temperature health effects will strike the most vulnerable.”

By NADJA POPOVICH, BLACKI MIGLIOZZI, RUMSEY TAYLOR, JOSH WILLIAMS and DEREK WATKINS

Climate modelling by Climate Impact Lab

Additional design and development by Troy Griggs.
Narrative cartographic representation in which storytelling is performed by scrolling.
Narrative cartographic representation in which storytelling is performed by scrolling.

On the jarring, 12-hour drive from St. Petersburg to Moscow, another Russia comes into view, one where people struggle with problems that belong to past centuries.

A Modern Train, a Rotting City

A few times every day, the high-speed train between St. Petersburg and Moscow barrels through the threadbare town of Lyuban. When word gets out that the head of Russia’s state railway company — a close friend of President Vladimir V. Putin — is aboard, the station’s employees line up on the platform standing at attention, saluting Russia’s modernization for the seconds it takes the train to fly through. Whoosh.

But Vladimir G. Naperkovsky is not one of them. He watched with a cold, blue-eyed stare as the train passed the town where he was born, with its pitted roads and crumbling buildings. At 52, having shut down his small computer repair business, Mr. Naperkovsky is leaving for another region in Russia, hoping it is not too late to start a new life in a more prosperous place. The reasons are many, but his view boils down to this: “Gradually,” he said, explaining his view of Lyuban.

At the edges of Russia’s two great cities, Moscow and St. Petersburg, many like Mr. Naperkovsky have been left behind by the country’s economic boom, their hopes and dreams crushed by the steady erosion of what they once had. In Lyuban, and in towns like it across the vast country, a paradox looms: Russia’s growth and modernization have often come at the expense of the very people who were supposed to benefit from it.
Narrative cartographic representation in which storytelling is performed by scrolling.
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But then his time came, as well. Mr. Chertkov washed the grease off his thick hands and hauled himself up into the cab of his truck and pulled away.

Proximity to Moscow was hardening him, Mr. Chertkov said, as his rig merged with traffic from the airport. Maybe it was time to check out for a season, park his rig in his native village where people are simpler and more virtuous. Put his keys on the shelf and do nothing until the spring.

But these were the idle thoughts of a man moving at full speed in the direction of the Kremlin. On the right he passed one of Russia’s largest shopping malls, and a high wall of housing blocks that are home to some 8,000 new arrivals. After that there was nowhere to go but in.

Translations by Natalia V. Osipova and Philipp Chapkovski
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GRAPHICAL TECHNIQUES AND INTERACTIVITY
for enforcing the structure and narrative flow

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WHERE FARMING BEGAN (National Geographic, 2015)
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GRAPHICAL TECHNIQUES AND INTERACTIVITY
for enforcing the structure and narrative flow

3. Enhancing structure and navigation

- buttons
- scrolling
- breadcrumbs
- section header marks
- timeline
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- **buttons**
- **scrolling**
- **breadcrumbs**
- **section header marks**
- **timeline**

May 30, 1760

*I went to visit the Negroes in their Houses [where] I found also 7 of the wild Negroes, whereof one of the chiefs, is nam’d Acompong, who is a Captain of one of the 5 Towns, whc is call’d after him. His Br. Cudjoe is Coll. Of another. I have been told that in the 5 Towns, wch they, are above 1500 free Negroes, who lead an orderly Life, & have cultivated their own Land. Their Officers or Governors who are call’d Captains have a Pension from the Government. Capn Acompong’s Dress was an embroidered Waistcoat, gold Lace around his Hat, a silver chain abt. His Neck to wch was hung a silver Medal wherein, on one side was King George ye 2nd’s Picture and on the other his Commission with this subordination. Captn.*
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Elk’s Perilou Journey

Scroll to continue

THE JOURNEY OF YELLOSTONE ELK (National Geographic, 2016)
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Elk 22 winters on a mixture of private ranches, conservation easements, and nature preserves. These areas offer good grazing and safe haven from predators, but they’re dotted with oil and gas development—180 wells operate within Elk 22’s winter range. Around May 15, Elk 22 will start heading west on her annual journey to Yellowstone National Park.

THE JOURNEY OF YELLOSTONE ELK (National Geographic, 2016)
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GRAPHICAL TECHNIQUES AND INTERACTIVITY for enforcing the structure and narrative flow

Aleksandr Chertkov repaired his vehicle near the village of
4. Providing controlled exploration

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The Zagreb area averaged 5 days when temperatures climb to 32 degrees or higher in 1960, and could expect to see between 24 and 55 very hot days by the end of this century.
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Conclusion:

- A reflection on how authors currently tell stories in cartography.

- Mapping narratives requires the development of specific forms of cartographic representations → graphical techniques and interactivity that could enforce various levels of structure and narrative flow.

- Future work → cognitive and emotional experience of the reader.
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