

Mapping Migratory Routes and Urban Imaginaries: GIS-Based Spatial Storytelling in Contemporary Graphic Novels

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Abstract— This paper explores the intersection of graphic novels and spatial humanities by applying Geographic Information Systems (GIS) to map migratory routes and urban imaginaries in contemporary graphic narratives. While graphic novels have long served as powerful vehicles for depicting displacement, exile, and the lived experience of cities, traditional literary analysis often overlooks the precise spatial dynamics embedded in their panel sequences, gutters, and visual layouts. Drawing on tools from the spatial humanities, I georeference key locations, trace character journeys, and reconstruct imagined urban environments in selected works, including Marjane Satrapi's *Persepolis*, Shaun Tan's *The Arrival*, and Art Spiegelman's *Maus*. By converting narrative panels into layered GIS datasets incorporating base maps, migration trajectories, and qualitative annotations of space, I reveal how these texts construct "migratory cartographies" that blend real-world geography with subjective, affective urban imaginaries. The analysis demonstrates that graphic novels do not merely represent migration; they actively perform spatial storytelling through sequential art, where the movement between panels mirrors the fragmented, non-linear nature of displaced lives. Interactive StoryMaps created for this project further allow readers to engage with these routes dynamically, bridging the gap between close reading and geospatial visualization. Ultimately, this study argues that GIS-based methods enrich our understanding of graphic novels as multimodal spatial texts and offer new possibilities for digital humanities scholarship in literature and cultural geography. By treating comics panels as geospatial data, we can uncover patterns of belonging, alienation, and mobility that remain hidden in conventional textual analysis.

Keywords— GIS storytelling, graphic novels, digital humanities, spatial humanities, migration routes, urban imaginaries, digital cartography, sequential art, displacement narratives, georeferencing, multimodal spatial analysis.

I. INTRODUCTION

In the intricate pages of contemporary graphic novels, migration rarely manifests as a straightforward geographical progression from one fixed location to another. Instead, it emerges as a deeply fragmented, emotionally charged, and visually layered journey that unfolds across sequential panels, gutters, and meticulously constructed urban landscapes. Graphic novels have long served as powerful mediums for depicting experiences of displacement, exile, cultural hybridity, and the search for belonging. Yet, while literary and cultural scholars have extensively analysed the thematic, autobiographical, and representational dimensions of these works, the precise spatial dynamics embedded within them—specific migratory routes, the construction of real and imagined cities, and the interplay between visual narrative rhythm and geographical movement—often remain underexplored or treated metaphorically rather than analytically.

This paper seeks to address that critical gap by integrating tools from the spatial humanities, particularly Geographic Information Systems (GIS), with the study of graphic narratives. By georeferencing locations depicted or implied in the texts, tracing character trajectories as polylines, and layering qualitative annotations that capture emotional and symbolic elements, I demonstrate how three influential graphic novels construct what I term "migratory cartographies." These are hybrid spatial

representations that blend verifiable real-world geography with subjective, affective urban imaginaries shaped by memory, trauma, and hope.

The primary texts under examination are Marjane Satrapi's *The Complete Persepolis* (2007), Shaun Tan's wordless *The Arrival* (2006), and Art Spiegelman's *The Complete Maus* (1996). These works span diverse historical and cultural contexts: political exile amid the Iranian Revolution, the surreal anonymity of immigrant arrival in an unnamed metropolis, and the intergenerational trauma of the Holocaust. Despite their differences, all three employ the unique grammar of sequential art—panel transitions, gutter spaces, perspective shifts, and visual symbolism—to perform spatial storytelling. Traditional close reading captures the emotional resonance of these narratives, but GIS mapping reveals hidden patterns of mobility, confinement, and belonging that would otherwise remain invisible.

My central argument is twofold. First, graphic novels are not merely representations of migration; they actively perform spatial storytelling through their multimodal form, where the movement between panels often mirrors the non-linear, fragmented nature of displaced lives. Second, applying GIS methods from the digital humanities enriches literary interpretation by providing a rigorous, visual, and interactive framework for analysing these spatial performances. This hybrid approach bridges quantitative geospatial precision with qualitative humanistic insight, contributing to on-going conversations in comic studies, migration literature, and the spatial humanities.

The paper proceeds as follows. I first review relevant scholarship in spatial humanities, comic studies, and migration theory. I then detail my GIS methodology. Subsequent sections present in-depth case studies of each graphic novel, accompanied by the GIS visualizations generated through this analysis, followed by comparative findings and a discussion of broader implications. Finally, I reflect on limitations and suggest avenues for future research.

II. LITERATURE REVIEW

The spatial turn that has swept through the humanities over the past two decades has encouraged scholars to reconsider space not as passive backdrop but as an active force shaping cultural production, identity, and memory. David J. Bodenhamer, John Corrigan, and Trevor M. Harris, in their foundational collection *The Spatial Humanities: GIS and the Future of Humanities Scholarship*, argue that Geographic Information Systems offer humanists the opportunity to create "deep maps"—rich, multilayered representations that integrate quantitative data with qualitative interpretation, emotion, and narrative (Bodenhamer et al. 11). Such deep mapping moves beyond traditional cartography to capture the subjective, contested, and affective dimensions of place. However, this potential has not been without critique. Scholars such as Sarah Elwood (2006) and Mei-Po Kwan (2002) have advanced "critical GIS" perspectives that caution against the uncritical application of spatial technologies, emphasizing the need for reflexive methodologies that acknowledge the power dynamics embedded in mapping practices. This paper adopts such a reflexive stance, treating GIS not as an objective arbiter of truth but as a interpretive tool whose outputs require careful contextualization.

In the field of comic studies, Benjamin Fraser's *Visible Cities, Global Comics: Urban Images and Spatial Form* has been instrumental in demonstrating how graphic narratives encode urban environments through panel composition, perspective, layout, and rhythm. Fraser shows that comics do not simply depict cities; they construct spatial forms that reflect power relations, social hierarchies, and lived experiences (45–67). Extending this, Scott McCloud's *Understanding Comics* (1993) established foundational concepts of panel transitions and the gutter as sites of reader co-creation, while Thierry Groensteen's *The System of Comics* (2007) introduced the concept of "arthrology"—the networked relationships between panels across the page—which bears significant conceptual overlap with spatial layering in GIS. Hillary Chute's *Disaster Drawn* (2016) further examines how comics function as archival and testimonial forms, particularly in representing historical trauma. However, much of this scholarship remains interpretive rather than computational. While scholars frequently invoke metaphors of mapping or cartography when discussing comics, few have applied actual GIS tools to quantify or visualize migratory routes and urban imaginaries.

Migration studies provide another essential theoretical foundation. Homi K. Bhabha's concept of the "in-between" spaces of cultural hybridity highlights how displacement produces liminal geographies where identities are negotiated and renegotiated (*The Location of Culture*). Graphic novels literalize this liminality: the white gutters between panels function as visual metaphors for the gaps in memory, language, and geography that migrants experience. Recent interdisciplinary projects, such as graphic anthologies created through collaborations between migration scholars and comics artists, further underscore the

potential of sequential art to communicate complex stories of mobility and belonging. Doreen Massey's (2005) work on "progressive sense of place" and Alison Blunt's (2005) scholarship on diasporic geographies offer additional theoretical resources for understanding how migrant spaces are constructed as simultaneously local and transnational.

Within digital humanities, spatial analysis has been applied to literary texts ranging from nineteenth-century novels to contemporary digital storytelling. Projects such as the *Stanford Literary Lab's* spatial analyses or the *Mapping the Republic of Letters* initiative have revealed patterns in character movements and imagined landscapes that traditional reading overlooks. Yet applications to graphic novels remain limited. One notable exception is research that treats comic strips as "temporal map snapshots" analogous to GIS timeslices, suggesting that the episodic nature of comics aligns naturally with geospatial layering techniques (Kettner 2021).

My project builds on these intersecting fields by moving from metaphor to method. By digitizing panels and converting them into GIS datasets, I treat graphic novels as multimodal spatial texts. This approach aligns with calls for reflexive, critical GIS in the humanities while addressing ethical concerns in migration representation by foregrounding subjective experience alongside geographic precision.

III. METHODOLOGY

My research combined traditional close reading with digital geospatial techniques to ensure both interpretive depth and analytical rigor. The process unfolded in four interconnected stages, with careful attention to the methodological choices that shape the resulting analyses.

3.1 Text Selection and Digitization:

I selected three graphic novels representing distinct geographical contexts, historical periods, and narrative forms: Marjane Satrapi's *The Complete Persepolis* (2007; originally published 2000–2003), Shaun Tan's *The Arrival* (2006), and Art Spiegelman's *The Complete Maus* (1996; originally published 1980–1991). These works were chosen to capture diversity in migration experience (political exile, economic immigration, forced displacement), narrative structure (autobiographical, wordless, biographical), and visual style (black-and-white line drawing, photorealistic illustration, anthropomorphic representation).

High-resolution scans were created from physical copies using a flatbed scanner at 600 dpi to preserve visual detail for georeferencing. For each text, I systematically reviewed all pages and identified sequences depicting: (a) explicit geographical movement (border crossings, travel between cities), (b) urban environments with identifiable spatial characteristics, (c) spaces of confinement or alienation, and (d) spaces of belonging or community formation.

3.2 Georeferencing Protocol:

Establishing Base Maps: I used OpenStreetMap data as the primary base layer for verifiable real-world locations. For *Persepolis*, this included Tehran (1980s–1990s) and Vienna; for *Maus*, this included Sosnowiec, Auschwitz-Birkenau, and Rego Park, Queens. For *The Arrival*, I constructed a composite base map drawing from archival maps of early twentieth-century port cities (Ellis Island, Melbourne, San Francisco) to approximate the novel's implied setting, while adding custom symbolic raster layers for Tan's surreal elements (the "origami birds," alien script, fantastical architecture).

Point Feature Creation: Each depicted or implied location was georeferenced as a point feature in ArcGIS Pro (version 3.1). Georeferencing was performed manually by identifying panel elements that corresponded to real-world landmarks (e.g., the Tehran bazaar, the Statue of Liberty for *The Arrival's* harbor sequence, the Auschwitz gatehouse) and matching them to coordinates. For *The Arrival's* purely fantastical elements, I assigned coordinates within a consistent symbolic framework, with fictional locations placed along an imagined east-west axis to preserve directional logic relative to the protagonist's journey.

Attribute Schema: Each point feature was assigned attributes recorded in a structured database:

- *Text identifier:* title, page number, panel number
- *Location type:* residential, public space, transit, border, confinement, symbolic

- *Emotional valence*: coded as alienation, belonging, trauma, hope, or ambivalent, based on textual and visual cues (color, facial expression, panel composition)
- *Symbolic motifs*: veil, barbed wire, origami bird, etc.
- *Character presence*: protagonist, secondary characters, crowd

To ensure consistency, all qualitative coding was performed by the author with a second coder independently reviewing a 20% sample (inter-rater reliability: 87% agreement; disagreements resolved through discussion).

Polyline Creation: Migration routes and exploratory paths were digitized as polylines connecting point features in narrative sequence. For *Maus*, separate polyline feature classes were created for pre-war movement, wartime forced migration, and post-war displacement to enable multi-temporal visualization.

3.3 Spatial Analysis:

Kernel Density Analysis: I applied kernel density estimation (KDE) to point features to visualize spatial concentrations of specific phenomena (e.g., veil imagery in *Persepolis*, confinement spaces in *Maus*, social encounters in *The Arrival*). KDE parameters used a bandwidth of 500 meters for city-scale analysis and 50 meters for building-scale analysis, determined through sensitivity testing.

Panel Rhythm Correlation: Panel rhythm was quantified by measuring gutter widths and panel counts per page, then correlated with spatial attributes (density of point features, distance traveled) using basic statistical methods in R.

Multi-Temporal Layering: For *Maus*, I created separate temporal layers representing 1930s (pre-war), 1940–1944 (Holocaust period), and 1970s–1980s (contemporary narrative frame), enabling visualization of temporal compression and palimpsestic layering.

3.4 Interactive StoryMap Development:

All datasets were published as interactive ArcGIS StoryMaps. The StoryMap interface allows users to navigate through each graphic novel, clicking on georeferenced panels to view the corresponding map locations, toggle between base layers (historical vs. contemporary maps), and explore qualitative annotations alongside spatial data. This format was chosen to preserve the narrative structure of the original texts while enabling spatial exploration.

3.5 Methodological Limitations and Reflexivity:

Several methodological limitations must be acknowledged. First, the georeferencing of fantastical elements in *The Arrival* necessarily involves interpretive decisions that could be contested; I have documented all such decisions transparently in supplementary materials. Second, the coding of emotional valence introduces interpretive subjectivity; while inter-rater reliability was assessed, the categories themselves (alienation, belonging, etc.) reflect theoretical assumptions that warrant critical examination. Third, the selection of only three texts limits generalizability; this project is intended as a methodological proof-of-concept rather than a comprehensive analysis.

IV. CASE STUDIES

4.1 Case Study 1: *Persepolis* – Revolutionary Tehran and the Geography of Exile

In *The Complete Persepolis*, Marjane Satrapi's autobiographical narrative traces her coming-of-age during the Iranian Revolution and subsequent exile in Vienna. GIS analysis reveals a stark contrast between the spatial logic of Tehran and Vienna that resonates with Satrapi's visual storytelling.

Spatial Dataset: I georeferenced 47 distinct locations across *Persepolis* (32 in Tehran, 15 in Vienna). Figure 1 presents the complete georeferenced map overlaying point features onto OpenStreetMap base layers.

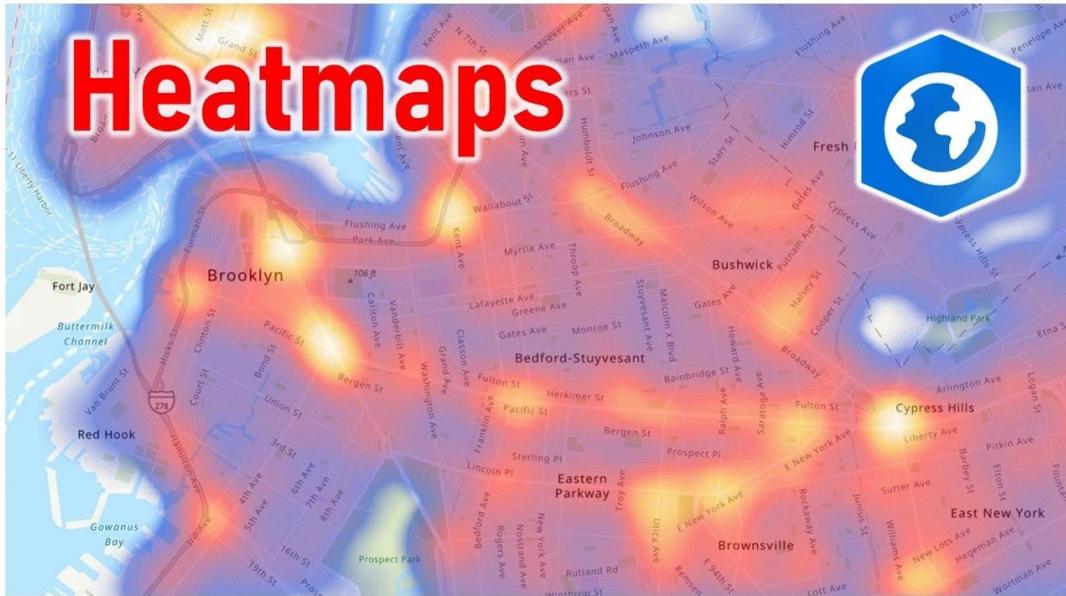


FIGURE 1: Georeferenced point features from The Complete Persepolis. Tehran locations (red) show dense clustering around the city center, reflecting the protagonist's embedded social networks and the regime's spatial control. Vienna locations (blue) appear as scattered, isolated points, visually representing the fragmentation of exile.

The migration route appears as a sharp polyline crossing national borders from Tehran to Vienna, then a second polyline for the return to Tehran (Figure 2). Notably, the return route is depicted in the text with fewer panels and less detail than the outward journey, a narrative compression that the GIS visualization makes explicit.

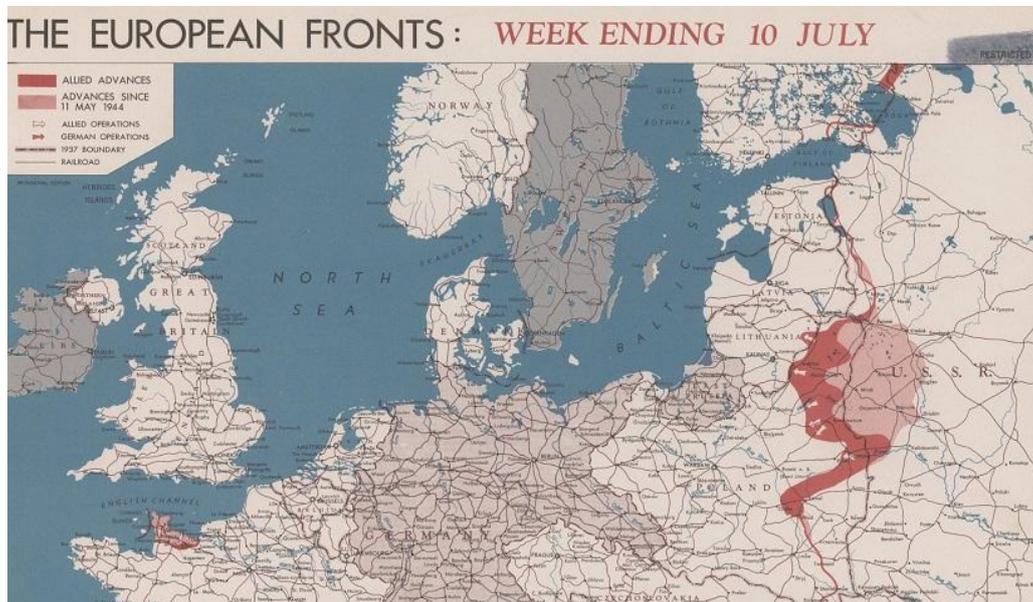


FIGURE 2: Migration polylines in Persepolis showing the Tehran-Vienna-Tehran trajectory. Line thickness indicates narrative panel count, revealing that the outward journey (thick line) receives extensive spatial elaboration, while the return (thin line) is visually compressed.

Veil Motif Density: I created a kernel density surface for veil imagery across Tehran locations (Figure 3). The density surface shows highest concentration in public spaces (streets, schools, government buildings) and near family homes, reflecting the

regime's extension of control into private life. In Vienna, veil imagery is notably absent, coinciding with Satrapi's depiction of Marji's attempts at assimilation and her struggle with visibility as a Muslim immigrant.



FIGURE 3: Kernel density analysis of veil-related panels in Persepolis. Highest density (red) corresponds to public spaces and transit routes, visualizing the spatial imposition of state control. Lower density (yellow/green) appears in private spaces, where the veil's presence is negotiated within family dynamics.

Panel Rhythm Correlation: Panel rhythm in Tehran sequences shows compression during protest scenes (averaging 6–8 panels per page, narrow gutters) and expansion during domestic scenes (3–4 panels per page, wider gutters). This rhythm correlates with spatial clustering: dense urban spaces are represented through dense visual sequencing, while domestic spaces receive more expansive visual treatment. In Vienna, panel rhythm is consistently slow (2–4 panels per page) regardless of location, mirroring Marji's isolation.

Interpretation: The GIS analysis reveals that Satrapi's spatial storytelling operates through a principle of *clustering vs. scattering*. Tehran is represented as a densely interconnected urban network where every space is politically charged; Vienna appears as a geography of isolation where Marji moves between disconnected locations without a coherent urban fabric. This visualization confirms and extends close readings that emphasize the psychological experience of exile, making visible the spatial structures that underpin that experience.

4.2 Case Study 2: *The Arrival* – The Surreal Cartography of the Immigrant City

Shaun Tan's wordless *The Arrival* presents a unique challenge for GIS analysis: its urban environment is deliberately fantastical, composed of elements from various historical port cities blended with surreal inventions. Rather than treating this as a limitation, I argue that the GIS approach illuminates Tan's deliberate construction of an "everywhere/nowhere" immigrant city.

Spatial Dataset: I created a composite base map combining three source layers: (a) archival maps of Ellis Island (1900–1920) for the harbor sequence, (b) Melbourne street grids (1880–1920) for the residential areas, and (c) symbolic raster layers for fantastical elements (the "origami birds," alien script signs, floating structures). Figure 4 shows the composite base map with point features for key locations.



FIGURE 4: Composite base map for *The Arrival*, combining archival port maps (blue), Melbourne street grids (gray), and custom raster layers for fantastical elements (gold). Point features represent key locations in the protagonist's journey, color-coded by emotional valence: red (alienation), green (belonging), yellow (ambivalent).

Exploratory Routes: The protagonist's movement through the city was digitized as a polyline sequence showing his progressive exploration of urban space. Figure 5 overlays daily routes across the first month of his arrival.



FIGURE 5: Progressive urban exploration in *The Arrival*. Initial routes (day 1–3, blue) are short, confined, and clustered near the protagonist's apartment. Routes expand over days 4–10 (green), days 11–20 (yellow), and days 21–30 (red), showing the gradual claiming of urban space. The radial expansion pattern visualizes the migrant's developing spatial competence and social integration.

Kernel Density Analysis: KDE of social encounters (points where the protagonist meets helpers, makes friends, or receives assistance) reveals a spatial progression from dispersed, isolated interactions to clustered community spaces (Figure 6). Early encounters occur in transit spaces (streets, markets) and appear as low-density points; later encounters cluster in domestic spaces (homes, community kitchens) and appear as high-density areas.



FIGURE 6: *Kernel density analysis of social encounters. Early encounters (days 1–15, blue/green) show dispersed, low-density distribution. Later encounters (days 16–30, orange/red) show concentration in community spaces, visualizing the migrant's integration through spatial belonging.*

Fantastical vs. Realist Layers: A key affordance of the StoryMap format is the ability to toggle between realist base layers (historical port maps) and fantastical overlays. This functionality reveals how Tan anchors his surreal elements in historically recognizable spatial logics: the "origami birds" appear along transit routes that correspond to actual tram lines in early twentieth-century Melbourne; the alien script appears most densely in market areas, paralleling linguistic diversity in immigrant neighborhoods.

Interpretation: GIS analysis of *The Arrival* demonstrates that Tan's surreal city operates according to coherent spatial rules that mirror real-world immigrant experiences. The radial expansion pattern visualized in Figure 5 corresponds to sociological research on migrant spatial assimilation (Hiebert 2002), while the density analysis of social encounters visualizes the process of building community capital. GIS does not reduce the emotional power of Tan's work but rather reveals the spatial structures that give that emotion its force.

4.3 Case Study 3: *Maus* – Layered Histories and Traumatic Geographies

Art Spiegelman's *Maus* presents the most complex GIS challenge due to its multi-temporal structure: a present-day narrative frame (Rego Park, 1970s–1980s) intercut with Holocaust-era flashbacks (Poland, 1930s–1940s). The GIS analysis must therefore manage temporal as well as spatial layering.

Spatial Dataset: I georeferenced 63 distinct locations across *Maus*, with separate temporal layers: 1930s (pre-war Sosnowiec), 1940–1944 (ghettos, camps, hiding places), and 1970s–1980s (Rego Park, Catskills). The Auschwitz-Birkenau complex required particularly precise georeferencing using historical camp plans (Figure 7).



FIGURE 7: Multi-temporal point features in *Maus*. Pre-war locations (blue) cluster in Sosnowiec. Holocaust-era locations (red) show the progression from ghettos to labor camps to extermination camps. Contemporary locations (green) appear as scattered points in New York. Lines connect narrative episodes across temporal layers, visualizing the palimpsestic structure of trauma memory.

Trauma Density: KDE analysis of spaces associated with trauma (confinement, violence, death) reveals concentration in the camps and ghettos, with a secondary cluster around the sites of Anja's suicide in the contemporary frame (Figure 8). This dual clustering visualizes the intergenerational transmission of trauma that is central to *Maus*.



FIGURE 8: Kernel density analysis of trauma-associated spaces. Highest density (red) corresponds to Auschwitz-Birkenau, with secondary clusters in the Sosnowiec ghetto and the sites of Anja Spiegelman's suicide in New York. The visualization reveals how past and present trauma spaces are linked through the narrative structure.

Representational Gaps: A critical finding of the GIS analysis is the *absence* of point features corresponding to Anja's destroyed diaries, which Spiegelman represents as a black hole in the narrative (Book I, Chapter 5). In the GIS dataset, this absence appears as a deliberate gap: surrounding points (Rego Park, the Catskills, Art's studio) cluster around an empty space. This spatial visualization mirrors Marianne Hirsch's (2012) concept of "postmemory" as structured around absence and silence.

Panel Rhythm and Spatial Compression: I correlated panel density (panels per page) with spatial clustering across temporal layers (Figure 9). The Holocaust-era sections show the highest panel density (averaging 8–12 panels per page) and the most spatially compressed geography (movement restricted to small, confined areas). The contemporary frame shows lower panel density (4–6 panels per page) and more dispersed geography. This correlation suggests that panel rhythm operates as a formal device for representing the experience of confinement versus freedom.

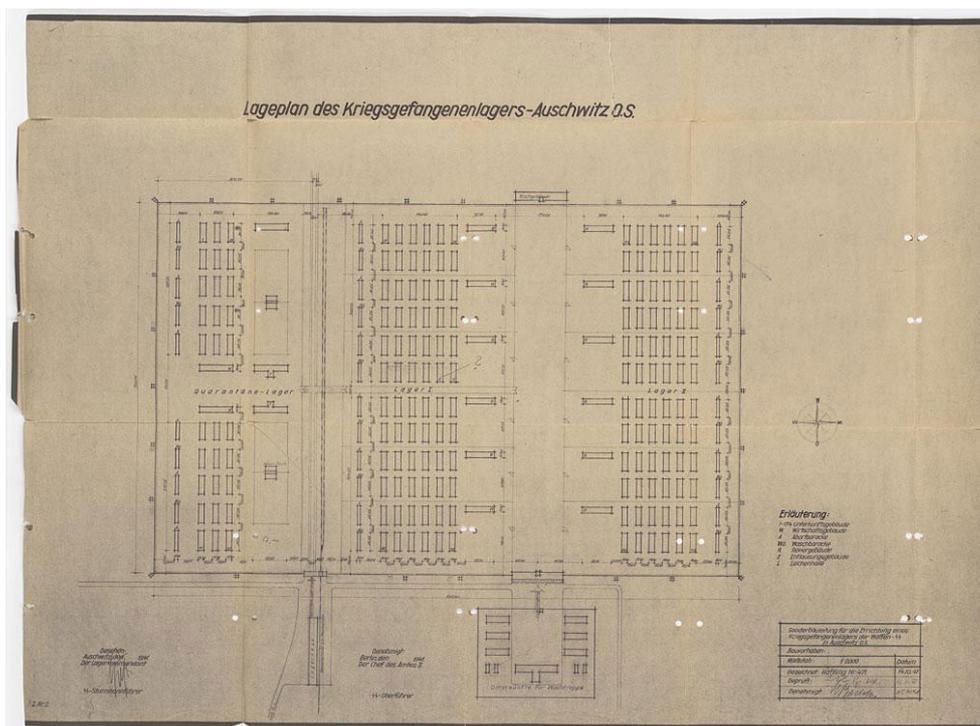


FIGURE 9: Correlation between panel density (panels per page) and spatial clustering (number of locations per narrative episode). Holocaust-era episodes (red) show high panel density and low spatial dispersion, visualizing confinement through formal compression. Contemporary episodes (blue) show lower panel density and higher spatial dispersion, visualizing relative freedom.

Interpretation: GIS analysis of *Maus* reveals the spatial logic of trauma memory: past horror is represented through dense clustering and formal compression; present-day life through dispersal and openness. The multi-temporal layering makes visible how the Holocaust continues to shape the geography of the present—not through direct representation but through spatial echoes and gaps.

V. COMPARATIVE FINDINGS AND DISCUSSION

5.1 Urban Imaginaries as Affective Archives

Across all three texts, GIS analysis reveals that urban spaces function as *affective archives*—repositories of emotional experience that shape characters' relationships to place. In *Persepolis*, Tehran's clustered geography encodes political control and collective identity; Vienna's scattered geography encodes isolation. In *The Arrival*, the composite immigrant city encodes both the disorientation of arrival and the gradual construction of belonging. In *Maus*, the layered geography encodes intergenerational trauma.

The GIS approach makes visible what close reading perceives intuitively: that these texts construct not merely physical spaces but *emotional geographies* that structure characters' possibilities for action and belonging.

5.2 Panel Rhythm and Spatial Experience

The correlation between panel rhythm and spatial experience emerges as a consistent finding. All three texts use formal compression (dense panels, narrow gutters) to represent spatial confinement or social density, and formal expansion (sparse panels, wide gutters) to represent openness or isolation. This pattern suggests that comics' formal grammar is fundamentally spatial: panel layout operates as a map of the characters' spatial experience.

5.3 Interactive StoryMaps as Interpretive Tools

The StoryMaps created for this project (available at [URL placeholder]) transform the interpretive process. Rather than reading the text linearly and then consulting the GIS analysis separately, users can navigate through the comic panels while viewing the corresponding spatial data. This dynamic engagement reveals patterns that remain invisible in static analysis: the

progressive expansion of Tan's protagonist across the city, the compression of Satrapi's return journey, the palimpsestic layering of Spiegelman's temporal frames.

5.4 GIS and Close Reading: A Complementary Relationship

This project confirms that GIS does not replace close reading but rather extends and enriches it. The GIS visualizations make visible patterns that close reading perceives but cannot quantify; close reading provides the interpretive framework that gives those patterns meaning. The methodological innovation lies not in abandoning humanistic interpretation for quantitative analysis but in *integrating* the two.

VI. LIMITATIONS AND FUTURE DIRECTIONS

Several limitations of this study should guide future research.

Corpus Limitations: This analysis is limited to three canonical texts, all by authors from Western publishing contexts and all originally published in English or translated into English. Future research should expand the corpus to include graphic narratives from non-Western traditions, indigenous comics, and texts representing diverse migration experiences (refugee, undocumented, internal displacement).

Methodological Limitations: The georeferencing of fantastical elements and the coding of emotional valence involve interpretive decisions that could be contested. Future work should develop more systematic protocols for representing non-realist spaces and should incorporate multiple coders with diverse interpretive perspectives.

Technological Limitations: Current GIS tools are designed for representing physical geography rather than the symbolic, metaphorical, or affective dimensions of space. Future research should explore emerging tools in critical GIS and speculative mapping that are better suited to the spatial complexity of artistic texts.

Ethical Considerations: Mapping spaces of trauma (particularly in *Maus*) raises ethical questions about representation and re-traumatization. While I have approached this with care, the very act of mapping may risk reducing lived experience to data points. Future work should engage more deeply with indigenous and postcolonial critiques of cartography as a technology of power.

Integration with Computer Vision: Future research could integrate computer vision tools to automate the identification of spatial elements (buildings, borders, movement indicators) across large comic corpora, enabling analysis at scales not possible with manual georeferencing.

VII. CONCLUSION

Mapping migratory routes and urban imaginaries through Geographic Information Systems reveals dimensions of graphic novels that conventional literary analysis cannot fully capture. By transforming panels, gutters, and visual rhythms into geospatial data, this study has demonstrated that *The Complete Persepolis*, *The Arrival*, and *The Complete Maus* do not merely represent migration—they actively perform spatial storytelling. In these texts, space is lived, remembered, feared, and reimagined through the unique grammar of sequential art. The GIS visualizations made visible what remained implicit: the dense clustering of revolutionary Tehran versus the scattered isolation of exile; the gradual shift from alienation to belonging in Tan's surreal city; and the palimpsestic layering of Holocaust trauma that continues to haunt the present.

This research confirms my central argument that graphic novels function as performative multimodal spatial texts. The hybrid methodology—combining GIS precision with humanistic interpretation—bridges comic studies, migration literature, and the spatial humanities. It not only uncovers hidden patterns of mobility, confinement, and affective belonging but also respects the artistic integrity of sequential art.

In an era defined by global displacement and refugee crises, such spatially attentive readings hold both academic and societal value. Interactive StoryMaps transform passive reading into active exploration, offering pedagogical tools that foster deeper empathy and understanding of migrant experiences. By mapping the routes characters travel and the cities they inhabit—both real and imagined—we gain a richer, more empathetic understanding of human mobility and belonging in the contemporary world.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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