Graphonauts:

Introducing a Hybrid Human–AI Pipeline for Text-to-Game Transformation via Knowledge Graphs

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ABSTRACT

This study represents the first systematic attempt to transform ethnographic texts into playable game experiences using knowledge graphs (KGs) as an intermediary framework. While large language models (LLMs) promise automated KG construction from text, dense ethnographic writing resists full automation: its interpretive richness requires human expertise to preserve nuance, ensure transparency and maintain scholarly integrity. We therefore introduce a pioneering two-stage hybrid workflow that integrates expert interpretation with computational assistance. In the first stage, a domain expert collaborates with an LLM to construct a knowledge graph, guiding the model to extract salient concepts and relationships from ethnographic source material. In the second stage, a custom tool procedurally renders this KG as a playable 2D platformer where concepts become traversable platforms and relations appear as interactive mechanics such as ladders, bridges, and navigable gaps. Using the anthropological classic *Argonauts of the Western Pacific* as a case study, we analyze through autoethnographic analysis how players experience what we call experiential hermeneutics, a fusion of epistemic, kinaesthetic and interpretive pleasures, when moving through theoretical structures rather than merely reading them. We argue that this hybrid workflow offers a pragmatic and reflexive path for integrating LLMs into playable scholarship while foregrounding the interpretive and affective dimensions of game-based knowledge representation.

Keywords

Large Language Models, Playable Knowledge Graphs, Human-AI Cooperation, Experiential Hermeneutics, Affective and Interpretative Pleasures.

INTRODUCTION

Knowledge graphs (KGs) serve as structured repositories of human knowledge, powering applications from search engines to question-answering platforms. Major knowledge graphs such as Wikidata (Vrandečić 2012) and Freebase (Bollacker 2007) have traditionally been built through crowd-sourcing (Cao et al. 2020), involving three fundamental stages: knowledge acquisition, knowledge refinement, and knowledge evolution (Zhong et al. 2023). The manual nature of this approach, while ensuring quality control, remains labor-intensive and time-consuming, creating significant barriers to knowledge representation in specialized domains.

Recent advances in large language models (LLMs) promise to automate KG construction from unstructured text, demonstrating strong performance in entity and relation extraction tasks (Zhong et al. 2023; Koutsiana 2025). However, it remains an open question whether LLMs can effectively build knowledge graphs from anthropological texts. The dense, interpretive nature of humanities scholarship presents unique challenges (Diaz 2024): ethnographic writing layers multiple meanings (Geertz 2008), requires domain expertise to decode, and are likely to resist the kind of straightforward extraction that works well for factual databases. Moreover, fully automated approaches raise concerns about scholarly transparency, interpretive fidelity, and trustworthiness (Koutsiana 2025), critical issues when representing decades of fieldwork and theoretical insight.

Rather than pursuing full automation, this study introduces a hybrid human–AI workflow that positions the LLM as a collaborative tool guided by expert interpretation. Taking Bronisław Malinowski's *Argonauts of the Western Pacific* (1922) as our case study, we explore how domain experts can work alongside LLMs to construct anthropological knowledge graphs that preserve ethnographic nuance while leveraging computational efficiency. We then extend this inquiry beyond representation to ask: what happens when we transform these knowledge graphs into playable experiences? Specifically, we develop a custom tool that procedurally renders KGs as 2D platformer games, where anthropological concepts become traversable platforms and theoretical relationships manifest as interactive mechanics: ladders connecting hierarchical ideas, bridges spanning conceptual distances, gaps requiring interpretive leaps. We apply this tool to our human-ai co-created knowledge graph, and explore how users perceive the resulting game 'Graphonauts' through the method of autoethnography (Adams 2016, Rapp 2018).

We find then that this text-to-game transformation via knowledge graph intermediation opens new possibilities for what we term *experiential hermeneutics*: a mode of engagement where players move through theoretical structures rather than merely reading them, fusing epistemic understanding with kinaesthetic pleasure and interpretive discovery.

Our contributions to the literature are therefore fourfold.

1. A hybrid human–LLM workflow for generating compact ethnographic knowledge graphs.
2. A procedural translation system that renders these graphs playable through 2D platformer mechanics.
3. An autoethnographic assessment revealing three pleasure modalities, namely epistemic, kinaesthetic and hermeneutic, that characterize player engagement with playable knowledge graphs, expanding the literature on embodied and interpretive pleasures in games.
4. A theoretical articulation of experiential hermeneutics as a mode of playable scholarship.

The remainder of this paper proceeds as follows: Section II situates our work within the existing literature on knowledge graph construction, procedural rethoric and computational anthropology. Section III details then our two-stage system design: the hybrid workflow for expert-guided KG construction and the procedural engine that transforms graphs into playable platformer environments. Section IV presents our case study on the anthropological classic 'Argonauts of the Western Pacific', documenting the transformation process and analyzing the three pleasure modalities, namely epistemic, kinaesthetic, and hermeneutic, that emerge from playing 'Graphonauts'. This section also discusses the limitations that emerge from the entire text-to-game via knowledge graph transformation. Section V concludes and lays out directions for future work.

BACKGROUND AND RELATED WORK

The Challenge of Automating Knowledge Graph Construction

Knowledge graphs gained widespread attention in 2012 when Google introduced its Knowledge Graph to enhance search results by integrating information from multiple sources (Singhal et al. 2012). At their core, knowledge graphs represent information as networks where nodes denote entities (objects or concepts) and edges define the relationships between them (Zhong et al. 2023). This structured format captures real-world knowledge in ways that are both intuitively understandable to humans and computationally efficient for machines. While definitions have evolved over the past decade, the fundamental goal remains unchanged: organizing complex information into systematic, interconnected formats that bridge human and machine comprehension (Fensel 2020).

Given the labor-intensive nature of manual knowledge graph construction, there has been considerable interest in automation (Oelen 2020). This automation involves several key subtasks: named entity recognition (Chiu 2016), relation extraction (Zeng et al. 2015), event extraction (Chen et al. 2015), and entity linking (Shen et al. 2014). With advances in natural language processing, the field has increasingly adopted transformer-based architectures for automatic knowledge graph creation (Xu et al. 2024). Two primary research directions have emerged: extracting knowledge graphs from existing large language models (Funk et al. 2023), or using LLMs to build knowledge graphs from scratch or complete initial ontologies (Veseli 2023). Recent studies demonstrate GPT-4's particular effectiveness in knowledge graph construction tasks (Zhu et al. 2024).

Regardless the improvements, it may be that text-to-KG construction systems will always need some human oversight in order to build trust with the users (Groth et al 2023). Within regards to the humanities this may be particularly true since texts from the humnanities tend to depend on narrative structure, cultural nuance and implicit context (Diaz 2024). However, it remains an open question to what extent LLMs are capable to extract entities and relations from anthropological monographs or related anthropological texts (f.e. fieldnotes or publications). Our work contributes to the literature then in two ways: first, we demonstrate how a hybrid human-LLM workflow can generate viable knowledge graphs from anthropological monographs; second, we show how these curated knowledge graphs can become interactive and playable rather than merely visualized.

Procedural Rhetoric and Playable Interpretation

Games convey meaning through rules, systems, and affordances, a process known as procedural rhetoric (Bogost 2010). Whereas conventional visualization tools present knowledge as diagrams or taxonomies, games render relational structures as lived, enacted experiences. This perspective has shaped a wide range of playable media, from citizen science games such as Foldit (Yoshimi 2025) to critical art games like *The Migrant Trail*, where understanding emerges through interaction rather than observation.

Within the humanities, a growing movement explores how games can function as interpretive tools, enabling players to engage with cultural or theoretical material

through system-based experience rather than textual explanation (Flanagan 2009). Instead of expressing theories through diagrams or prose, researchers design systems in which conceptual relations are performed by players themselves. This resonates with 'procedural hermeneutics' (Salin 2018): the idea that interpretation unfolds through action, experimentation and embodied traversal.

Our work extends this trajectory by using curated LLM-produced knowledge graphs as the structural basis for a 2D platformer. Anthropological relations are mapped to physical mechanics such as climbing, crossing or leaping, turning abstract argumentation into spatial, kinaesthetic inquiry. This shift makes play a way to engage with theory, not just show it.

Computational Anthropology and Knowledge Graphs

Anthropology's engagement with computation dates back at least six decades to Hymes' publication of *The Use of Computers in Anthropology* (Hymes 1965). Yet, as both historical surveys and recent methodological reflections show (Peponakis 2021), computational approaches have remained at the margins of the discipline. Albris et al. (2021), for example, argue that despite growing interest in digital tools, anthropology continues to struggle with integrating computation in ways that respect the interpretive depth of "thick data" and ethnographic practice. They propose that computational methods should *complement* rather than replace ethnographic reasoning, an orientation that also guides the present work.

In recent years, however, computational anthropology has expanded to include text mining, knowledge modeling, agent-based simulation and cultural analytics (Leetaru 2014; Peponakis 2021). Yet these techniques typically rely on large corpora or structured datasets, thereby leaving unaddressed the narrative density of ethnographic monographs, exactly the challenge highlighted by Albris et al. (2021), who note that most digital methods struggle to work directly with ethnographic "thick" materials. While ontologies have begun to gain traction within anthropology (Colpron 2022) , they are rarely translated into fully structured knowledge graphs, and existing work has not explored how such graphs might become interactive or playable systems.

Parallel work in "anthrogames" (Hoffmann & Paschke 2025) demonstrates that game mechanics can embody anthropological concepts, enabling scholars to "think-with" cultural processes through play. Previous anthrogame prototypes, whether gamified chat interfaces (Hoffmann 2024, 2025a) or the AI-native educational game 'Malinowski's Lens' (Hoffmann 2025b), have focused on representing *aspects* of ethnographic reasoning, but none have explored the structured representational affordances of knowledge graphs.

Our work extends these developments by introducing a prototype that uses a hybrid human-LLM workflow to transform ethnographic monographs into playable 2D platformer games. Building on Albris et al. (2021)'s call for anthropologists to experiment with computational tools while remaining attentive to ethnographic nuance, we propose playable knowledge graphs as a method that converts monograph-based knowledge into interactive node-and-relation structures that players navigate through gameplay. This approach reframes the computational engagement not as a replacement of narrative ethnography but as an experimental

complement: a way of exploring, inhabiting, and interpreting anthropological knowledge through structured yet playful means.

TWO-STAGE SYSTEM DESIGN AND IMPLEMENTATION

This section presents our hybrid pipeline that transforms an ethnographic monograph into a playable 2D knowledge-graph world. Unlike fully automated systems, our pipeline is intentionally semi-automated: an LLM proposes a structured graph, and the researcher refines it before procedural translation.

Overview of the Hybrid Pipeline

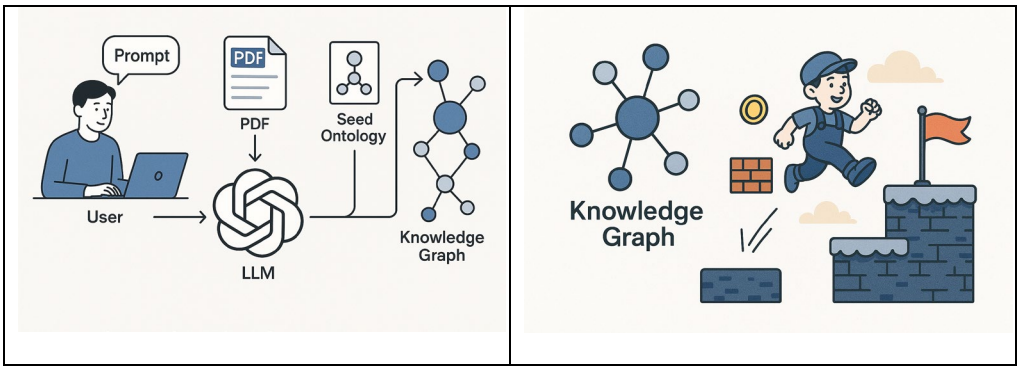

Figure 1: Overview of the Pipeline from Unstructured Text to Playable Knowledge Graph using an LLM.

The hybrid workflow unfolds in two interconnected stages (See also Figure 1). In the first stage, the researcher uses the chat interface of an LLM (in our case, Claude Sonnet 4.5) to construct a knowledge graph through iterative prompting. The researcher provides three inputs: a crafted prompt (see Appendix), the monograph as a PDF, and a foundational ontology (see Appendix). The LLM then processes these inputs to generate an initial knowledge graph that extracts key entities and relations from the ethnographic text.

The resulting graph is not accepted uncritically. The domain expert inspects the generated knowledge graph and evaluates whether it accurately represents the major concepts of the book. If necessary, the expert either refines the output through additional prompting to improve the structure, or manually edits the graph by adjusting connections and adding nodes. This manual inspection is crucial to ensure the knowledge graph genuinely conveys the book's central concepts, though it remains subject to the domain expert's own interpretive biases. Through this iterative process of generation, evaluation and refinement, a deliberately compact, human-vetted knowledge graph emerges that is suitable for computational transformation. Figure 2 illustrates a sample graph of size n = 20 generated from the monograph used in our experiments.

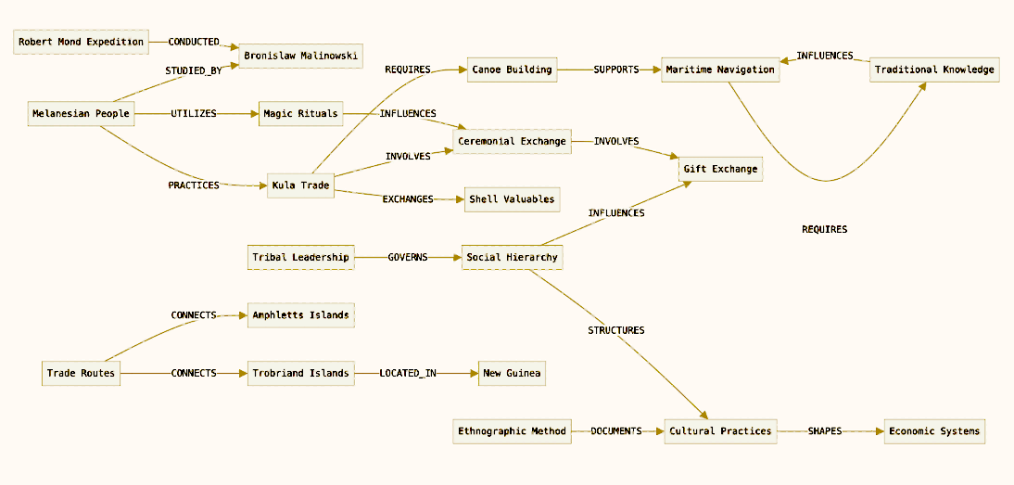

Figure 2: Knowledge Graph for N=20 for 'Argonauts of the Western Pacific'.

In the second stage, the curated graph is imported into our custom translation tool, which procedurally converts it into a playable environment. The tool automatically assigns spatial coordinates, transforms nodes into platforms, maps relation types to mechanical affordances, implements fog-of-war logic, and ultimately outputs a fully navigable 2D platformer. This stage is fully automated and deterministic, ensuring consistent results regardless of variability in the upstream LLM interaction.

Across both stages, the guiding criterion is not perfect extraction accuracy but *playability*: the creation of a graph that is small enough to explore, structurally coherent and conceptually rich in ways that can be expressed through game mechanics.

Player-Facing Interface

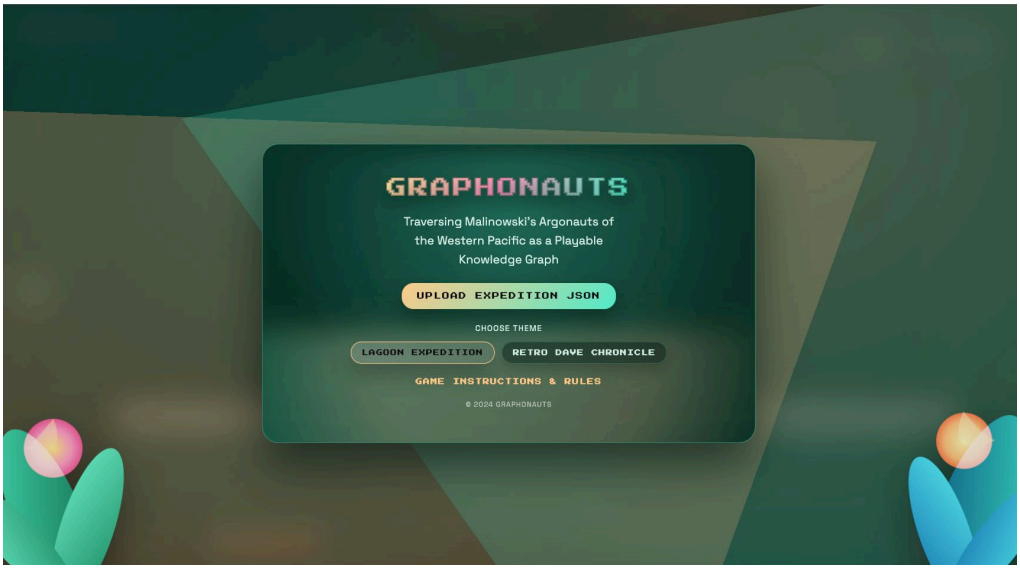

Figure 3: Title Screen of the Game 'Graphonauts'

Graphonauts presents a minimalist interface designed to foreground spatial navigation and conceptual discovery. At the beginning of the game, players see an

introduction screen, depicted in Figure 3. It shows the title of the game Graphonauts, presented on abstract background in deep greens with glowing plant-like shapes at the corners. Centered on the screen is a rounded rectangular panel displaying the game's logo in neon-pixels. Below the text is a button inviting the player to upload the knowledge graph in JSON format. The screen also offers a choice between two visual themes and a link to Game Instructions & Rules, all arranged neatly together to guide the player into the game World.

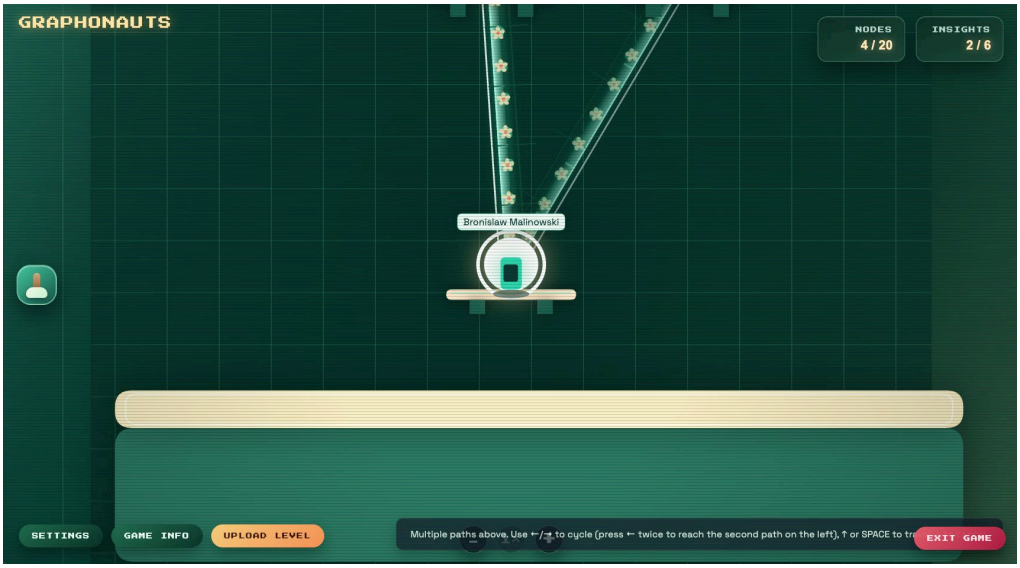

Figure 4: User Interface of the Game 'Graphonauts'

After uploading the knowledge graph, the player views the main interface of Graphonauts (Figure 4). The main Graphonauts interface unfolds as a spacious, teal-toned grid where the player begins on an initial platform connected to several potential routes. By pressing the up arrow, the player can cycle through these available paths, each visually coded to indicate its relation type: hierarchical connections appear as ladder-like structures, while relational or associative paths take the form of smooth, branching trails. Selecting one allows traversal to the next platform in the conceptual landscape. The current concept such as *Bronisław Malinowski* is highlighted at the center, with its reachable paths extending above. On the left side of the screen, a digging tool icon can be dragged onto any platform to 'dig deeper' opening a pop-up window where the player can engage in a chat-with-PDF style dialogue with the underlying concept or source material. In the upper-right corner, progress indicators track both Nodes visited and Insights earned, reinforcing a sense of advancement through the knowledge graph. Functional buttons at the bottom (Settings**,** Game Info**,** Upload Level**,** and Exit Game) provide quick navigation and also a possibility to zoom in and out the user interface window (See additional Screenshot in the Appendix).

Traversal as Learning: The Player Journey

Players begin at a root concept derived from the monograph such as *Argonauts of the Western Pacific* surrounded by a thick fog-of-war that mirrors the initial uncertainty of entering an unfamiliar ethnographic field. The game's goal is to visit all plattforms in the level. As traversal unfolds, different relation types shape how the conceptual landscape gradually becomes visible: hierarchical relations reveal nearby

nodes, associative relations expand lateral clusters of related ideas, and transformative relations trigger longer jumps that unlock more distant conceptual terrain. This movement is not merely mechanical navigation but an interpretive process: failed jumps, unexpected detours, and surprising linkages encourage players to reconsider the conceptual proximities and distances within the ethnography itself. Insight coins appear only after at least six prerequisite nodes have been visited, underscoring that comprehension emerges through synthesizing interconnected concepts rather than encountering them in isolation. Through exploration, reflection and discovery, the act of traversal becomes a form of learning (1).

Mechanics-to-Semantics Mapping

As shown in Table 1, each edge type corresponds to a movement mechanic:

Relation Type	Meaning	Mechanic
Hierarchical (part-of, subset, derivation)	Vertical ordering	Ladders
Associative (related-to, influences, co-occurs)	Lateral Connection	Bridges
Transformative (requires, depends-on, causes)	Conceptual Rupture	Gaps/Jumps

Table 1: Relation to Movement Mechanic

This mapping is not decorative; it is interpretive. Physical movement makes conceptual structure felt in the body. A difficult jump signals a conceptual discontinuity; a gentle ladder ascent suggests layered hierarchy; a long bridge evokes a stable association. Thus, abstract anthropology becomes kinaesthetic.

Technical Architecture

At the heart of our prototype is the level-generation module, which translates the abstract knowledge graph (inputted as JSON) into a coherent two-dimensional game environment that players can traverse (2). Building on the graph produced through the LLM-guided curation process (as described in III.1), this component applies a structured mapping procedure that distributes concepts across the plane using a deterministic force-directed layout. In this approach, spatial organization emerges from geometric forces and graph connectivity rather than predefined semantic mappings between relation types and spatial axes. While relation categories remain meaningful for in-game mechanics and visual cues, the underlying layout is driven by the spring algorithm's balancing of repulsion and attraction, producing a navigable arrangement that remains reproducible across runs.

The spatialization process is implemented in a dedicated Python module**,** which computes the layout and serializes it into a JSON-based level specification**.** Python is also used for the graph-to-game translation pipeline and the generation of all level metadata. The resulting JSON specification defines the placement of interactive concept nodes and the edges that connect them, along with the lightweight triggers that govern how players reveal or encounter textual information within the game world. It also embeds semantic styling metadata, enabling visually distinct

representations of different relation types or conceptual categories through a canonical colour mapping. Node-salience values inform several gameplay-facing design choices: they indicate which concept becomes the player's starting position, determine the small set of neighbouring nodes revealed at the outset, and identify the most conceptually significant nodes that appear as collectible "insights" during traversal. In this way, salience contributes to shaping the player's interpretive entry point into the graph while the geometric layout remains governed by the force-directed algorithm.

To ensure flexibility and reproducibility, the system exposes its mechanical and spatial parameters through an external configuration file. This file allows researchers to systematically vary factors such as gravity, jump force, fog density, camera speed and the overall scale of the level. By parameterizing these variables, the level-generation module supports controlled experimentation with spatial metaphors for textual structure, enabling future studies that examine how different mappings between semantic relations and game geometry affect player navigation, comprehension and engagement.

Once generated, the level specification is consumed directly by the browser-based game engine**,** which is implemented in JavaScript and HTML and renders the game world using the browser's built-in Canvas2D API. This engine handles all moment-to-moment runtime systems, including rendering, platform physics, fog-of-war logic, and player interaction. Together, the Python-based generation pipeline and the lightweight browser-native rendering framework form a fully reproducible workflow from knowledge-graph input to playable spatial experience.

AUTOETHNOGRAPHIC EVALUATION OF PROTOTYPE

Rationale for Selecting Autoethnography

Autoethnography offers an established mode of inquiry that foregrounds the researcher's embodied engagement as a source of data (Cunningham & Jones 2005). The method has proven especially valuable in Human Computer Interaction (Rapp 2018) and game studies, where scholars have used autoethnography both to guide iterative design (Rahbek 2025) and to evaluate player experience (Adams et al. 2016).

We adopted autoethnography for three reasons. First, the approach legitimizes the embodied, affective, and interpretive qualities of play, elements central to our investigation of playful knowledge graphs. Second, it enables reflexive analysis of our own assumptions and interpretive biases, offering insights that formal usability studies might overlook. Third, it provides a resource-efficient means of generating preliminary findings prior to larger empirical studies, avoiding the logistical demands of participant recruitment and controlled experimentation.

In this context, autoethnography serves as both methodology and meta-commentary: by engaging the prototype as researchers and players, we illuminate how playable knowledge graphs reorganize scholarly understanding.

Case Study Selection: *Argonauts of the Western Pacific*

We chose Bronisław Malinowski's 'Argonauts of the Western Pacific' (1922/2013) to test our approach. This ethnography offers a complex conceptual terrain of interwoven themes such as reciprocity, circulation, hierarchy, ritual knowledge, and maritime mobility, that lends itself well to procedural mapping. Its conceptual density made it particularly suitable for transformation into a playable graph, enabling us to investigate how anthropological theory might be reformulated through interactive navigation.

Several factors informed this selection. First, the work stands as a foundational text in social anthropology, commonly assigned to undergraduates and thus widely familiar within the discipline. Second, its central focus, the Kula exchange system, remains a generative site for anthropological inquiry, as evidenced by recent scholarship such as James and Hann's (2024) centenary volume. Third, the ethnography's emphasis on movement (for example canoe voyages, circulating shell valuables, ritual sequences, and various forms of spatial and social mobility) aligns naturally with the navigational mechanics of game environments.

Transforming the Ethnography into a Playable 2D Platformer

To convert *Argonauts of the Western Pacific* into an interactive 2D platformer, we applied the pipeline described earlier, beginning with the construction of the knowledge graph by the lead author of this paper, who has read the book intensively prior to the study. To do so effectively, the lead author experimented with different prompt designs for several days before settling on the final prompt (suggested in the Appendix) that worked in tandem with the foundational ontology (Appendix) and the book fed to Claude-Sonnet-4.5 via the public interface to create the 20-node knowledge graph. target size of twenty nodes was intentional: it aligns with the typical number of discrete platforms found in conventional platformer level design, making the conceptual structure directly mappable onto spatialized game elements. The resulting knowledge graph was further vetted by a senior anthropologist to make shure all entities and relations match with the content of the book.

Once the graph was finalized, our system procedurally translated it into a network into a playable 2D platformer. Nodes were rendered as platforms, relations were converted into navigational pathways or constraints, and clusters informed the arrangement of level segments to preserve thematic coherence. The transformation tool automated asset placement, collision logic and traversal flow, enabling an immediate transition from textual abstraction to functional gameplay (2).

Autoethnographic Procedure

To investigate how the prototype mediates ethnographic knowledge through play, two participants conducted multiple gameplay sessions, each approximately five minutes in duration. One of the authors observed player behavior and interactions with the system during gameplay. Despite their brevity, these sessions generated a cumulative understanding of the experiential, cognitive and affective dynamics produced by navigating the knowledge-graph-based world. The analysis centered on four dimensions: (1) cognitive insight, (2) kinesthetic tension, (3) interpretive hesitation and (4) affective response.

Observations were supplemented by reflective accounts from two players: P1, aged 30-40 with a background in computer engineering, and P2, aged 40+ with expertise in anthropology, media, and copyright. Both participants are male and play casual games weekly. When asked whether they held any bias against AI-mediated knowledge before the experiments, both denied having such preconceptions. After each gameplay round, participants took notes that were saved separately for analysis.

We conducted thematic analysis of both the gameplay observations and participant notes, coding for patterns in how players engaged with the knowledge graph structure. This iterative process revealed five different types of encounters with the game, including three distinct pleasure modalities that characterized the player experience: epistemic, kinesthetic and hermeneutic, as outlined below.

Embodied Navigation as Epistemic Encounter

At first glance, the central challenge of visiting all nodes of the knowledge graph seems simplistic. Yet movement across the graph quickly revealed itself as an encounter with Malinowski's conceptual architecture. Traversing between platforms became a form of epistemological navigation: instead of reading a linear ethnographic argument, we moved through its structure. Both players found it pleasurable to unravel the content of the book through the 'fog-of-war' system. P1 noted that this slow unveiling of the book's key concepts would allow players to learn concepts from the text. He emphasized that it made him curious about the book's ideas, while P2 stressed that it gave him a quick overview of important concepts contained in the book.

Digging for Depth

The shovel mechanism, which allows players to "dig" for more detailed information, proved especially generative. It interrupted the rush toward completion and encouraged deliberate contemplation. This mechanic made visible the tension between the game's necessary reductionism and the ethnography's interpretive richness. Digging became a way of acknowledging that nodes are only entry points, not endpoints, of cultural understanding.

P1, for example, noted how in one gameplay session, he stopped at the platform labeled 'Ethnographic Method' and used the shovel mechanic to learn more about the concept. For him, the shovel mechanic was a central game element, as it allowed players to 'really get into the key concepts of the book in a more in-depth manner'. P2 noted the ease of examining the board, either in part or as a whole, with the 'dig' opportunity as a way to approach particular topics without overwhelming the visual presentation. The 'dig' function suggests there is more knowledge beneath any topic, rather than presenting the text as a finite book to be finished. At the same time, the limited number of nodes provides enough organization for the themes to feel approachable.

Spatial Curiosity and Conceptual Distance

Across repeated playthroughs, the two players found themselves drawn to the relationships between spatially distant nodes. The physical effort required to traverse large conceptual gaps produced new questions: What logic links geographically separated platforms? Spatial distance thus became a form of conceptual prompting,

making the ethnographic relations newly salient. P1 noticed these connections after visiting the linked nodes 'Canoe Building', 'Maritime Navigation', and 'Gift Exchange', which allowed him to easily infer that canoe building must be related to some forms of gift exchange. This essentially mirrors a central message of the book, which describes a complex exchange system of armshells and necklaces among different island groups who embark on large canoe expeditions. P2 reflected on the potential value of the game and its visual format as a tool for better understanding the material's key themes. For him, presenting knowledge linearly, with a clearly defined beginning and end, is partially an artifact of printing technology, economics and copyright law. Digital formats like the gamified graph, however, offer new affordances to arrange information and for players, readers and viewers to engage with information in non-linear ways.

Promise and Risk

Our autoethnographic engagement revealed a productive tension. On one hand, the prototype reduces Malinowski's thick description, risking a false sense of mastery. A player may believe they "understand" a concept simply by landing on its platform. On the other hand, the system offers a surprisingly rapid orientation to Malinowski's conceptual terrain. As player P1 noted, he could quickly grasp the main concepts and use the shovel to dig further. This rapidity does not replace close reading but can provide an initial cognitive map that scaffolds deeper scholarly engagement.

P2 noted the fixed, 'as-is' presentation of the game and wondered whether it might also be useful as a collaborative project, where players could arrange and rearrange the platforms to draw their own connections. This might be of exceptional value in a classroom setting. Likewise, this could mitigate and disrupt the sense that the meaning of the text is fixed and meant purely to be 'grasped' or consumed instrumentally. Instead, it suggests that the text is meant to be engaged with in search of new meanings and connections. We noted this improvement suggestion, and discuss it further down in section V.II.

Embodied Interpretation

Ultimately, the autoethnographic procedure revealed Graphonauts as a space where interpretation becomes movement. Decisions about where to go, when to dig, and how to traverse uncertain edges became interpretive acts in themselves. This embodied approach to interpretation manifested differently for each player. After several rounds of play, P1 found that playing the graph slowly was most effective, as it gave him time to absorb the different concepts presented in the book as well as understanding how they were interconnected. Pausing periodically to simply observe the unraveled graph allowed him to interpret the structure and engage with the knowledge in a pleasurable way. P2 noted that the kinetic elements provoked a feeling of excitement, reinforcing that the act of navigating the text is itself a form of meaningful engagement. Furthermore, the association of the format with 'gaming' brings a sense of pleasure that may be absent from traditional encounters with 'classroom texts'.

DISCUSSION AND THEORETICAL SYNTHESIS

From Representation to Enactment: Procedural Rhetoric as Experiential Hermeneutics

Our autoethnographic findings suggest that playable knowledge graphs transform scholarly representation from static depiction into dynamic enactment. Whereas traditional knowledge graphs such as Wikidata or Freebase operate as visual taxonomies optimized for retrieval, the playable graph foregrounds movement, constraint, and spatial reasoning as mechanisms for producing meaning. In this respect, Graphonauts extends procedural rhetoric (Bogost 2007) beyond persuasion toward what we term *experiential hermeneutics*: the use of interactive procedures as vehicles for interpretive insight.

In the prototype, relations are not merely diagrammatic; they are embodied as mechanical affordances. Climbing a ladder to represent hierarchical relations, balancing on a conveyor to model circulation, or leaping across a gap to signal conceptual rupture transforms abstract reasoning into kinaesthetic performance. Argumentation is not presented to the player but enacted through their traversal decisions, timing and embodied responses.

The three pleasure modalities identified in our analysis (epistemic, kinaesthetic and hermeneutic) illustrate this fundamental shift in engagement. Epistemic pleasure emerges at the intersection of recognition and spatial association, where embodied adjacency generates mnemonic insight that bridges theoretical understanding and experiential encounter. Kinaesthetic pleasure arises when navigation mechanics resonate with the ethnographic dynamics under study, for instance, climbing a ladder that conveys the layered hierarchy of a social or ritual structure, letting vertical movement stand in for conceptual ascent. Finally, hermeneutic pleasure occurs as newly revealed nodes and relations invite interpretive synthesis, functioning much like the discovery of conceptual footnotes or the gradual revelation of an argument's underlying structure, whereby meaning emerges through progressive exploration rather than linear exposition.

Together, these modalities demonstrate that understanding in Graphonauts results from enacting rather than observing conceptual structure. The system thus repositions games as tools for scholarly inquiry: not models that stand in for knowledge, but procedures that cultivate particular forms of interpretive engagement. We propose the term *experiential hermeneutics* to describe this approach, an analytical practice in which ethnographic argumentation materializes as interactive, rule-based systems that require movement, experimentation and embodied sense-making.

Limitations and Ethical Discussion

While our findings are promising, they must be interpreted in light of several methodological and epistemological limitations.

Ontology Bias and Epistemic Flattening

A serious limitation concerns the ontology biases introduced when ethnographic concepts are translated into the discrete, node–edge formalism of a knowledge graph. Although our hybrid workflow allows for human curation, it nevertheless imposes a structural logic that reflects Western epistemological assumptions about categorization, hierarchy and relational discreteness, assumptions that may not align with the cosmologies, relational ontologies or locally meaningful distinctions present in the ethnographic material itself. Such flattening risks reifying analytic separations that the source culture does not make, or overlooking forms of ambiguity, fluidity, and situated meaning that resist discretization. While our intention is not to present the generated graph as an authoritative representation of Malinowski's fieldwork, this structural imposition remains an inherent constraint of the medium. Future iterations will therefore require more participatory validation with anthropologists and, where possible, indigenous scholars or community members, as well as experiments with alternative representational schemas that can better accommodate relational nuance, polyvalence and culturally specific modes of knowing.

Model Dependency and Technical Constraints

The current pipeline uses a single LLM (Claude-Sonnet-4.5), limiting generalizability. Cross-model comparisons, including open-source architectures such as the LLaMA-3 family of models (Grattafiori et al 2024), are necessary to assess extraction robustness and mitigate proprietary dependencies. Likewise, the mapping from relation types to mechanics is not yet optimized or validated across multiple ethnographies.

Player Skill and Accessibility

Platformer mechanics introduce skill-based barriers: players with limited motor ability or unfamiliarity with platformers may be unable to reach certain nodes, unintentionally restricting conceptual access. This conflicts with the project's goals of scholarly accessibility. Difficulty settings, alternative navigation modes, and non-motor interaction paths are required to accommodate diverse players.

Evaluator Bias and AI Skepticism

Given recent findings that humans often display biases against machine-generated content (Hidalgo et al. 2021), autoethnographic evaluation may be influenced by prior attitudes toward AI-mediated knowledge. We mitigated this risk through pre-evaluation questioning, though more systematic bias controls are warranted.

Limited Evaluation Scope

Our study does not include a formal user evaluation beyond autoethnographic engagement, a methodological choice reflecting both the prototype's exploratory status and our aim to first articulate the conceptual and technical foundations before testing learning outcomes at scale. Undoubtedly, autoethnography provided phenomenological depth that task-based experiments at this stage would not have captured. Nevertheless, the absence of broader participant studies limits our findings' generalizability and precludes claims about comparative pedagogical efficacy or interpretive diversity across user populations. Future work will involve empirical

evaluations with students, researchers, and non-specialist players, examining how traversal-based engagement supports comprehension, retention, and critical reflection relative to traditional textual readings and static visualizations.

Participatory Validation

A further limitation concerns the absence of participatory validation with domain experts from the community that the ethnography considers. While our hybrid workflow includes researcher-led curation of LLM-generated graphs, the interpretive responsibility still rests primarily with the system designers, leaving limited opportunity for community members connected to the ethnographic material to interrogate or contest the structures produced. This omission risks reproducing existing disciplinary biases, overlooking culturally specific relational logics, and normalizing graph configurations that may not reflect the intentions of the original text or the epistemologies it describes. Future work will therefore incorporate participatory review sessions in which community members evaluate, revise, or annotate the generated graphs prior to their procedural translation, enabling a more reflexive, collaborative, and ethically grounded approach to playable scholarship.

CONCLUSION

This study introduced a hybrid human–LLM pipeline for transforming ethnographic monographs into knowledge graphs that can be played. Rather than treating large language models as authoritative extractors of anthropological knowledge, our workflow positions them as collaborators that generate candidate conceptual structures subsequently refined through human judgment. These curated structures are then translated via our custom-made tool into spatialized, traversable environments where nodes become platforms and edges become mechanics, enabling players to enact scholarly argumentation through embodied movement.

Using Malinowski's *Argonauts of the Western Pacific* as a case study, we demonstrated how this approach enables players to encounter anthropological concepts not only as textual representations but as interactive affordances. Our autoethnographic evaluation with two players identified three recurring pleasure modalities, namely epistemic, kinaesthetic and hermeneutic that illuminate how the system fosters interpretive engagement. These findings support our broader theoretical claim that procedural rhetoric can function as *experiential hermeneutics*: a mode of understanding in which interpretation emerges through action, traversal, and embodied problem-solving rather than passive consumption.

From a scholarly perspective, playable knowledge graphs offer a complementary representational modality for the humanities. By converting conceptual relationships into navigable architectures, they make visible the connective tissue of ethnographic theory and open new pathways for exploratory learning. This affordance is particularly salient for introductory or cross-disciplinary audiences, for whom spatialized overviews can provide orientation before engaging the full complexity of primary texts.

However, the approach also raises methodological and ethical considerations, as discussed in Section V.2. Playable graphs inevitably simplify complex ethnographic arguments and may create illusions of comprehension if used without critical framing.

Moreover, platformer mechanics introduce accessibility constraints that risk excluding some players from full conceptual engagement. These limitations highlight the need for careful pedagogical integration, transparency regarding the reductionist nature of the model, and participatory validation with domain experts from the community considered.

Future research will extend this work along three trajectories. First, we aim to broaden the mechanical vocabulary of the platformer by introducing collaborative exploration modes, annotation layers and player-authored modifications of the knowledge graph. Second, we plan to evaluate the pipeline's generalizability by applying it to a wider range of ethnographic and theoretical texts, and by conducting systematic comparisons across LLM architectures and prompting strategies. Third, we will conduct empirical studies assessing learning outcomes, retention and interpretive depth relative to traditional readings and static visualizations.

ENDNOTES

(1) A demonstration video hosted on Zenodo offers a visual walkthrough of the generative process, showing how the monograph was transformed into a playable knowledge graph. It also features a short gameplay segment illustrating how players interact with the system. Link to the video: https://zenodo.org/records/17711737.

(2) The source code and artefact of our custom tool are available at https://github.com/michaelpeterhoffmann/graphonauts.

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APPENDIX

Prompt Used

“Create a knowledge graph for the book 'Argonauts of the western Pacific' by Bronislaw Malinowski attached as pdf. Please use the basic entities and relationships outlined in the

[Foundational Taxonomy]

as starting ground from which to expand upon. Set the number of entities to exactly n=[...].”

Foundational Taxonomy

Core entities and relationships are presented in Tables 2 and 3. Full details are available in the associated repository (https://github.com/michaelpeterhoffmann/graphonauts).

Entities
Person/Agent
Social Group
Cultural Practice
Material Object
Location
Event
Knowledge System
Entities

Table 2: Primary Entities in the Foundational Taxonomy

participates in (Person → Event)
belongs to (Person → Social Group)
practices (Social Group → Cultural Practice)
located at (Event → Location)
possesses (Person → Material Object)
transmits (Person → Knowledge System)

Table 3: Key Relations in the Foundational Taxonomy

Additional Screenshot

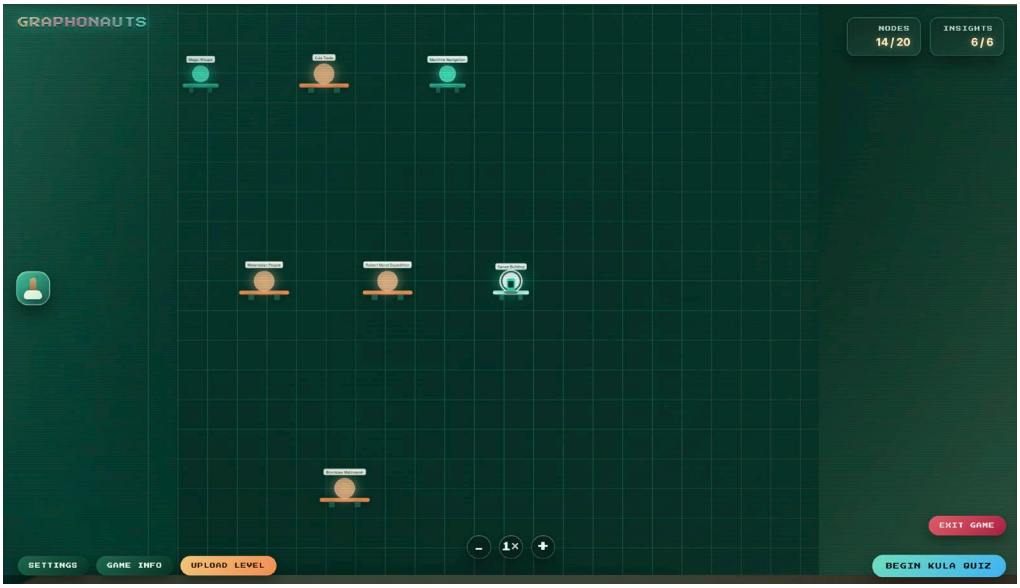

Figure 5: Zoomed-out view of the interface