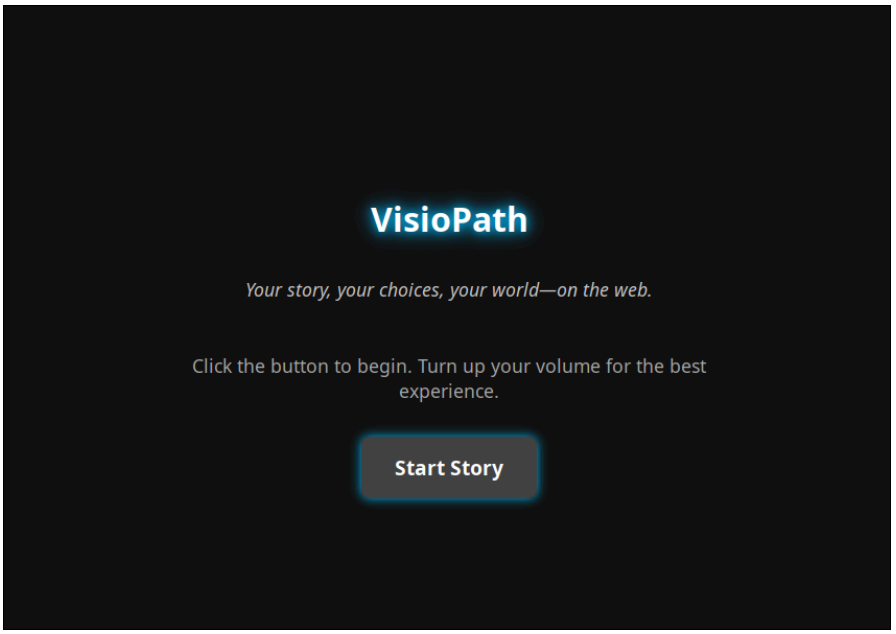
Faculdade de Ciências da Universidade de Lisboa

Multimedia
2024/2025

—— *VisioPath* ——

Your story, your choices, your world—on the web.



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Abstract

VisioPath is an interactive, multimedia web application that uses branching narratives to explore immersive storytelling. Built using React and Next.js, it supports text, images, audio, video and animation, enabling users to experience nonlinear stories by making meaningful choices.

1. Introduction

VisioPath: Your Story, Your Choices, Your World - on the Web is an interactive multimedia application that focuses on digital storytelling through non-linear narratives. Developed as part of the second project theme, 'Interactive Video and Multimedia Immersion', it explores the potential of user-driven stories in which the choices you make affect the course and outcome of the narrative.

Interactive multimedia applications have transformed the way stories are told and experienced. As Ivan Sanchez-Lopez [5] points out, interactivity is not just a mechanical feature; it introduces emotional, dramatic and cognitive layers that enrich user engagement and immersion. In this new landscape, stories do not unfold without user intervention, effectively making the audience a co-creator of the experience. At VisioPath, our aim is to harness these narrative dynamics by combining text, video, sound, images, and animation with branching decision paths in a modular format.

2. Theme

Development of a web-based visual novel engine using React that can load and play an interactive story. In this story, the user has to make different choices that lead to different endings. These endings are defined by a structured JSON-like file. The application supports multimedia elements such as text, images, video, sound and animation to create an immersive experience. The story follows three students — Sofia "The Magician", João Limão and Hugo "Linux Master" — who rebel against a corrupt academic system.

3. Objectives

The main objective of this project is to develop a functional, accessible, web-based visual novel engine that runs smoothly on modern browsers. The engine is designed to enable players to create branching narrative structures using a simple, flexible, JSON-like format. It must support multimedia content, such as background images, videos, sounds, text, and animations, to enhance immersion. End users interact with the story by making narrative choices that shape its path and outcome. Additionally,

the application should offer a clear and engaging user interface, designed with UI/UX and accessibility best practices in mind.

4. Planning

With the initial research complete, the JSON-based story format defined, the core engine implemented and the integration of multimedia content successfully achieved, the remaining work will focus on refining the user experience and preparing the final deliverables. This includes refining the interface for better usability and responsiveness, enhancing the visual presentation of choices and transitions, and incorporating accessibility features.

The final stages will comprise thorough testing and debugging, performance optimisation and producing a final demonstration video to showcase the engine in action.

5. Inspiration/ Related Work

- Telltale's games [1].
- Visual Novel Maker [2] - Commercial software with a graphical interface and limited web support.
- Choose Your Own Adventure [3] - A series of children's gamebooks that allow readers to take on the role of protagonists and make choices that change the course of the story.
- Ren'Py [4] - A popular visual novel engine, but desktop-based and not built for the web.

6. Target audience

Our target audience is made up of people who are interested in interactive storytelling and narrative-driven video games. This includes users who enjoy choose-your-own-adventure games and visual novels. We aim to evoke nostalgia in those who loved storybooks as children.

7. Features

The application is designed to load and interpret a structured JSON-like file that defines the flow of the visual novel, including narrative text, scene transitions, and branching choices. It allows users to navigate through different story paths by selecting from available options, dynamically updating the content based on those decisions. The engine supports the display of text, background images, embedded video, and sound creating a rich and immersive experience. A simple system for

tracking progress or saving the user's place in the story is also envisioned. The user interface is responsive and interactive, adapting smoothly to different devices while maintaining clarity and engagement throughout the experience.

a) Edited Videos for the Project

The story begins with the opening video, 'In the Beginning', which showcases the Faculty of Sciences at the University of Lisbon. This video was found on YouTube [7] and trimmed to 11 seconds using Clipchamp, with the audio removed.

The story concludes with a closing video titled 'To Be Continued…'. Created using Canva, it features background audio [8] and includes animated text and character visuals.

b) Indexes, Navigation and Exploration Between Videos

Our application includes a dynamic story tree that visually represents the interactions between nodes (scenes) in the story's narrative. This tree enables users to view the entire branching structure of the story, navigate between nodes by clicking on them and preview each node through image thumbnails generated from the actual scene content.

The video processing technique used to create the indexes is frame capture (frame extraction) via seek and canvas. After the video loads and reaches a specific time, automatic seek is used to find that instant. Then, a canvas is used to visually capture the video content. The resulting image is displayed as a navigation thumbnail.

Users can click on any node in the tree to jump to that scene, even if it is not the next logical choice. This enables non-linear navigation across all videos and scenes.

c) Included Animations (UI and Story Transitions)

Animations play a key role in ensuring smooth transitions and enhancing the storytelling experience. Story transitions between scenes are executed using fade-ins, slide-ups, and other CSS-based animations that maintain continuity and reinforce the mood of each narrative moment. The main dialogue text appears progressively to simulate a typing effect. The current playing node on the story tree has a flicking effect.

These animations create a cohesive visual flow, thereby elevating the interactive experience.

d) Hypervideo Integration and Multimedia Synchronization

VisioPath leverages hypervideo principles to deliver an interactive and immersive storytelling experience. Within each scene, whether presented through video or static images, users encounter clickable elements such as overlay buttons and spatial hotspots that serve as navigational anchors.

These elements are not only stylistically consistent across the interface but are also temporally controlled, appearing at precise moments to align with narrative pacing. This synchronization of multimedia creates a cohesive flow that enhances user engagement. The persistent story tree further grounds the experience, offering a clear overview of the narrative structure. Altogether, VisioPath ensures that transitions between scenes, user interactions, and media playback are tightly integrated, fostering a seamless and contextually aware journey through the story.

e) Configurations via descriptors/metadata

VisioPath relies on a structured, JSON-like descriptor format to define the story's flow, multimedia content, and user interaction logic. Each story node is described using metadata fields such as titles, background images or videos, audio tracks, narrative text, and branching choices. This configuration approach abstracts the content from the logic, enabling authors regardless of technical background to create rich, interactive stories without modifying the core codebase. Authors can modify the story by editing the *story.ts* file, defining transitions, media assets, and interactions through declarative tags and values, which the engine then parses and renders dynamically in the browser.

Some graphic features can also be changed, in this case in a *config.xml* file. These include the fonts used in the interface and in the text boxes that appear as narration. It's also possible to change the background and text colors.

8. Sketches and Storyboards

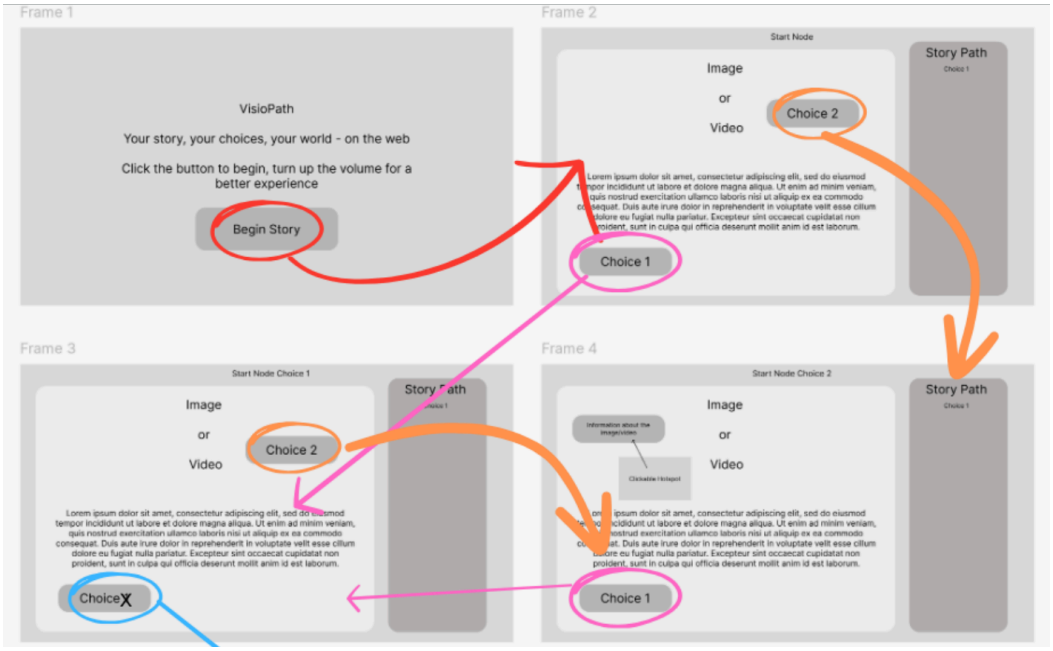

Figure 1. Storyboard representing the structure of the VisioPath application.

This storyboard represents how the user navigates between each scenario. The first frame contains the title, slogan and an instruction of how to begin the immersive experience of *VisioPath*. After clicking the “Begin Story” button marked with a red circle, the user is redirected to the second frame, which contains an image or video, followed by text and choice buttons that change the way the story proceeds. The following frames stick to the same patterns and rules. On the right-hand side of each frame is shown a story tree, which acts as an index, allowing the user to visualize and navigate the space of all the videos in the application.

9. Design Principles and Design Rationale

The VisioPath application incorporates several cognitive design principles aimed at enhancing multimedia experiences, particularly those defined by Mayer. Firstly, the **split-attention principle** is respected by ensuring that visual content is presented in an integrated and centralized layout. This prevents users from having to divide their attention between unrelated areas of the screen, thus reducing cognitive load.

The **modality principle**, which recommends presenting verbal information through audio narration instead of on-screen text, is not applicable in this case. VisioPath does not include voice narration. It uses background music and sound effects to enrich the atmosphere without conveying narrative content.

In accordance with the **redundancy principle**, the application avoids repeating the same information across multiple modalities. Since there is no voice narration, there

is no risk of duplicating the on-screen text through spoken words. The sounds used are non-verbal and serve only to enhance mood, not to deliver narrative details.

The **spatial contiguity principle** is also followed. When textual information or interactive hotspots are presented, they appear close to the related visual elements on screen. For instance, when users click on interactive areas within an image or video, contextual information is displayed nearby, maintaining a coherent spatial relationship between stimulus and explanation.

Temporal contiguity is respected, with visual and textual elements appearing simultaneously. This allows users to process them together, rather than as separate events. This maintains the narrative flow and improves comprehension.

Finally, the **coherence principle** is followed by excluding unnecessary elements from the multimedia presentation. Extraneous visuals, sounds, or words that do not contribute to the storytelling or interaction are deliberately omitted, resulting in a cleaner and more immersive user experience.

Together, these principles contribute to a coherent, focused, and user-friendly multimedia environment that supports immersion and enhances narrative comprehension.

The chosen UI configuration reflects a minimalist and immersive design philosophy. By selecting a dark background for the interface, the application ensures that visual content like images and videos remain the focal point while reducing visual strain during prolonged use. The use of a light gray text color for the general interface provides subtle contrast without being harsh, contributing to a clean and unobtrusive aesthetic.

The main font used in the project is Joystix [6], inspired by traditional arcade games and set with UndertaleFont in the global globals.css file. Additionally, the UndertaleFont font is used explicitly in some parts of StoryEngine.module.css, with a fallback to sans-serif.

These design choices were made with both cognitive ergonomics and narrative immersion in mind, aligning well with principles of perceptual clarity and aesthetic coherence.

10. Materials and tools

VisioPath is an interactive web-based storytelling engine that combines multimedia content, user-driven narratives, and a branching visual interface. The application is built using React with the Next.js framework, which provides server-side rendering,

routing, and optimized image support through its next/image component. React is used to manage the component state and user interactions, while Next.js helps structure the project efficiently and deliver content quickly.

For audio playback, *VisioPath* utilizes Howler.js, a JavaScript library that simplifies loading and playing audio across browsers. It is used for two main purposes: playing sound during each scene. Video content is supported natively through HTML5 video tags, allowing scenes to seamlessly switch between image and video backgrounds depending on the story node configuration.

The layout and styling of the application are managed with CSS Modules, specifically within the StoryEngine.module.css file. This ensures style encapsulation and allows for custom themes, visual connectors in the story tree, and animated UI components. The visual story tree is powered by a recursive rendering strategy in React, based on a custom PathNode structure that dynamically builds and displays user navigation paths as a vertical branching diagram.

Content-wise, the story is defined as a structured object in a separate story.ts file. Each story node can contain a title, image, video, audio, text, and a list of choices that branch to other nodes. This setup allows authors to create complex, nonlinear narratives with visual and auditory immersion.

Relating to the materials used to make the story, the images were generated using the GPT-4o model, from Chat GPT. As for the videos, they were edited (cut) in ClipChamp. The audio sounds were mostly sourced from Pixabay, a website that offers free music.

Together, these technologies enable *VisioPath* to deliver a polished, multisensory storytelling experience that runs entirely in the browser. It is lightweight, extensible, and designed for creative writers and developers who want to build interactive narratives for the Web.

11. Future Work

While the current implementation of VisioPath successfully delivers an interactive narrative engine with multimedia synchronization, hotspots, and branching logic, several areas remain open for future improvement and expansion.

A key enhancement would be the development of an **authoring interface**, allowing non-technical users to create, edit, and preview story nodes without modifying the source code. This editor could be web-based, offering form fields for

titles, text, media links, choices, and hotspot configuration, automatically generating the corresponding JSON structure used by the engine.

Additionally, the system could benefit from:

- **Live reloading of story files**, enabling updates without requiring a full rebuild or redeployment of the application.
- **Advanced story creation control**, giving creators a UI with more flexibility over how elements appear and disappear in each node.
- **Save and load functionality**, enabling players to resume progress across sessions.
- **Analytics tools**, to help authors understand player behavior, popular paths, and dropout points.

These extensions would increase accessibility, usability, and maintainability, transforming VisioPath from a developer-centric tool into a full-featured platform for interactive storytelling.

12. Repository Link

The complete source code for the project is available at: https://github.com/Hugana/multimedia-story. The two promotional videos can be found at the following links: https://www.youtube.com/watch?v=h7QP8lIxY80 and https://www.youtube.com/watch?v=iAYCqw8lAgc.

13. Conclusion

VisioPath successfully demonstrates the potential of interactive multimedia applications in delivering compelling and immersive storytelling experiences. By combining a modular architecture with a rich set of audiovisual features, the application offers users the ability to explore non-linear narratives shaped by their own decisions.

Throughout the development, we prioritized usability, responsiveness, and cognitive design principles. These efforts resulted in a coherent system that synchronizes videos, sounds, images, and interactive elements into a unified narrative experience. The inclusion of dynamic branching, visual storytelling with hotspots, and a navigable story tree reinforces the user's sense of presence and agency.

Although some advanced functionalities, like a visual story editor, remain in the realm of future work, the current version provides a strong, extensible foundation. VisioPath stands as a solid proof of concept for web-based narrative engines,

showing how multimedia, interaction, and structure can come together to build a meaningful and engaging digital story.

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