# Contemporary Open Films:

An Analysis of the Affective, Sensorial and Relational Geographies Produced by Contemporary Cinema Interfaces

**Teodora Sinziana Fartan**

University of York

Theatre, Film, Television and Interactive Media

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# Abstract

This paper attempts to map emergent experiments in computationally-mediated interactive cinematography by addressing a selection of contemporary case studies that claim to move beyond traditional point and click decision-based narrative systems. The paper proposes the concept of the open film as a space to explore, rather than a line to follow: a decentralised, hypercursal experience that manifests no only through narrative permutations, but also through experimental modes of participation made possible via networked data exchanges. This research endeavour proposes an approach to layered cinematic interfaces, where sensorial and affective modes of engagement seek to complement those of the narrative structure - a model exemplified through an analysis of the interactive film ‘Erica’ (Flavourworks, 2021), which demonstrates progression towards the ideal of the open film through its deployment of haptic technologies.

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## I.Introduction

As a result of developments toward new modes of interactive engagement with film, contemporary experiments in interactive cinema now aim to enable an expanding range of aesthetic expressions and affective experiences that complement their nonlinear narrative structures. These emergent cinematic experiments are fundamentally algorithmic in their capacity to assume multiple, divergent states of expression that are responsive to a viewer's interactions with the diegetic world of the film. From the integration of mobile or gaming technologies, to haptic, spatial or affective relational structures, new interactive cinema artefacts promise more complex, layered systems of engagement which move beyond branching narratives in terms of interactive complexity.

In order to map some of these emerging approaches, this research sets out to engage with the experiences produced by a selection of novel cinematic interfaces, with the aim to both reverse engineer the way in which they operate as tools for interactive engagement and to understand their affective and sensorial impact. To this end, the study will focus on three contemporary interactive media artefacts that each promise an additional mode of interfacing to that of a branching story system, in order to examine how these multi-layered modes of engagement are achieved and to what extent do they contribute meaningfully to the interactor's experience.

Moreover, this paper suggests the metaphor of the 'open film', adapted after Umberto Eco's conceptualisation of the "open work" (1989) that, in turn, informs the rich theoretical framework of hypertext (Hayles 2001; Scolari 2009), as a mode of conceptualising these more complex interactive cinema experiments, where several

modes of interfacing with both the narrative and the media objects present inside the film operate concomitantly, creating a plural space of signifying. Through a layered set of interactive affordances, further possibilities of engagement for the viewer open up on affective, spatial, relational and cognitive scales.

The interactive media assemblages resulting from these layered topographies of interaction come to be, or become, only over time and in the context of an active interactor participating in the algorithmic structures. Given the participatory nature of experiencing such work, this research aims to engage with these artefacts particularly through mapping traversals through the work that at once attempt to reverse engineer the black boxed structure of the narrative and interactive mechanics at play, whilst also reflectively engaging with the interactor's experience from a sensorial and affective perspective. Most notably, it aims to look at how all three artefacts attempt to foster an engagement with a different type of diegetic movement: spatial, kinetic and relational.

With particular attention to the tradition of hypertext in which the distributed emergent narratives of interactive cinema hail from, this thinking through and with *traversing* for mapping narrative nodes, spatial configurations or relational schemas, as required by the artefact, becomes a mode of attempting to make visible, through reverse engineering, the larger systems of interaction at play through combining event sequences into a network. In a secondary purpose, traversal is not only understood here in the sense of the wider computer science understanding of the term, where traversing involves moving from link to link in a given network, but also as a process of engagement that involves cycling through and simultaneously engaging with a variety of "cross-genre meaning relations", as Lemke suggests (2005) - traversing, therefore, is not only a horizontal act of moving through a networked structure in order to visualise it, but also a way of vertically engaging with a multiplicity of media and, as this paper argues, semiotic modalities enabled by the operations of interfaces. Traversal, therefore, is proposed as a dual method for reflexively analysing one's experience of the story and the affordances of its interfaces as they move through an open work.

The computational moving image artefacts that will be addressed as primary objects of study within this research paper find themselves at the crossroads between cinema, video games, narratology and interaction design through their interweaving of multiple characteristics of these disciplines into an interactive computational story system. This study aims to specifically address works produced in its contemporaneity in order to understand the current state of development of emerging cinematic interfaces - as such, the selected artefacts constitute newly released titles contemporary to the current moment (2021) and form part of the new resurgence of interest in interactive film heralded by the success of Netflix's Bandersnatch (Brooker, 2018).

Each of the three artefacts have been selected due to their promise of a more complex mode of engagement than that of the branching model of non-linear storytelling, enabled by the layering of another set of computational affordances onto that of the decision point-based story system: *Erica* (Flavourworks, 2021) showcases a proprietary touch interface which facilitates new modes of tactile and kinetic interaction with film footage; *I Saw Black Clouds* (Wales Interactive, 2021) attempts to construct a character-based relational system that operates in tandem with the decision point system, where viewers can build (or weaken) their affective relationships with characters based on their choices in relating to these; and finally, *The Dark Side of the Moon* (Tayanna, 2021) which sets out to integrate 3D spatial navigation and gamified object interaction with traditional film footage, attempting to probe new possible integrations of video game techniques into the domain of film.

Through traversing these artefacts and engaging sensorially and affectively with their interactive systems, this research aims to investigate the novel cinematic interfaces proposed and sets out to use traversing as a way to produce story system visualisations which enable critical reflection on whether these approaches constitute new methods for participation.

Furthermore, an in-depth analysis of the artefact that most successfully embodies a multi-layered cinematic interface as described in the metaphor of the open film – one that progresses the practice towards multi-layered modes of engagement, will be

carried out in order to provide a deeper understanding of the affective and experiential qualities of its particular approach to combining a secondary mode of interaction with responsive narrative.

As such, this research paper is primarily guided by a series of research questions that, alongside the theoretical framework of the open film and its multiplicity of structure, serve to inform the case study analysis:

1. What new developments in the production of complex cinematic interfaces are emerging today?
2. How are the novel affordances promised by these emerging artefacts realised – and what is the complexity level of their underlying systems of exchange?
3. How could an interactor with no authorial control be able to conceptualise and further analyse, or visualise, these complex interactive story systems?
4. What role can traversing the story system, both structurally and sensorially, tangibly reveal about the modes of engagement scripted into the work?

This paper, therefore, aims to provide insight into emerging contemporary developments in interactive film and to contribute to the current academic debate around experimental computationally-driven storytelling formats for cinema, by approaching a selection of case studies that lay a claim to expanding the interactive modes of the genre in different ways. Furthermore, this research aims to also provide experimental insight into possible modes of analysing the interactive affordances of film artefacts in light of their black boxed mode of existence. Finally, the hope of this work is to examine and bring to the forefront new experimental trajectories in interactive cinema that may, in turn, inspire further experiments with the boundaries of computational interaction methods within the practice of film.

## II.Context: Interactive Cinema from Kinoautomat to Contemporary Experiments

With more and more audiovisual artefacts coming into being by virtue of an underlying computational system, as by-products of the convergence of algorithmic structures with heritage media practices, viewers are increasingly faced with broadening degrees of agency within a fictional storyworld. No longer a mere observer, the viewer, also termed “interactor” (Murray, 1998), due to their novel condition of mediator between their desires and the fabric of the story, is now bestowed with the ability to manipulate the multilinear narratives afforded by computation. Consequently, these new assemblages of technological mediation, facilitated by algorithmic exchanges, have begun to develop new possibilities for interaction and immersion within a fictional space.

Currently, the borders of the domain of interactive storytelling find themselves blurred due to interactive media often avoiding medium-specificity. Artistic forms that can support models of interactive narrative range from networked web fictions to image-based, filmic and extended reality formats - networked narratives can also be present in non-electronic formats such as print (Hayles, 2007), however, this paper is primarily concerned with algorithmic interventions and their scripting of interactive affordances: therefore, computationally-driven interactive narrative is at the forefront of this study.

Amongst the practices being transformed and rendered visible by the emergence of new forms of interactive storytelling is that of interactive cinema, where computational mediation is foregrounding new post-cinematic narratives that increasingly unfold via multi-layered interactive affordances. As theorist of cinema Raymond Bellour stated when addressing the increased interlacing of cinema and computation, “we have now gone beyond the image, to a nameless mixture, a discourse-image, if you like, or a sound-image, whose first side is occupied by television and second side by the computer, in our all-purpose machine society” (Bellour et al., 2018), making reference

to both the immediacy of televised content and the hypermediacy of networked digital media (both affordances which are cultivated within interactive cinema), as well as the current socio-cultural context dominated by ubiquitous computing. It is particularly this interactive *beyond-image* mentioned by Bellour et al. (2018) that this research concerns itself with, with the ultimate aim to explore the possibilities of expanding the palette of multi-layered affordances that interactive cinema can possess.

Traditional experiments in interactive cinema have focused on a symbiosis of the computational system and database of filmed sequences in order to produce an interactive audio-visual experience that the audience can actively participate in. Involving a combination of classical montage technique with a more abstract computational system, these works allowed the audience to decide the particular order of the sequence they would be viewing content in. As Abba posits, “to date, an interactive film form has been conceived of in terms of branching, multi-linear narratives predominantly drawing on the mechanics of the computer games industry” (2008) - following Abba’s assertion, we can further conclude that the structures underlying interactive cinema often have their roots in hypertext and early networked narratives that also constitute the basis of narrative games. Hypertext, therefore, becomes particularly relevant to us in the context of interactive cinema due to the shared structures and approaches between authoring practices in both mediums.

Chris Hales traces the roots of interactive cinema stretching back to the 1960s, with 1967 being “the first use of the term interactive in the human-to-computer sense” (2005). Since then, developments in interactive cinema have slowly evolved together with new technological advancements, with new technologies bringing about experimental ways of scripting interaction within moving images. Historically, interactive cinema has surfaced under different terminologies, from ‘decision movie’ to ‘FMV’ (full motion video game, a type of video game where the gameplay consists of filmed sequences and the interaction is realised via decision points). Hales establishes three phases in the evolution of interactive cinema: “an early phase centred on dramatic narrative issues and entertainment”, followed by a phase dominated by HCI

advancements and the ludo-narrative debate within academia and finally, the “post-Internet phase”, where interaction has come to involve a process of co-authoring between interactor and the story system, often involving multiple types of media (2005).

Very early examples of interactive moving image involved the participation of a live audience through collective action, the outcome of which would affect the real-time screening of the movie. Examples such as “Kinoautomat” (Cincera, 1967) and “Mr. Sardonicus” (Castle, 1961) became popular through allowing the audience to collectively vote on specific outcomes of the narrative - whilst Mr. Sardonicus was relatively simple and involved pen-to-paper voting from the audience, Kinoautomat was more complex in that it provided audience members with a button interface and featured multiple decision points. Further technological possibilities emerged in the 1980s with the development of the laser disk, which allowed ease of experimentation with non-linear video works. Improvements in video quality and storage capabilities allowed practitioners unprecedented conditions for experimentation - as Weinbren recalls, “I realised that the language, the possibilities, the significance of cinema is forever changed” (1997). With the personal computer becoming mainstream in the 1990s, practitioners were provided with the necessary algorithmic tools in order to deliver more robust nonlinear video systems, using the power of computation to process inputs and outputs rather than live audience interaction. The power of the computer, both in terms of algorithmic affordance and ability to store and manipulate data, enabled new, more sophisticated interactive films to emerge.

From this point onwards, the history of interactive cinema expands into an exploratory phase with computational interfaces - in particular, in the early 2000s, Chris Hales identifies a turn towards the “utilisation of unusual or intuitive physical interfaces” (2005) as a means of allowing decision capabilities for the user.  In today’s context, much of the scripted interfaces that appear in cinematic contexts have moved to immaterially presiding “beyond the buttons” (Andersen and Pold, 2014), becoming absorbed by touch screens, tracking technologies, counters and other less visible modes of scripting data exchanges.

After the personal computer achieved widespread status, interactive cinema continued to expand as a medium; it is perhaps important to note here that immediately following computational capability, it was influenced by interactive documentaries, most notably through Glorianna Davenport's work at MIT Media Lab. This particular aspect is relevant due to what Hales identifies as the "pioneering use of video databases and keywords" (2005), a modus operandi that still underpins contemporary approaches to interactive film.

As the Internet emerged and became a widespread technology, interactive cinema mutated once more and began exploring new formats. Notably, amongst these, is the FMV, or full-motion video game, a genre of video games that rose to popularity in the mid-1990s by attempting to approach video games in the more literal sense through "the direct combination of live footage with cinematic techniques and the gaming experience" (Arsenault and Perron, 2012) - named a "fad of computer games" by Hales (2005), this short-lived genre is often criticised within video games studies as failing to instil affective response in an audience due to its its passive, live-action filmed sequences that evade engaging the player and slow down dramatic progression.

By the mid-2000s, interactive cinema had continued to develop via web formats and increased bandwidth capabilities allowed for real-time sharing of more complex projects. Interest in live interactive TV emerged, as well as social media applications of interactive storytelling. Human-computer interaction in itself has vastly expanded within the past two decades, which in turn has allowed for new technologies to give rise to new experimental models - from movement to brainwaves, the possibilities for data-driven interaction have significantly increased. The emergence of mobile devices has also contributed to the cementing of everyday interfaces such as the touchscreen; furthermore, mobile and web communication technologies have been used in works such as Last Call (2010), where the audience could send text messages to influence the narrative.

Those works that involve unexpected correlations between imaginative interface, audience and film are termed “movie as interface” (Hales, 2002) - it is precisely with these works that this research concerns itself with. In relation to these artefacts, Hales points out that, “if all the audience can do is vote to choose by majority what happens next, the creative potential of the interactive film will have changed little since Kinoautomat” (2005) - therefore, it is crucial to look beyond the glamour of a new or surprising interface and attempt to understand the underlying system of interactive exchanges in order to assess whether the work truly proposes a novel approach to interactive film. This is a particularly crucial line of enquiry that this research will follow in subsequent chapters where analysis of new cinema interfaces involves critical reflection on the interactive nature of the particular device.

It is also relevant to assert as this point that this research concerns itself only with those post-Internet examples of interactive audio-visual narratives that are inherently computational, where the decisions of the interactor affect the future storyline and overall outcome of the story, whilst one or more interfaces present themselves to the audience. Although usually the content of interactive films consists of a selection of pre-recorded scenes that are arranged in a particular order by the viewer’s interactions, the case studies to be discussed here attempt to push beyond this model and into the territory of the experimental by means of interactive systems such as haptic manipulation and spatial navigation, proposing new cinematic interfaces for interfacing with the film worlds. Today, we see a revival of the 1990s tendency to experiment with unusual and intuitive interfaces, a resurgence following the prominent exposure of Charlie Brooker’s Bandersnatch in 2018, however, rather than being physical or micro-controller based, contemporary interfaces predominantly exist within the immaterial digital realm, becoming present beneath the screen of mobile and computer screens.

Having reviewed a condensed history of interactive cinema, we can gather that this history is somewhat nebulous and peppered with a multitude of experiments - as Lunefeld points out, one can even speak of “interactive cinemas” (382), due to the

distributed prototypes and disparate series of developments that have sprouted across both computer science and art cinema disciplines. Whilst coming together in a somewhat nonlinear fashion, these previous crucial arenas of experimentation still do provide a good foundation for understanding how the merging of interactive narrative and cinema could operate, as well as a foothold for further experiments in expanding the repertoire of interactive cinema.

Today, algorithmic technologies of interaction that usually feature within the space of the Internet and that of videogames are increasingly used as ingredients for formulating new possibilities for film production, as well as new meaning for cinema audiences. Whilst the practice of interactive film has been around for some decades now, there has been a recent revival of interactive cinema experiments driven by the adoption of game engine technologies for audio-visual media generation and the experimentation with new methods for immersing an interactor within the world of the film. Consequently, emerging contemporary formats of computationally-mediated interactive film are attempting to probe new territories for experimentation with other possible ways of immersing the audience within the work through embodiment, spatiality and affective involvement.

In discussing his theories around the relevance of computation to expanded cinema, Gene Youngblood asserts that artists need to experiment and understand where the algorithm surpasses already existing methodologies in moving image practice - “the challenge, as in any medium, is to turn effects into expressions. To give formal possibilities some kind of syntactical or linguistic function” as Huhtamo points out (1990) - it is precisely these new expressions, these nascent properties that algorithmic underpinnings only can produce, that constitute the primary focus of this thesis. As Youngblood urges, this study aims to investigate what is that which the computer can do that cannot be achieved with previously established methods? What are the novel possibilities foregrounded by algorithmic networks? And, moreover, what new affordance and aesthetic categories emerge within and beyond the space of the digital screen?

It is with this main trajectory in mind that this research endeavour centres itself around specifically those forms of interactive cinema where an algorithmic system is both used to assemble moving image into sequences that can generate multiple narrative paths and utilised to explore other affective, spatial and embodied dimensions of interactive cinema through the layering of another interactive affordance onto the non-linear structure.

When addressing multimodal interfaces, this research draws on Rieser and Zapps' theoretical thinking on new forms of narrative within audio-visual media, who identify the new models of narrative emerging out of the integration of interactivity with moving image practices as "transitional pointers to a new grammar of interactive storytelling" (2002). A similar perspective also emerges within McLuhan's discussion around the blending of film and computer mediation, which claims that computation carries a medium over from the world of sequence to that of creative configuration and structure, and identifies this transition as a fundamental quality of new media works involving computational technologies.

This paper further focuses on Hales' notion of the "movie as interface" (32) to cement the idea of *cinematic interfaces*, by which it is meant those computational interfaces that operate specifically in tandem with the medium of film (rather than digitally-born environments) and are respectively scripted to enrich live footage material with rich interactive and embodied possibilities, particularly at the level of story. *Cinematic interface* is proposed here as mode of conceptualisation for the unique forms in which interfaces are blending with the praxis of film. Rieser and Zapp also identify the "personalised interface" (2002) as a necessity for addressing the unique formats and conceptual models produced by integrations of various emerging technologies within traditional media domains. They further ask us to consider their questioning of their new modes of narrative and audience reception.

Moreover, they identify these new possibilities of technological intervention within film as the seeds for a new language for interactive moving image - the concept of a new

grammar of interactive storytelling also emerges in Marshall McLuhan's thinking, who also positions his discussion around the interventions of computer mediations within film by claiming that "the movie, by sheer speeding up the mechanical, carried us from the world of sequence and connections into the world of creative configuration and structure. The message of the movie medium is that of transition from linear connections to configurations." (2001)

This concept of configuration, rather than linearity, is of primary importance here for understanding the emerging grammar of storytelling within the dimensions of film - configuration in itself is defined not only as a particular arrangement of things, but specifically as the processual ordering of computational tasks or software in order for it to work in the way that the user prefers. The notion of configuration itself encapsulates the essence of creating bespoke software so as to fulfil an author's calculated intent, a concept that clearly mirrors the often-custom software needed to produce computationally-mediated film interfaces. Consequently, this paper proposes an expansion in our understanding of the essence of the concept of 'interface', from the way that it is understood in computer science as being a "boundary across which two independent systems meet and act on or communicate with each other" (Beal, 2021), to the way that is operates within the cultural and more humanist dimension of computation, as an aesthetic form (Pold and Andersen 2014) contributing to a particular digital aesthetic, in this case, of computer-mediated cinema.

It is proposed here, therefore, to define cinematic interfaces as the *configuration of meaningful changes* that the viewer can effect in the world of the film, taking place via operations of data exchange and resulting in heightened affective and immersive potentialities; the term *changes* is deliberately chosen here over that of choices, due to the fact that cinematic interfaces allow for the interventions by the viewer that explore further domains than that of narrative decision, such as spatial navigation and haptic interaction. This research attempts to orient itself particularly towards these emergent cinematic interfaces that aim to provide meaningful configuration to the viewers through their computational mechanisms: in this sense, all three selected artefacts attempt to materially-fulfil a possibility for interaction beyond that of the ordering the narrative

sequence, opening up the palette of perceptual sensibility for engagement with the diegetic world of the film.

## III. Towards The Open Film

This study is particularly concerned with the ways in which the merging of cinema and algorithmic structures enables new semiotic assemblages, and, to this end, proposes the concept of the “open film” as a metaphor for conceptualising those works that incorporate the aforementioned experimental cinematic interfaces, particularly in contexts where layered interactive systems are constructed. Whilst the previous chapter has provided a frame of reference for conceptualising interactive film and defining emerging cinema interfaces, the particular lines of flight that address cinema as it finds itself at the crossroads of interaction, computation and audiovisual media will now be situated within a theoretical framework through the metaphor of “the open film”.

As Martin Rieser and Andrea Zapp proclaim, today we have entered into an “era of narrative chaos” (2002), a time characterised by the eradication of existing traditional frameworks in favour of speculative, radical and critical experiments in rethinking storytelling through emerging technologies. The integration of algorithmic technologies with narrative most prominently affects the relationship between audience and author - when theorising particularly film narrative, Brannigan suggests that “narrative is a way of organising spatial and temporal data into a cause-effect chain of events with a beginning, middle and end” (1992); when interaction enters the arena of this particular definition, it does so by allowing the audience to directly alter the links of the cause and effect chain. This formulates the basis of the traditional model of interactive cinema, where a viewer is able to make choices within the narrative that have a noticeable impact on the sequence of events and narrative progression of the film’s story. This research proposes that today, we can push beyond this sequence-centric ideal and look towards interfaces that develop other modes of interaction with the fabric of the film, attuned to sensorial, psychological, affective or spatial modes of engagement. In this sense, the convergence of narrative and computational

technology forms a rich territory for the exploration of alternative structures of sensing, new interactive affordances and the blurred boundaries between the subject and the film's diegesis.

Postmodern and post-structuralist thinking have also played a role in the emergence of this era of narrative chaos, with concepts such as multiplicity, rhizomatic and nonlinear structures, the scrambling of temporal order, the mixing of genres and the dismantling of established textual structures. The turn towards de-centred and open models of narrative call for the emergence of text that constitutes a "constantly shifting configuration of variables" (Ben-Shaul, 2008), where boundlessness and decentralisation serve as premises.

In this very ethos, Katherine N. Hayles defines one of the urgent theoretical tasks of current contemporary research into narrative interactive media as the necessity to develop "vocabularies and concepts appropriate to coded media that recognise their specificity" (2001), drawing attention to the relevance of the layers of code and rule-based behaviours resting at the basis of experiments in computational narratives.

This paper attempts to take a first step towards answering that call by proposing the concept of the "open film", emerging from Hayles's theorising of the 'open-work' (in turn, developed from Umberto Eco's theorising of the term (1989)) as a mode of conceptualising hypertext. An open work is "open in multiple senses" (Hayles, 2001) through its hypertextual qualities as well as its production, mode of interaction with audiences and distribution. With a renewed focus on the materiality of the work, the spotlight is moved on the sense of embodiment and physical representation, as well as what Hayles calls "the materiality within the work": the making visible of those complex interplays that constitute the basis of computationally-driven narratives. For Hayles, a call to re-focus on the materiality of the text also entails focusing on those areas where the text pushes beyond the page and moves into cognitive, virtual and/or physical space, creating "layered topographical spaces open for navigation and exploration" (2001).

Taking the concept of “open-work” as defined by Hayles (2001), a reconceptualization of interactive film is proposed within the same parameters - the notion of the *open film* is, therefore, put forward as a term for those computationally-driven film experiments where both the narrative and the aesthetic and sensorial space of the image, through algorithmic underpinnings, remain open and in a constant state of flux due to the possibility for the interactor to intervene within the system. Furthermore, this conceptualisation aims to move the focus from a purely narrative management perspective and towards the fabric of the film itself, the domain of the screen; open, boundless and mutable are taken here as qualities that should further apply to the media itself, not only to the interactive system that governs it. The open film is just that, an open audiovisual system that allows for multiplicity of several modes of interaction, both physical and virtual, in an effort to explore new immersive territories. Open films move towards the emergence of fluid, open and re-configurable interfaces that allow affective and embodied modes of experience.

Consequently, an open film exhibits multi-layered possibilities of interaction, where not only the narrative finds itself in a constant state of becoming, but other interactive affordances allow for multiple entry points and modalities of engaging with a work; crucial to the open film is the idea of multiple interfaces and the possibility for different interaction modes to be layered, in order to allow multiple processes of data exchange to operate within the space of the film. The promise of the open film is that of providing a space to explore rather than a line to follow, a decentralised, multilinear experience through narrative permutations and experimental modes of participation realised through the new interfaces.

## IV.Beyond Multicursality

In order to formulate a critical understanding of the proposed notion of the “open film”, it is essential to understand both its hypertextual mechanism and its systems of interactive possibility. We will begin our exploration by looking at how ‘open films’ move

beyond multicursality and adopt a structure that I will call hypercursality, where the movement of the interactor operates not only at the level of traversing linked nodes within the story network, but also at subsequent levels on interaction that serve to feed into creating what Janet Murray terms a sense of dramatic agency through their involvement of sensation, affect and spatiality. Before proposing the ways in which a hypercursal model can operate within a complex open film, it is important to gain an understanding of how multicursal systems encapsulate the networked narrative systems of interactive cinema.

Drawing on Espen Aarseth's analogy, who in turn seeks insight into the concept of labyrinths in order to offer an understanding of the complexity of hypertexts, we can attempt to envision two types of labyrinth structure: firstly, a unicursal labyrinth, where, no matter how complex the winding structure becomes, there are "no forked paths or internal choices to be seen" (Doob, 1990); secondly, a multicursal structure, where multiple entry and exit points operate, allowing for the existence of multiple possible pathways that a person could take in order to traverse through the maze; the images below provide a visual aid in conceptualising these two forms of labyrinth:

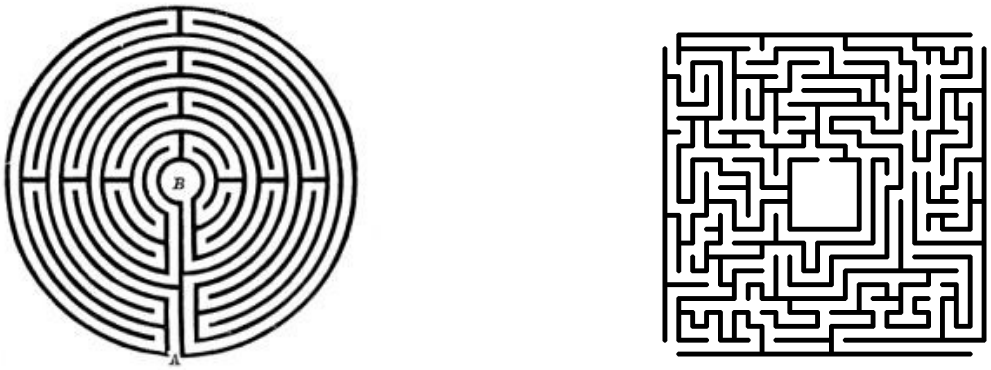


Fig 1. *Unicursal labyrinth (left) and multicursal maze (right).*

We can clearly discern that the unicursal labyrinth above, whilst winding and complex, requires a person to move from point A to point B, a convoluted yet still linear path.

When thinking about the model on the right, one can notice that there are multiple points where the maze can be entered and exited, which means that the degree of possible paths increased exponentially from the one path available in the unicursal model. The two types of labyrinths were used by Aarseth to explain the distinction between traditional narrative and hypertext; here, they serve as metaphor for the plot sequences of interactive and non-interactive film.

Much like the unicursal labyrinth, traditional film produced by editing together footage ultimately follows a linear path from start to finish, guided by the artistic direction of the editor. Although the path may appear convoluted and simulate complexity due to stylistic and montage techniques, ultimately we are guided through one single narrative, linear or non-linear - and, most importantly, no matter how many times we view the work again, it displays the same story, the exact path previously taken from point A to point B. Therein lies the most important distinction between traditional and interactive film - the ability to produce multiple, personalised traversal through a story.

The multicursal maze represents a choice-based journey where the interactor has to choose an entry point and continues to make choices in terms of left/right directions throughout the journey inside the maze; this agency afforded to the interactor is also responsible for the generation of multiple paths, where traversing the same maze a second time may provide an entirely different journey due to the multiple points of interaction prescribed into this model.

Consequently, the multicursal labyrinth is a perfect metaphor for thinking through a branching point system, as it essentially entails a journey peppered with decision points throughout; the journey, therefore, becomes inherently interactive through the foregrounding of choice and the multiplicities that this affords. Aarseth conjures the image of the multicursal maze in order to think through the notion of hypertext, or networked electronic fictional text (1997), which Hayles most simply defines through three base requirements: “multiple reading paths; text that is chunked in some way; and some king of linking mechanism” (2001) - the journey through maze encapsulates the

multi-layered possibilities of forking reading paths, whilst the different segments making up a journey can be likened to Hayles' chunks; finally, the structure of the maze itself is here a physical system that allows this experience to exist - with hypertext and interactive cinema, this underlying system is digital, immaterial and often invisible; the analogy of the maze, therefore, helps in providing a concrete example that does not require too much abstraction in its conceptualisation. Furthermore, if one is to look more closely at terminology, as Doob points out, "the term *multicursal* suggests this kind of maze is a series of choices between paths" (1990), underscoring that the possibility of choice is the very defining quality of this maze.

We can, therefore, easily see why Aarseth chooses to discuss the multicursal maze model, which also features a complex, interactive structure that allows for forking paths. Moreover, he emphasises the effects on the reader foregrounded by reaching the end without having had access to some portions of the text, without having had full knowledge of the entirety of the narrative possibility within an ergodic text:

> "[...] when you read from a cybertext, you are constantly reminded of inaccessible strategies and paths not taken, voices not heard. Each decision will make some parts of the text more, and others less, accessible, and you may never know the exact results of your choices; that is, exactly what you missed. This is very different from the ambiguities of a linear text. And inaccessibility, it must be noted, does not imply ambiguity but, rather, an absence of possibility - an aporia"
>
> (Aarseth 1997, pp. 3)

Aarseth draws here on the allure of possible choices within a narrative, where the paths not taken serve to entice the interactor and attract a more heightened cognitive response - the allure of the "voices not heard" (1997), of that which is left outside of the path taken and is possible, yet has not been experienced through one traversal of the storyline - a sense of internal contradiction which captivates the audience's desire and further underscores the potential for electronic narratives to offer the possibility for the

reader to engage with different journeys each time they attempt to traverse the story again.

Whilst this analogy was initially applied to text-based electronic interactive narrative, the maze analogy is extremely relevant within the sphere of interactive cinema. Similarly to a multicursal maze, from a narrative standpoint, the interactive film has the possibility to allow for forking paths and multiple entry and exit points into the narrative, effectively enabling the user to traverse a story multiple times, whilst generating personalised content with every pass, each story instance specific to the interactor's sequence of decisions. Moreover, just as the multicursal labyrinth, the interactive film is built around continuous choice, whilst the unicursal model posits only one choice - to enter the labyrinth. The metaphor of the unicursal/multicursal maze models can further serve to provide us with an understanding of not only the concrete structures of these systems, but also the ways in which one moves through and with these systems.

It is apparent that, whilst the multicursal model of the labyrinth provides a solid mode of conceptualisation for networked narratives, it falls short in the context of providing a foothold for systems whose complexity involves more than one system.

Circling back to the open film, the multicursal maze seems to satisfy the networked narrative element, but falls short of encapsulating the full interactive complexity of such a model - how can a multi-layered interactive system operating within an artefact further open up the concept of the multicursal maze? In this context, we are speaking of multiple levels of entry and exit points and the simultaneous existence of several networks operating in different formats and according to different objective - it is important to note here that whilst the networked narrative aims for sequential output and coherence for the viewer, more sensorial or embodied forms of interaction that serve to deepen immersion, such as haptics, may create networks along a configuration that is driven by generating affective response in the user, rather than sense-making.

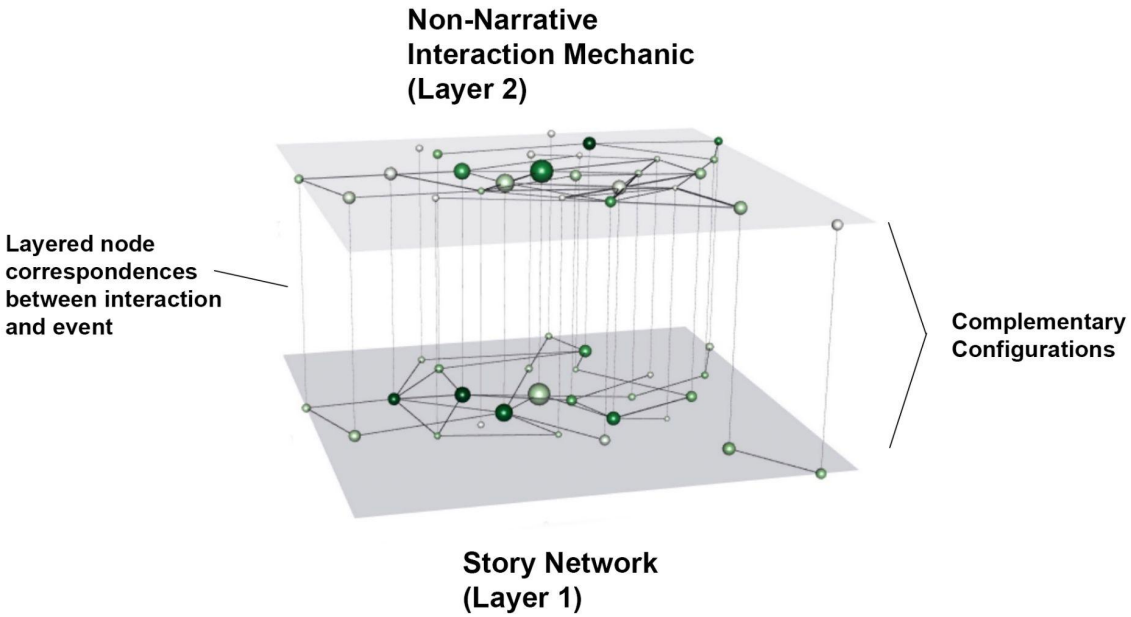


*Figure 2. Hypercursal model of interaction that operates both horizontally (as branching narrative system) and vertically (as perceptual or affective interactive system)*

Hypercursality, therefore does not only happen horizontally, but also starts to operate on a vertical scale through the operation of a layered interface that introduces other modes of engagement concerned with categories moving beyond cognition, such as affect, spatial perception or haptics. Similarly to Deleuze and Guattari's rhizome, the possibilities move out of a two-dimensional system and into a non-linear, distributed and layered model.

Hypercursality serves here as a mode to visualise and deepen the conceptual understanding of the open film and the way in which interfaces can multiply, interact and become layered onto a story system. The multicursal structure constitutes the basis horizontal model which corresponds to the networked narrative database, whilst the vertical layer represents interactive topographies (such as touch, mobile interaction, spatial navigation, responsive media objects) that may take a variety of non-linear shapes, depending on their function within user engagement; whilst the interactive layer

is non-linear and less predictable in format, it is superimposed on the narrative network - for example, certain scenes in an interactive film may allow spatial navigation for the purposes of affective or sensory stimulation; this may not happen every scene, but the nodes in which this interaction is implemented form their own network that is scripted in the authorial process.

This paper offers the hypercursal model as a way to conceptually demonstrate the layered cinematic interfaces that can fulfil the ideal of the open film, where multiple semiotic modalities are in operation throughout the work. The primary aim is to help illustrate how novel technological explorations enable an expansion to the traditional model of databases narrative and give rise to new cinematic interfaces, and demonstrate the relationship between a branching narrative structure and the further layers that may be built in order to explore more embodied, tactile or spatial forms of engaging with the fabric of the film.

## V. Methodology: Traversal Mapping as Method for a Multi-Layered Analysis

The metaphors of the maze models can further serve to provide us with an understanding of not only the concrete structures of these systems, but also the ways in which movement operates in terms of the viewer's perception of these systems. As Doob points out, the traveller moving through the maze is undergoing a process of converting chaos into order through the means of their own perception and interactions, as they carve a linear way through an otherwise multilinear system (1991). Furthermore, in a hypercursal system, tracing a path beyond the level of narrative network becomes further complicated by the non-textual nature of the layered interactions, which are linked to more aesthetic and affective considerations such as mood, tactility, suspense, and other sensorial or emotional possibilities.

One of the most relevant takeaways that Doob's analysis of classic labyrinthine structures provides us with is that of situating the process of journeying through a labyrinth as one of *conversion*, where a multicursal path of possibility transforms into a unicursal path: "if one passes successfully through a multicursal labyrinth without retracing one's steps, a mapping of one's travels would describe a unicursal pattern: multiplicity still exists in the maze itself, but the choices of the maze-walker define a single path that others can follow" (1991) - as such, Doob encapsulates here a crucial core idea for the understanding of interactive audiovisual media via the prism of the labyrinth: the notion that, ultimately, at the level of personal perception of one playthrough, interactive cinema will be outputting a *specific* unicursal path, one generated through the process of direct and lively interaction with the system. The output of traversing the linear final path, one that can be re-traced, recorded or compared, can become very useful in the context of research, particularly as a methodology of reverse engineering - as Soares de Lima et al. point out, the process of network traversal for the can become a very useful tool for the compositional analysis of a work of interactive media (2017).

When moving through a structure, the act of traversing, which implies a crossing between points, becomes a passing through from the initial state within the story continuum to the final outcome - this research proposes the concept of "traversal" as a mode of visualising the movement that the interactor undertakes through the story system, a crossing that can constitute a modelling strategy to combine a chosen repertoire of story variants of the same narrative pattern into an overall network structure (Soares de Lima et al., 2017).

In the context of the open film, the crossing not only happens at the pragmatic level, creating a link between the introduction and possible conclusion point of the story, but also occurs at the level of affect and embodiment through the different interactive affordance at play. Traversing is approached here as a verb, in the tradition of postmodern feminist thought spearheaded by Donna Haraway, who highlights the importance of "acts of doing" (1985) encapsulated by verb thinking - traversing is a process of movement across not only narrative, but also the affective relations made

possible through interfaces, at once cognitive and embodied, within the multi-layered interactive systems of a responsive media environment.

A story *traversal*, therefore, in its noun format, should be understood as a mere possible story instance amongst the multiplicity of possibilities that an interactive system affords - as Soares de Lima et al. suggest, conducting a multitude of traversals through a work can produce on overview of the the entire networked system. A similar approach is employed in Lai and Manber's "Flying through hypertext" model, which they theorise in response to difficulties in navigating and orienting oneself within a hypertext, from the position of the interactor (1991) - the tool allows for a flight through the hypertext system in order to get a better understanding of the overall network lying underneath.

Murray et. al also utilise the system of traversal mapping, alongside an expanded set of models such as spatial or node mapping, in their understanding of interactive media works (2020). What is more, Murray outlines a crucial point of consideration for the relevance of traversal mapping as a process of reverse engineering: making visible the blackboxed structures within interactive media artefacts (2023, pp. 322). As she points out when discussing the process of designing with machines, visibility becomes a crucial matter for concern, as computer-mediated artefacts are often blackboxed: whilst the input and output are relatively easy to discern from observation, the computational process that enables this relation remains hidden to the eyes of the observer. Consequently, traversing attempts to seek an understanding of these blackboxed processes through mappings of the layered interactive systems at play; it not only aims to record, but also to unearth, to assemble a system from parts in order for an analysis to be performed.

Traversing is, therefore, adopted here not only as a method for pragmatically reverse engineering the complex structures of the open work that present themselves, as Hayles points out, as "layered topographical spaces open for navigation and exploration" (2005), but also as a mode of opening up the nebulous structures at the core of these artefacts to material existence: a systematic use of traversing as research method allows the researcher to experience the materiality of the algorithmic

structure, which, as Hayles calls for, “allows us to bring into visibility the materiality that work suggests” (2001).

Continuing in this line of flight, the action of traversing can also be perceived as a movement across semiotic materialities. Lemke approaches traversing as a process of moving across various attentional space. For Lemke, along the traversals made through hypertext, “meanings are made and feelings experienced” (2005, pp.50) - traversing across hypertext, therefore, involves an amalgamation of genres and media that has increased semiotic and affective potential. Lemke further points out that meaning is no longer situated within discrete media scenes or objects, but rather that meaning is also made across and between them, as we juxtapose, catenate, and traverse through interactive media: “we construct meaning along a traversal, dynamically, as we move from lexia to lexia, we are trying to build meaningful sequences" (2005, pp.52). An expansion to Lemke’s thought is proposed here, where traversing is situated within the media-rich context of cinema and conceptualised against the affordances of interaction: this research proposes a shift in focus to the felt, embodied and spatial experience of the interactor, given the cinematic interfaces of the open film are focused on sensorial subjectivities.

## VI. Traversing the Open Film: An Exploration of the Layered Topographies of Interactive Cinema

Three contemporary interactive films were selected for analysis, with the aim to judge the depth of interactive experience and complexity of the system that they presented – another relevant criteria of selection for these artefacts was their promise to contain a novel approach to interactive cinema specifically through the layering of a secondary cinematic interface onto that of a branching narrative, thus being possible artefacts that may constitute open films. It is particularly important to note here that all of the artefacts openly advertised the integration of a secondary interactive system to that of the narrative algorithm.

The selected samples, therefore, encompass three different approaches to cinematic interfaces as follows:

1. Branching narrative blended with relational character mechanics, in *I Saw Black Clouds* (Wales Interactive, 2021).
2. Branching narrative blended with spatially navigable filmed spaces and interactive objects, in *The Dark Side of the Moon* (Tayanna,2021).
3. Branching narrative blended with a new mode of utilising the touchscreen for simulating presence within the film's diegesis, in *Erica* (Flavourworks, 2021).

All three artefacts constituted complex systems from an algorithmic perspective. In order to be able to map the story systems and interactions at play within the work, it was crucial to be able to experience the full spectrum of experience that these interactive artefacts had to offer, in order to assemble a global view of how interaction is scripted beneath the hood. Creating a mosaic of the inner workings of these artefacts was no easy feat and involved multiple playthroughs couples with techno-auto-ethnographical and observational research mapping the sensorial and affective implementations of computational interactions – or what we will call "traversing" within this paper.

Traversing is adopted here as a method for reverse engineering, recording and cutting across the possible semiotic modalities of the texts produced through the layered interactive interfaces of these films - the research process involved the engagement of the researchers in numerous traversals through three interactive narrative artefacts, in order to at once map narrative nodes for reverse-engineering and attempt to understand and reflect on how interactions are scripted into the aesthetic and sensorial qualities of the story's immersive potential. It is important to note here that the three artefacts studied are complex and a great number of traversals was necessary in order to create maps of such extensive documentation (as seen in the Appendix) - whilst the research did reveal a limited branching system for all artefacts, each artefact consisted of hundreds of points to be mapped in order to be able to deduce the operational modes of the overall story system. Whilst the branching system did not prove to be too advanced,

traversing was particularly useful in critically assessing interactions and understanding where they served to deepen the narrative and where they were mere illusion. Furthermore, traversing allowed for a deeper exploration of not only nodes and connecting points, but also the ways in which interaction can become layered onto the narrative network, thereby opening up the film to sensorial or affective possibilities. As such, it was paramount in allowing for an overall reflection on how these tactics could be useful for future experiments in open film productions.

In consequence, the implementation of traversing and mapping as research methods proved to be crucial in producing maps of both the narrative database and experimenting with visualising interactions - for example, tracking the most affectively-charged interactions within Erica, such as firing a gun using haptics in the most emotionally heightened moment of the film, or mapping the spatial configurations of the three dimensional 'world map' of The Dark Side of the Moon and comparing it to how the narrative is plotted across both space and time. Whilst engaged in traversing, the research involved not only mapping point after point, but judging the quality and method of interaction offered by various scenes, as well as attempting to demystify the touchpoints between the layers offering immersive engagement and the narrative system. Whilst traversing in the context of a narrative employing only a decision point system may seem like a straightforward process, when placed in the context of works that layered two or more complex model of interaction, traversal became a crucial part in understanding how story and the poetics of interactivity were coming together to formulate an experience that went beyond cognitive engagement and into spatial, haptic or affective territories.

In terms of the narrative mapping, one of the largest findings deducted after completing all story maps concerned the illusion of narrative interaction – whilst all three narratives offered an exhaustive number of decision points and story options, when visualised, this proved to be constructed of mostly illusory decision points with no bearing on the narrative system – all three artefacts followed a very simple linear or bi-fold structure as the only possible path, as seen in the Appendix. Whilst all models presented highly

interactive choices in the ending sequences, this level of complexity only occurred in the last three to seven decision point levels – whilst this represented a disappointing conclusion regarding the state of development for the narrative aspect of the open film, there were far more interesting findings in regards to potential for sensorial and spatial interaction.

In terms of the interactive layers, all three artefacts presented promising experiments that, whilst present in a state of technical infancy, as is often the case with early experiments, could provide a foothold for future models of interactive cinema. I Saw Black Clouds (2021) presented the most limited interactive system, taking the shape of a character relationship system geared towards increasing affective relationality between story and viewer - whilst this seemed to count and present the outcome for several points not relevant to the story but geared to building relationships, traversing the work numerous times demonstrated that, no matter the relationships built with characters, the majority story remains the same, certain characters only allowing the experience of episodes of the narrative. Whilst the other, main narrative-focused decision points in the film did supersede the character system, the prospect of an affective mechanic that would present a different narrative based on the relationship that the player chooses to build with characters could provide a fruitful path for experimentations with expanding the story network with another based on character relationality and dynamics.

The Dark Side of the Moon (2021) presents a promising approach to implementing 3D interactive navigation within traditional film formats and even scripting the possibility to collect and interact with objects, as seen in game genres such as hidden object games. The viewer often had to find and use objects to advance the narrative and certain items relevant to story progression (such as cell phones) could be used when the narrative called for it. Whilst this artefact did propose some really promising mechanics for how spatiality and movement can be used to further the interactor’s immersion within a cinematic world, the story system drastically limited the other spatial and agential interfaces by allowing the viewer almost no freedom of exploration - whilst one could

navigate significantly amongst the spaces, if one would not proceed to the next narrative node, there would be no other way of engaging with the story environment. This limited the potential of the interfaces presented, which could have been pushed further in terms of experimenting with the agencies given to the interactor. Nevertheless, this work does push the boundaries from an interfacing perspective through its implementation of further agencies for the player within traditional film.

Finally, Erica represented the most complex case study as deduced through the process of traversal. Not only did it feature more branching points and alternative narrative possibilities than the first two case studies, but the inclusion of mobile technologies and haptic interaction allowed for increased immersion and affective involvement within the diegesis of the film. The interactor could both make decisions at story points, but also use their touch screen to perform sensorial actions within the film – opening boxes, drawing, flipping pages, wiping a mirror of fog, etc. This haptics-based, sensorial second interface allowed for a heightened sense of immersion and a robust affective experience where the viewer could 'touch the world of the film', in the literal sense, and manipulate its fabric. Particularly in moments of heightened suspense or emotional weight, this second semiotic modality proved to be crucial for affectively involving the user in the narrative.

Whilst still in its infancy, the proprietary technology that Erica proposes for blending computational mobile and haptic technologies with an audio-visual story system comes the closest to the metaphor of the open film proposed throughout this paper. As such, an analysis of this artefact and its particular blending of haptics, kinetic cinema and branching story will follow, with the aim to better deconstruct and understand its inner workings as an artefact that successfully layers another semiotic model onto that of the narrative; this analysis hopes to bring theoretical thought and practise one step closer towards the ideal of the open film, through a close look at the novel methodology proposed by Erica.

As such, an analysis of the film Erica, in light of its use of haptic technologies, will constitute the focus of the next chapter. Before engaging in this closer analysis, the other two case studies will be shortly addressed, in order to provide a summary of the findings resulting from traversing across their interactive and narrative systems. Whilst these artefacts fall short of generating a good level of replayability, affective engagement and immersion, primarily due to their repetitive character and the drastic limitation of player freedom, their attempts at innovating the cinematic interface are still to be commended and can serve as a foothold for further, more complex experiments.

### I Saw Black Clouds: Affective Associations

I Saw Black Clouds (Wales Interactive, 2021) features a horror story of the haunting of a young woman who has lost her best friend. The epistemic narrative sees the protagonist attempt to understand what has happened to her friend, building various character relationships across the story. The film aims to record these character relationships, as well as track the attitudes and mental states of the character, within a menu that can be accessed at any times. The affective tone in the main decision points that the player chooses contribute to building both the attitude levels and the character relationship elements.

The film's story system is complex and features a very high number of decision points (over 500) - it claims to have two further interactive systems layered over that the narrative sequence model: a tracking mechanism that measures the interactors' emotional responses to other characters, as well as their overall attitude and the type of 'character' that they demonstrate through the way in which they engage with the work - therefore attempting to keep score on the affective undertones of the viewer's decision-making process.

As the interactor, you can see a series of metres that track your affective responses to the unfolding of events and characters, as well as their impact on the player character's 'self' in the menu section of the film interface. Engaging in Traversal-mapping has allowed us to explore this artefact in more depth with particular focus on the

psychological mechanic implemented in relation to story, event and self. Whilst the narrative was very complex (offering close to 600 scenes and 1000+ decisions per playthrough), traversing the work through the prism of the affective and psychological interface and comparing that to the narrative network produced demonstrated that these counters did not have an effect on the experience of story. Whilst they do indeed represent counters that record attitudes presented in certain moments and relational responses to characters and situations, having a different character or relationship level with others did not impact movement through the narrative. The Story values of Denial, Acceptance and Guilt did impact the final scene witnessed by the character, however the ways in which the counters operated seemed haphazard and not necessarily connected to clear sign posts from certain narrative nodes.

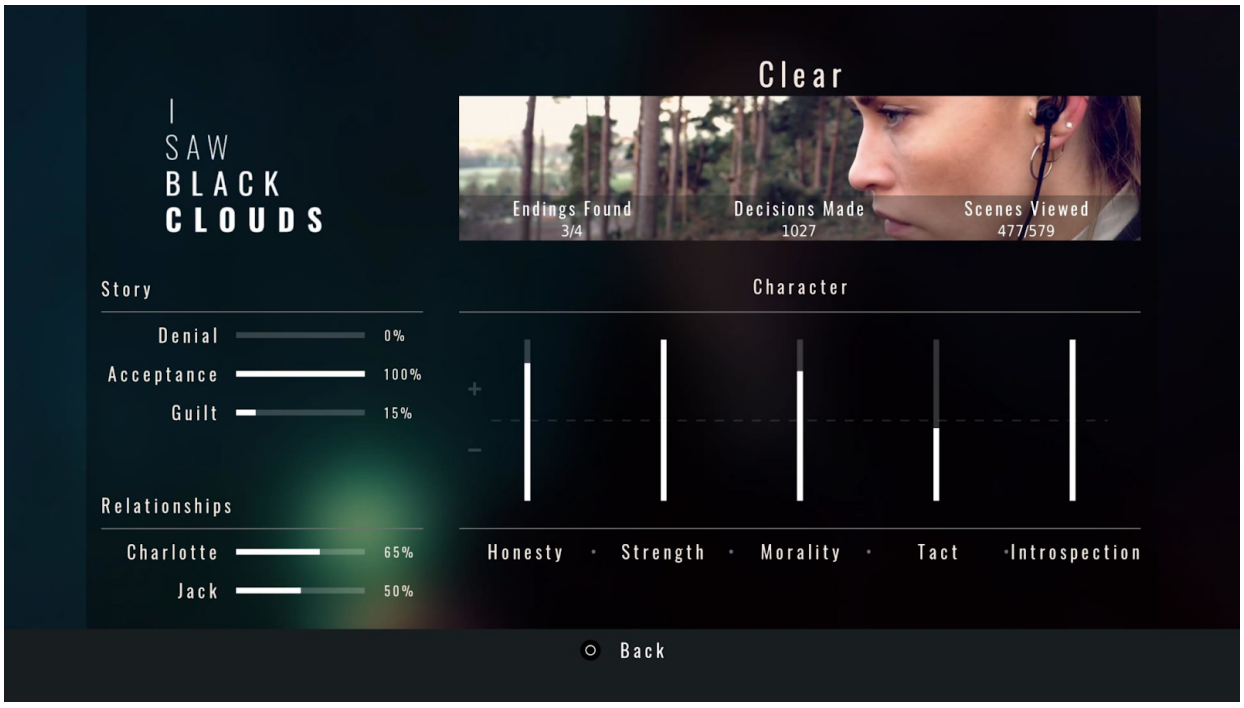


Figure 3. Still from ‘I Saw Black Clouds’ featuring the affective, quality and relationship tracker

Whilst the possibility of allowing interactors to build character traits, form relationships and have different story engagement styles are really interesting suggestions for systems which can impact on a user’s experience of the story, we found that the metre values have little power in deciding a specific ending. There are a handful of key

decision points within the narrative that decide which ending one will get, as well as your overall classification in terms of story interaction. Whilst the work features a very high number of decision points, most of these led to the same following scene regardless of which choice was made; interaction here is mostly illusory, both from the perspective of narrative and that of the affective systems promised.

This research deduced, as such, that the interfaces operating here were not truly layered – the narrative seemed to be disconnected from the counters, which reverse engineering proved to be mere visualisations. The only relevant counter, that of the Story values, would indeed have an impact - when the viewer reached a stage that the programmer deemed “the final scene”, would be the deciding factor in how the story ends. This was, however, disconnected from the overall narrative and it was not possible to understand how one’s attitude was mapped. Although heavily marketed as a new interface setting the work apart in the field, the psychologically-driven mechanics fell short from merging with the story. As such, this work did not present cohesive interfaces that were operating homogeneously, as indicated in the open film, but rather separate interfaces that briefly merged. The obscurity of how the system operates also created confusion and frustration for the viewer. As such, whilst this is a promising experiment in terms of its proposal, it falls short from the ideal of the open film.

### The Dark Side of the Moon: Expanded Agencies

The second case study addressed was that of The Dark Side of the Moon, produced by Tayanna Studios (2021). In this artefact, the spatial navigation elements and heavy influence of place-based storytelling promises new modes of interaction and new agencies for the viewer. Indeed, interactors can navigate from space to space, on micro scales (such as the rooms of a house) and macro scales (the town, public places, even the moon). Navigation happens via arrows that transport the viewer across the world of the film. The movie also introduces new agencies for the viewer, where objects can be selected in the world of the film and interacted with (such as a mobile phone that can be used to communicate with characters) or selected and stored in an inventory for use in

moments relevant to the story. Some of these objects are linked to navigational aspects - for example, needing a key to unlock the door of the house in order to leave.

Consequently, The Dark Side of the Moon proposes spatial, 3D navigation within the fabric of the film itself - reminiscent of hidden object games, the spatial movement and the object-related agency that the system allows results in the interactor being able to move around filmed rooms and spaces in the house whilst collecting and utilising objects. Whilst these tactics have long existed in video games, it is important to note that these modes of interactions are implemented entirely in traditionally filmed content – Tayanna innovates in terms of bringing these proprietary spatial and agential modalities of digitally-born environments into the sphere of cinema.

Whilst the implementation is experimental, the agential promise of these novel ways of interaction could provide a foothold for future experiments in spatial engagement with traditional filmed content. Where the experiment falls short is in relation to its merging of narrative with its other interactive mechanics. Traversing allowed us to map both the spatial world of the film and the unfolding of the story network – this posed certain difficulties in mapping, as both proved to be completely unrelated to one another on a diagrammatic level, despite several methods being employed to visualise these. Traversing allowed us to observe that the spatial world devised for the film could not be overlayed or related to the narrative network – this translated into the viewer's experience, where the disconnect between the spatial and story configuration was also apparent.

Below is a map of the spaces within the film world and the way that they could be navigated through by the user:

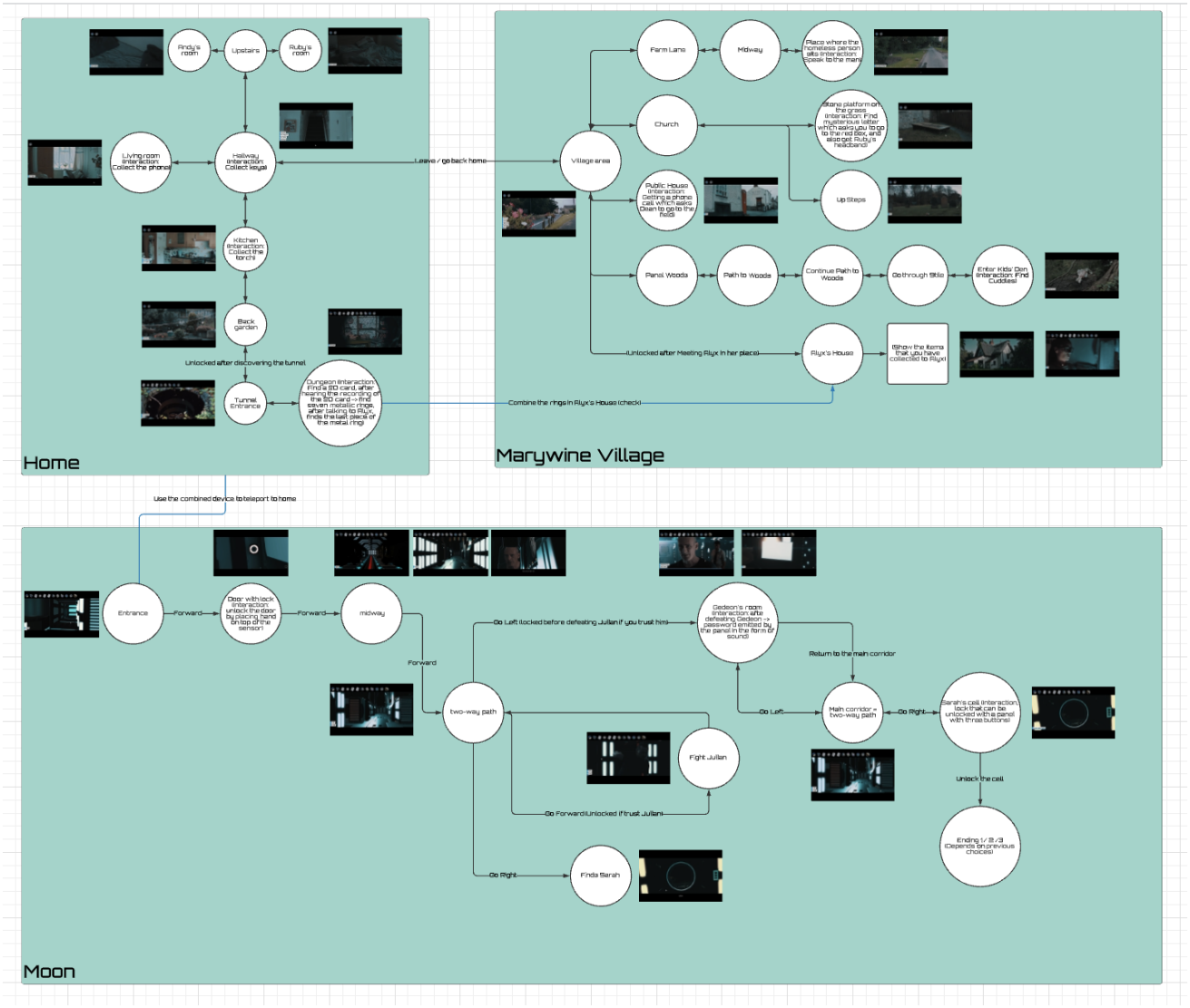


*Figure 4. Map of the navigable spaces within The Dark Side of the Moon.*

And here is a map of the narrative configuration of the work, as perceived by the interactor through their movement:

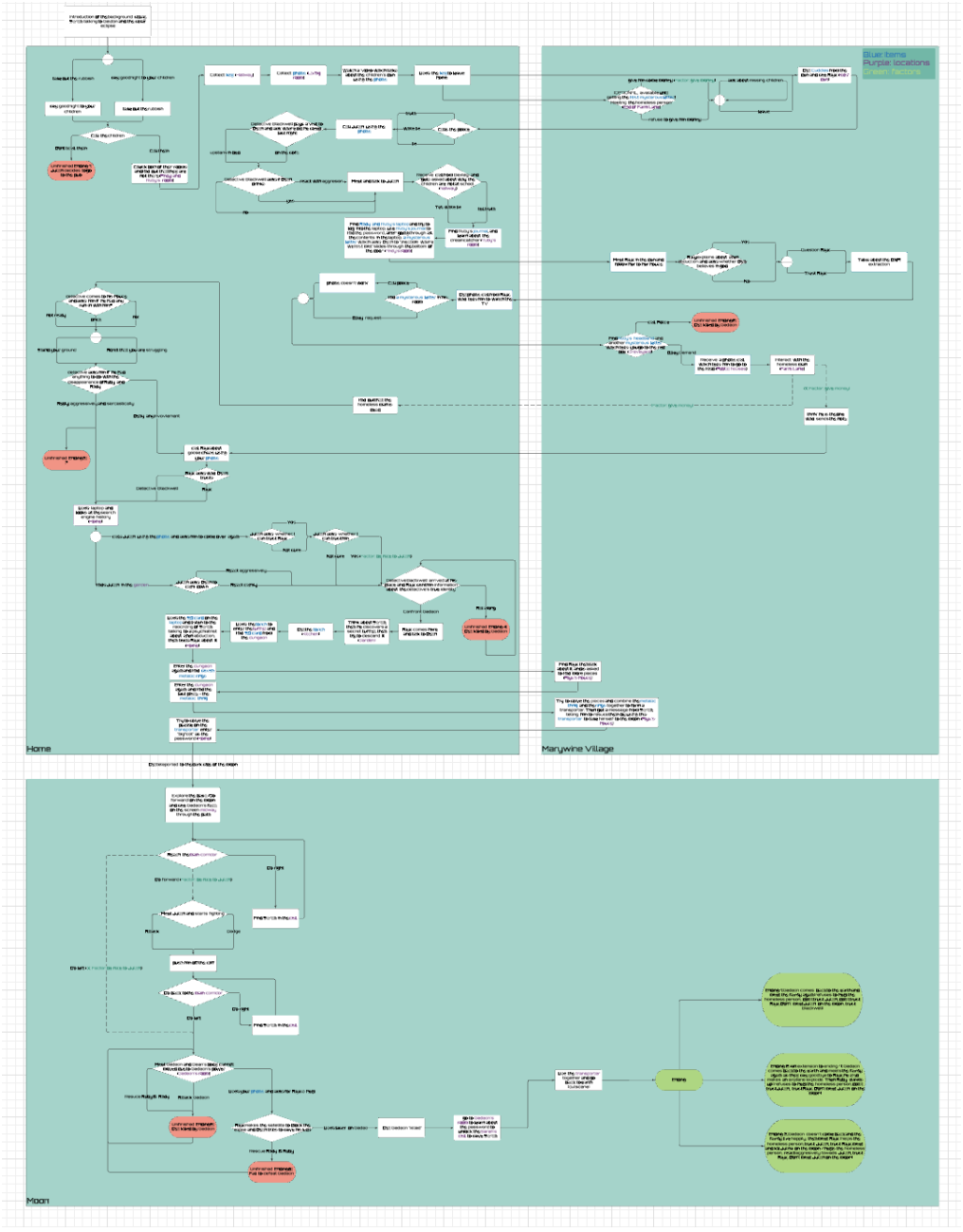


*Figure 5. Story map of narrative events in The Dark Side of the Moon.*

Multiple traversals were performed specifically with observational attention towards how the space of the film connects to the narrative structure, with this being the closest final structure produced in relation to the spatial elements. Whilst some overlaps are present,

the narrative is mostly independent from the spatial navigation and object interaction layer, which further impacted the story in terms of flow, immersion and replayability. The discrepancy between the movement through space and the movement through story often caused confusion or tedious wondering through scenes. Epistemic narrative devices such as hidden objects, clues, clickable spaces were often too esoteric and hard to demystify.

All in all, whilst this artefact presented both navigational/agential elements and decision mechanisms embedded in the filmed scenes, demonstrating strong connections to the spatial and menu configurations of hidden objects games and ludic mysteries, we have concluded that we are once again faced with an artefact where multiple interface modalities operate in tandem and on different semiotic levels, yet remain disconnected in terms of their configuration as layered networks that aim to collaborate. Despite this artefact presenting an interesting challenge in terms of thinking about how spatiality can become integrated within interactive stories as a design principle, it did fall short in terms of its blend of narrative and interactive mechanics.

As such, we will now turn our attention to a more extensive analysis of our final artefact, Erica (Flavourworks, 2021), which does present a more cohesive layering of story with its mobile and haptic interfaces, bringing us a step closer towards the possibility of layered cinema interfaces that increase immersion and affective engagement.

# VII. Affect and Haptics in Erica: Tactile Kinetics of Cinematic Space

This final chapter aims to explore the ways in which cinema can become a site for new interactive possibilities through the blending of a point and click interactive story system with tactile and gestural interventions inside the spatial configuration of the frame. Such a layering of interactive affordances that allow the interactor the ability to intervene both inside the screen world and within the narrative system is a step closer

towards the concept of open film discussed as central to this thesis, through its seamless blending of story with tactile, sensorial input that results in kinetic cinematic output.

The same methods of traversal as research instrument and mapping have been applied onto this artefact as with the previous case studies - due to its significant closeness to the idea of an open film that supports multi-layered interfaces in the form of haptic and decision nodes, an analysis of this final artefact is presented here with particular focus on how it scripts new modes of engagement and aesthetic categories.

Previous theoretical thinking in the domains of film and media studies will be re-addressed against the backdrop of contemporary manifestations of interactive cinema, with close attention being paid to those elements of human-computer interaction systems design that have been adapted within the praxis of visual storytelling. Through a close examination of previous understandings of tactility and corporeality within the landscape of both cinema and media studies, this research attempts to trace an evolution of these tactile and agential possibilities within the space of the open film, materialised through the integration of tangible, mobile interfaces as a gateway into the physical space of the film. Moreover, this section also aims to address the ways in which this new mode of becoming present within the space of an image operates in the context of interfacing with specifically filmed content.

Although a widely accepted mode of interaction within computationally-born story artefacts, touch is a sense not often explored within the space of live action film, or rather, not often explored in its material sense of direct engagement of one's physicality and the use of tactility and gesture as inputs for generating interactive responses within live filmed content specifically. In works where scenes and objects that have come into being through processes of rendering allow for their spatial manipulation with ease and, most importantly, are programmable - and therefore able to be coupled with an interface of the author's choice, tactility can be scripted with

ease. However, in the domain of live footage, not many attempts have taken shape outside of galleries and smaller experimental works.

The introduction of haptics within the space of live action moving image brings forward new possibilities for exploring the ways in which a viewer could have the potential to extend themselves within the world of the film in a manner that draws on physicality and embodied presence, as well as creating new potentialities for how the idea of tangibility can be addressed within the language of film. What is more, the concept of extending oneself inside the frame of the screen and having a materialised presence within the space of the cinematic image brings in new questions around the spatiality and depth of an interactive film world:

What forms could the sense of touch, captured via computational interfaces, take inside the screen space of the film? What extensions could be envisioned for the tips of our fingers and their digitally-captured gestural performances across devices? Moreover, when the spectator can use their own physicality to affect change within the frame of the film, how does this expand and question existing conceptions around the spatiality of film? Might we also talk about a “space-image” (Günzel, 2013) here, as we discuss in conjunction with video game worlds, where increased authorial attention needs to be ascribed to architecture and spatial configurations of the addressable elements within an image?

And, finally, how could touch become enmeshed with the production of narrative structures, acting as a narrative device within the process of generating interactive stories? These new possibilities of interaction between touch, footage and narrative will be addressed here through the proposal of approaching Erica’s modus operandi from the perspective of its layered story interfaces and examining its affordances for viewer participation in terms of embodiment, telepresence and meaning-making.

## Situating “Erica” : Beyond the FMV

The computational narrative artefact that will be approached here as a primary object of study finds itself at the crossroads between cinema, video games, narratology and interaction design through its interweaving of multiple characteristics from these disciplines into an interactive computational story system. Produced by Flavourworks and released for both mobile devices and Playstation’s Playlink (Sony’s platform focused on social gaming and interfacing with immersive experiences through mobile devices) in 2019, Erica is an interactive, computationally-mediated experience that makes use of film as its primary source of expression. Further described by its producers as “an interactive live-action thriller, merging the world of film and game like never before” (Steam, 2019), the story aims at experimenting with the introduction of haptic embodiment within the filmic experience as a second layer of interactive possibility, adding a agency modality to the more traditional decision point branching narrative system.

What is distinctive about the interactive film Erica is that it brings the fabric of film closer to possibilities of using kinetic feedback within a cinematic universe, triggered in response to digitally-mediated touch and gesture, specifically programmed as tools for facilitating depth of engagement with a story, but also modes of intervening within the narrative structure. Belonging to the thriller genre, the film follows a series of events in the life of a young woman named Erica as she addresses her troubled past and attempts to make sense of the mystery of her parents’ death, which ultimately leads to resolving the question of her own identity; part psychological thriller, part occult mystery, the film is a symbolically charged interactive story that allows for the viewer to forge her own path through multiple potential story configurations. The player participates in the formation of meaning within the story and influences the consolidation (or rupture) of character relationships, as well as the ultimate outcome, through her engagement with literal decisions, abstract choices and kinetic interactions through sensory devices such as mediated touch.

Erica was released within the context of what has been called a contemporary Full Motion Video Game revival, amidst a multitude of other new titles working exclusively with film as their mode of expression. Popular in the 1980s, FMVs, or full motion video games, emerged at once with the advances in laser disk technology - which allowed for better graphics and more costly processes of visual representation to be used for video games (Wolf, 2021); on the basis of this new potential for memory storage, FMVs took shape as playable media that exclusively utilised live footage sequences blended with interactive methods as their content. Speaking about the relevance of FMVs in the latest iteration of the *Encyclopedia of Video Games*, Mark J. P. Wolf stresses that the interactive movie genre holds significance in the discipline due to one singular reason: “it’s well-known failure” (2021) - the author goes on to list “limited interactivity, low-resolution imagery and unrefined acting” amongst the reasons for which this genre is to be condemned to obscurity, pointing out that, as the industry transitioned to three-dimensional, digitally-born worlds, “the world depicted by FMV appeared even more fixed and rigid” (2021).

Perhaps this may have been true at a time when CD ROMs had just emerged and creators were finding their feet in terms of experimenting with adapting interfaces within film; the niche of interactive film has certainly come a long way in terms of experimenting with both its form and content. It is also a question of restrictions of the medium: this particular view (purposefully selected due to it being illustrative of the general perspective on FMVs within the entire video games discipline) attempts to utilise a cookie cutter specifically meant for producing play-centric games with digitally born 3D content on what is essentially mediated film, looking for rules and freedom of exploration as signs of an artefact’s success, at the cost of overlooking the blending of interfaces with image composition, story, type of shot, stylistics, symbolism and other categories of importance to the experience of live footage; moreover, the recent revival of interactive film experiments and their integration of interfaces and new modes of digital mediation (as seen in LateShift(2016), the Complex(2021), Telling Lies (2019) - to name a few examples) contradicts the previous allegations made about FMVs - through the recent proliferation of new interactive film experiments, it is

clear that creators are not a abandoning the search for new ways to interact with film. Due to the unnecessary expectations surrounding FMVs to fit game-centric typologies, this paper proposes addressing the interactive movie presented here, therefore, not as an FMV, but rather as a computational story that operates within the medium of film as its primary mode of visual manifestation.

As we are starting to move beyond the simple sequencing of files present in FMVs and into a space of experimentation and expansion within the language of film, the idea of approaching the story by virtue of its computational, rather than play-centric nature, is proposed here as a mode of thinking through interactive film on the basis of the theatre of interactions at play within its world, rather than reducing it to medium specificity. Through a close reading of this computational artefact's affordances, a double analysis of its interface configurations will be carried out, with the aim of examining both modes of participation at play within the story system: the corporeal, embodied tactile interventions that facilitate telepresence within the virtual story space, and the decision-based narrative system which allows for individual choice to drive a user's experience towards a particular path.

## Beneath the Skin of the Film

In order to attempt to understand how technologically-mediated touch may operate within the space of interactive film, we will firstly turn our attention towards recent phenomenological perspectives concerning the materiality of cinema, namely the proposal of "haptic visuality" as a mode of engagement with moving imagery. Developed by Laura U. Marks in her seminal essay, 'The Skin of the Film', "haptic visuality" (2000) emerges from a perspective that attempts to critique the exclusive focus on the centrality of vision maintained by hegemonic formats of cinema. Marks, through conducting research around intercultural cinema, begins to recognise that some scenes have the power to suggest a "more visceral, emotional, sensuous form of cinematic engagement" (Kuhn and Westwell, 2014) and thus proceeds to draw connections between the idea of haptic visuality and a greatly heightened sense of

immersion, prompted by the dynamic materialities at play in audiovisual scenes that suggest materiality through their visual composition.

Marks asserts that, within works that exhibit qualities of haptic visuality, sensation becomes mediated through "the fabric and feel of film" (2000) - the sense of touch is, therefore, evoked visually, in a process where the eye, confronted with certain visual dynamics, draws on memories and visceral impressions in order to construct an understanding of the film that precedes the visual processing of the image; Marks essentially asks us to attempt to feel the tactile qualities of the film by allowing our other senses to engage with the image in ways that, through memory and mental connection, instil in us sensory perceptions beyond the visual.

Further probing this idea, Marks proposes that the skin of the film itself is more like a "membrane", a malleable surface that brings the audience in contact with the "material forms of memory"(2000)- the image, when encountered, prompts the mind of the viewer to react by resurfacing corporeal sensations of previously lived material encounters; haptic visuality does not, therefore, concern itself with the performance of any tactile activities in the physical sense, but rather relies on memory only as the activating force of non-visual sensory stimulation within the body.

We can, therefore, see that the sensorial dimension of touch was discussed previously in film theory by way of sensory information transmitted through mental associations; although the theory of haptic cinema does not, in fac address touch in the sense of its physical manifestation, it does outline some very important avenues for how tactile sensations can take shape within the space of film and their relevance in terms of communicating with the spectator on a much deeper level than that of the eye. One may ask themselves why the idea of touch was not addressed in its physical potential - after all, first experiments in interactive cinema, like Raduz Cincera's "Kinoautomat" (1967), had happened decades before the formulation of haptic visuality; however, the inclusion of cinematic interfaces in works that were not delivered as part of an audience-facing event (as with the aforementioned project),

had not yet moved beyond text-based visual interfaces operating on the basis of input from buttons or other forms. And how could the material activation of such an idea like touch-mediated spatial interaction have been considered, when the hypothesis of being able to physically use one's hands to feel the inside of the screen and perform meaningful actions within the frame seemed relegated exclusively to the domain of digitally-born computer environments?

This is not to say that the notion of haptic visuality is erroneous or incomplete in its ways - indeed film scenes are sites of exchange charged with powerful visual meaning and have power in themselves to appeal to our other senses through "shared structures of embodied experience", as Vivian Sobchack suggests (2004) - but rather, this research seeks to suggest an amplification and extension of the rich potentialities of sensorial interaction with the viewer suggested by Marks, an extension takin plays by way of computational integration of an interface capable to process touch and gesture input from the viewer and, beneath the hood of the screen, process that into the real-time editing and manipulation of scenes, so as to simulate fluid and natural motion sparked in virtual objects by the physical movement of the viewer? This work does not, therefore, seek to critique the concept of haptic visuality, but rather to extend it in light of new possibilities of technological mediated touch and to reposition it in the context of computational cinematic interfaces that allow for an expansion into the sensorial palette available through the merging of computation with the practice of filmmaking.

Returning to Marks' idea of the membrane between the fictional space of the film and the domain of sensation, which sits as a layer between the screen and the subject, we can perform an exercise in visualising it: the moving image, through its architecture, subject and stylistics, pushes against this membrane, transmitting impressions of material effects through its mode of presentation, impressions which are then internalised and processed cognitively by the spectator as haptic sensation (2000). But what happens if this membrane, instead of only being pushed outwardly (towards the viewer) by the arresting visuality of the image, can suddenly be folded

back and into the other direction, towards the inside space of the screen, through the tactile influence of the spectator?

How can this border zone between the site of the film and that of the real become mediated by a technological interface, and what new possibilities for addressing movement and materiality can arise from the membrane evolving into a gateway for the flow of data, instead of being purely a beam of cognitive signals? Moreover, how can such an interactive possibility co-exist, or more specifically, intermingle with, existing methods of point-and-click interaction in decision-based interactive film?

This idea of a border zone effectively becomes transformed into a zone of contact through the interventions of computation in the liminal space between spectator and screen; this paper attempts to move the focus from the screen as a site of gatekeeping and isolation to one of active exchange that involves both material and cognitive correspondences. The experimental practice of integrating physical touch via haptic interfaces is examined as a force that can bring the already existing tactile materiality of film - owed to its visual construction - into a space of new possibilities for embodiment and presence within the space of live footage cinema. Could we then be speaking about a truly multi-sensory image, one that allows for meaningful material intervention - and implicit agency- as well as for a sense of physical presence within the frame that is encountered through the body, rather than just felt by way of memory echoes in the mind? This paper aims to address a first step taken towards going *beneath* the skin of the film and towards the possibility of crossing the boundary between the spectator and the screen, through Erica's experiments with making virtual objects and spaces tangible, moveable and charged with affective significance through its utilisation of gestural interaction.

Although Erica's physical interface does put touch and gestural movement of the hand in direct cause-and-effect correlation with the objects and spaces in the film, which become malleable through their natural responsiveness to physical data input (and implicitly, the film itself becomes partly ascribed to the dimension of the virtual through its computational character), our artefact does omit the possibility of inducing

sensations through other capabilities of software, like vibration, which is already programmable in most mobile devices and generally utilised in game controllers and could function to mimic texture and provide a deeper sense of materiality to moments of heightened dramatic effect. As Orozco et al. point out, “a virtual world can be enhanced in a more complete imitation of the real space by the introduction of an artificial support technology called haptics” (2012, p. 217). It is necessary to make a distinction here between in the sense of how the term *haptic* is understood in human computer interaction and its interpretation within the film theory previously discussed. We will turn here to Orozo et al.’s definition of a haptic interface being “a device that allows a user to interact with a with a computer by receiving tactile and force feedback” (2012, p. 218) - in computer science, therefore, haptics implies not only tactility, but also the mobilisation of force through vibration and other motoric affordance of computer sensors in order to simulate deeper material associations, such as texture or even the weight of objects as suggested by David Parisi’s theorising of the reconstructions of touch in virtual space (2014).

*Figure 6. Wiping steam off the mirror in order to reveal the expression of the main character. The visual and embodied sense of the interaction imitates the natural gesture very accurately.*

The approach of computer scientists, therefore, differs from the one adopted by Marks et. al, in that the latter group approaches the idea of haptics in its broadest sense of meaning “anything related to the sense of touch (Ultraleap, 2019), where perception can be realised by grasping something or exploring surfaces. It is important to note this distinction as Erica is essentially lacking haptic integration in the domain of human-computer interaction, whilst in the realm of film studies it is haptically-rich and even demonstrates somatosensory effects on the viewer through the performative, gestural actions that can be performed on the objects inside the film world, such as guiding a pencil to draw on the page, flipping the pages of a book or swiping a knife (which, much like their real counterparts, are programmed to appear as having weight), wiping steam from mirrors and even abstractions of gestures such as the previous act of wiping away being used to tear the fabric of the present in order to reveal a memory.


*Figure 7: Flipping a lighter open and shut in the beginning of the narrative, the interaction imitating the natural movement and weight of the gesture.*

In light of this discussion, we can think speculatively beyond these scripted possibilities, to a time when the border between the viewer and the screen may be

completely dissolved and below it, a fully haptic and textural film environment will be revealed, with the ability to be experienced in its full physicality. But for now, we are addressing touch here in its sense of tactile interaction through mobile screens - despite not being fully materially-sensorial as desired by HCI, our artefact does take steps to fulfilling a turn towards a sensorial, rather than ocular centric cinema, as desired by the theorists of haptic cinema (Marks,200; Shoback,2014). We will aim to address here the spaces between touch, materiality, cognition and the fabric of the film be negotiated through the gestural performance of hand on touchscreen, with special attention paid to the expansion of film space from flat image plane to addressable cinematic environment. And more importantly, what new affective and engaging forms may this mode of tangible interaction allow in the arena of storytelling?

**The Challenges of Scripting Meaningful Change**

I will address these questions through an exploration of Erica's experimental attempt at framing a new sense presence and immersion for the spectator through its deployment of a double cinematic interface. The move beyond the boundary of the screen and inside fictional space, via the transmission of concrete sensory data has been extended here in the domain of cinema by the integration of a touchscreen-operated system that seamlessly integrates touch with spatial agency within the world of the film and further embeds itself within the larger story formation system governing the experience, as demonstrated by our artefact.

As shown previously, the idea of haptic visuality was formulated to operate in a manner of singular exchange, by transmitting visceral, primal sensation from the audio-visual content to the spectator - information here is circulating via a unidirectional avenue, from the frame to the spectator, and the latter does not have the ability to cause an effect themselves within the film, in the same way that the sense of "corporealized experience" (Sobchack,2004) is effected onto them. Through the deployment of algorithmic systems, Erica effectively refigures this system and

creates a space where information, rather than flowing from screen to recipient, moves in a circular system of data exchanges between audience and film, based on inputs and outputs that operate both at the level of story and at the level of the image architecture. The viewer can intervene not only in the story formation process through decision points, as traditionally seen in branching film structures, but is also allowed the affordance to effectively touch the film in order to gain agency and effect change within the spatial configuration of the image, a quality that brings forth a new set of possibilities for experimenting with physicality, agency and presence within the spaces created by cinema.

I argue, therefore, that through the applications of haptic technologies within cinema production, the possibility of haptic transmission begins to flow both ways within the space of the screen (from the film world to the mind of the spectator and, as the result of computational interventions, from the tactile input of the viewer into both the story and e virtual space of the film), thereby enabling the spectator to complete the feedback loop and effect meaningful change in the narrative and spatial compositions of the film.

But what is *meaningful* change? And how does it take shape within experiments of film that are overlaid onto a computational system of exchange? We will attempt to answer this question by investigating both modalities of input programmed into our case study: touch and choice. Both of these affordances of interaction that have been scripted into the film are linked to their own domain of output, either at the story formation or at the spatial manipulation levels, and both invoke their own nuances of agency which draw on the cognitive and the sensorial capacities of the viewer.

To firstly address how meaningful choice may be enacted within the space of interactive film, we will firstly examine some perspectives on choice within the arena of interactive media from the discipline of video games, due to their specific attention to the possibilities of choice and exploration manifested in video game worlds, possibilities which are consistent with those the affordances proposed by Erica. In the same way as video games can face the player with choices that can be emotionally or

morally charged, films that employ interaction can also operate on a level that Glena, Steinemann et al. identify as “highly personally meaningful”; moreover, they point out that “knowing that these choices would have consequences” leads to the viewer experiencing their interaction with the game world as meaningful (2017).

The game designer Sid Meier has famously defined games as "a series of meaningful choices" (Rollings & Morris 2000, p. 38), identifying the productive interaction between the player and the system as the fundamental nature of a game. This definition can, through its generalised focus on interactivity - and its exclusion of the idea of play, which is central to the discipline of video games studies - be extended to describe any interactive media that operates on the basis of a system of exchanges between its underlying program and the viewer.

Moreover, Salen and Zimmerman build on Meier’s idea of meaningfulness in order to offer a description of what they call ‘meaningful play’, which addresses how interactive exchanges can be meaningful from the perspective of the player. They identify that this occurs when it is apparent to the player that their input into the system has led to a “distinct outcome or change" (2003) - they conclude, therefore, that the value or impact of a choice needs to be conceptualised by the player in order for them to perceive their own engagement as meaningful.

Salen and Zimmerman’s definition (2003), although highlighting the very important distinction between choices that are perceived to be meaningful and choices that are perceived to be irrelevant, might also be criticised for not fully encapsulating the spectrum to which a player may feel that their engagement is “meaningful”. Oliver and Bartsch (2010) and Rogers et al. (2017), building on perspectives from psychology, conduct audience studies in order to attempt to provide an expanded idea of meaningful experience, by defining it “as a state of being moved, of gaining insight into important and difficult questions on life’s purpose, and of connecting with other players or game characters" - therefore, through their respective studies, they isolate emotional impact, reflectivity and exchange with either real players or virtual

characters as core requirements for the viewer to be deeply and authentically engaged.

Whilst the results of their studies do demonstrate that meaningful interactive media experiences are indeed reliant on the depth of the story presented, as well as the overall affective and reflective impact of the content, Oliver and Bartsch (2010) and Rogers et al. (2017) also reach a secondary conclusion, namely that “moral choices and dilemmas” are another quintessential factor for elevating an experience from the state of being simply ‘fun’ to that of being ‘meaningful’. The ethical weight of a decision within the story universe becomes another factor of consideration for assessing the overall richness of experience. As Glena et al. also demonstrate, the fact that interactive media artefacts put the moral responsibility of choice on the player themselves results in a deeper engagement, at the cognitive level, with the questions introduced by the available choices: “to spare or to attack, to save or to sacrifice, to kill or not to kill” (2017).

Further studies conducted by Patall et al. demonstrate the importance of the player’s own perceived autonomy in choosing between the available options and their understanding of what these options entail - a player’s perception of whether they are free, rather than constrained to make a choice, coupled with their understanding of where that choice may lead has crucial role in the significance of their experience - scripting possible player actions and clarity within choice options are also, therefore, central ideas to creating meaningful interaction (2008). Finally, Glena et. al also approach the idea of a branching narrative itself in their study, and discuss the fact that the player may “decide to take certain roads and as a consequence the story may change in ways that make it unique to the ones experienced by other players" (2017), in relation to which they conclude that interactive story experiences, through their ability to allow the viewer to personally forge their own narrative and, implicitly, suffer consequences for the ways in which their own autonomous choice, contributes significantly to a substantial experience .

Having explored the idea of meaningful choice as it surfaces within games studies (Rollings & Morris 2000, Salen and Zimmerman 2003) and psychology research addressing interactive media engagement (Patall et al. 2008, Oliver and Bartsch 2010, Glena et al. 2016, Rogers et al. 2017), we can derive a number of essential factors that will contribute to deep player engagement and the perception of whether an interactive experience possesses richness of meaning:

a. The clarity, availability and diversity of choice presented by the fictional world.
b. The moral weight of that choice in the narrative context, or the quality of it constituting a dilemma that requires deep cognitive engagement.
c. The affective potential of the story itself instils emotional reactions in the viewer.
d. The reflective quality of the content that prompts the player to make connections to their own lived experience.
e. The viewer's perception of the possible effect that choice will have at the time of deciding.
f. Their autonomy when it comes to the act choosing in itself.
g. The transparency of what kind of feedback the system has generated in response to their choice.

Based on the previous discussion around the new sensorial potential of this artefact to generate a new sense of material embodiment through tactility and gestural performance, as well as its closeness to the proposed notion of the open film, four more categories are proposed here, particular to the open film that manifests itself through interactive, haptically-enabled cinema:

h. The quality of input of the tactile interface and the diversity in use of in sensorial affordances
i. Its seamless integration with the fictional world's addressable objects and spaces

j. Consistency of the motion feedback with real-life scenarios of movement and gesture
k. The thoughtful blending of actions and gestures with the story generation system.

We can see through the new schema of essential factors that has been established here, specific to those interactive storytelling artefacts that combine both decision-based interaction and tactile possibilities, that an open film is able to formulate new categories and aesthetic formats of its own. Erica (2021) succeeds in cultivating new interactive affordances, formulating novel aesthetic and phenomenological categories for viewer engagement and providing novel avenues for exploration within interactive film. What is more, it not only succeeds in terms of proposing a novel mode of interfacing with cinema, but it also succeeds in terms of how it blends mobile and haptic technologies with the narrative story, demonstrating a truly layered structure where the sensorial interactive mechanics is configured *with*, rather than outside of, the story system.

Through multiple traversals of Erica with attention to how the tactile and sensorial elements are intertwined to story events, it is apparent that these structures are collaborative and complementary. The method of traversal revealed that a large majority of interaction points had direct and heightened relevance to the narrative and operated logically within the event that they appeared in; they were also critically and directly tied to sensorial haptic-based movements that further deepened the viewer's sense of immersion and agency within the work. Haptic interactions were used to provide a sensorial dimension to key elements of the narrative, aiding in generating affective response in the viewer. Furthermore, the balance between tactile interaction and story was well-refined – even throughout multiple traversals, being in the film-world (both cognitively and sensorially) did not feel tedious, repetitive or confusing to the interactor. As such, a set of cinema interfaces that are truly layered are present in this artefact, demonstrating a substantial first step towards the ideal of the open film.

All in all, whilst operating on the basis of a relatively simplistic branching narrative structure that features true interactive possibility only towards the final few points of the story, Erica succeeds in taking a step closer towards the open film through its effective utilisation of haptic media for generating sensorial, affective engagement with the fabric of the film. The seamless configuration of narrative events with interactive possibility creates an open semantic field where several modalities operate at once, creating a rich experience for the interactor which engages them not only cognitively but also sensorially and affectively. What is more, Erica demonstrates a hypercursal structural model, where narrative nodes at once present a horizontal structure and further vertical interactions that operate on scales beyond cognition – consequently, this artefact presents a highly relevant example towards further developments of open films that challenge the conventions of interactive cinema and attempt to move into sensory and affective territories through the affordances of computation.

## VIII. Conclusion

To put it all in a nutshell, this research paper proposes the concept of the “open film” as a mode of conceptualisation for emerging cinema experiments where multiple interaction mechanics operate at once, in an aim to deepen viewer engagement with the world of the film. An extension of Katherine N. Hayles’ idea of the “open-work” (2001) - an open film exhibits multi-layered possibilities of interaction, where not only the narrative finds itself in a constant state of becoming, but other interactive affordances allow for multiple entry points and modalities of engaging with a work; crucial to the open film is the idea of multiple interfaces and the possibility for different interaction modes to be layered and specifically configured together, in order to allow multiple processes of data exchange to operate within the space of the film. The promise of the open film is that of providing a space to explore rather than a line to follow, a

decentralised, multicursal experience through narrative permutations and experimental modes of participation realised through the experimentation with new interfaces.

The paper further proposes a hypercursal model as a schema for visualising and conceptualising the ways in which the layered networks of cinema interface can be configured together in order to operate as an open film where the viewer is engages on several semiotic levels. The process of “traversal” is proposed as a core mode of engaging with the case study artefacts through mapping of both story nodes and interactive possibilities in order to understand and further critically evaluate the ways in which these works push the boundaries of interactive possibility within the space of cinema.

Through the repeated traversing of a story system, coupled with mapping as a practice, cartographies of the algorithmic topographies underpinning the case studies are produced and used as the basis for a preliminary analysis across all artefacts, as well as an in-depth analysis of the artefact that shows successful configuration of story with sensorial interaction mechanics. Traversal was implemented experimentally here in order to test its potential for reverse engineering and critical reflection on the blending of story and interaction – as such, traversing moves beyond simple playthrough-story mapping relationships and into the territory of reflective and targeted observational research concerned with the traversing of all systems that make up a story and critically analysing how these are configured together. With the ultimate aim of understanding the way in which interactive mechanics are configured at the level of multi-layered cinema interfaces, traversal serves as a method of inquiry that leads to critical reflection.

The method of traversing was applied to  artefacts chosen as case studies on the basis of their promise to push traditional interactive film boundaries through the integration of haptics, spatial navigation and affective tracking metrics via additional interactive mechanics to that of story. Whilst all works showed creative implementation of interfaces and can provide a foothold for future experiments in expanding the palette of interactive possibility within cinema, the first two case studies did fall short from

demonstrating a truly open film structure due to their interactive and story mechanics being separately configured, rather than collaborating within the experience of the work. The final artefact, ‘Erica’ (Flavourworks, 2021), was found to indeed present a hypercursal structure through the successful and meaningful layering of a haptic interaction sensory modality onto that of the narrative. In order to further investigate the new spaces of possibilities and aesthetic categories that become viable with the emergence of multi-layered interactive affordances within the space of the screen, the thesis concludes through a close reading of the artefact ‘Erica’ (Flavourworks, 2021), which demonstrates increased immersion and involvement of the user through its incorporation of haptics within the study of the film.

To put it all in a nutshell, this research endeavour set out to examine emerging cinema interfaces and the affective, spatial and relational geographies that they propose in addition to the topography of interactive narrative. To this end, it provides a metaphor of the ‘open film’ as a mode of thinking for those formats that push to build on the branching narrative format. Building on the mulitcursal labyrinth structure, it provides a hypercursal schema in order to visualise how interactive systems could be configured together and overlapped. Furthermore, it sets out to explore how these two semiotic modalities can be configured within contemporary experiments that demonstrate such plurality of interfaces, proposing traversal as a way to reverse engineer and critically reflect on the modalities of these artefacts. A summary of the findings and an analysis of the artefact found to have layered interfaces that were configured together, rather than apart, is provided, in order to constitute a foothold for future thinking and practice within this direction. Ultimately, this paper aims to contribute to the contemporary debate surrounding interactive film by proposing a new mode of conceptualising and analysing those emerging cinematic works in which several interactive mechanics operate at once.

# Appendix 1 : Story Maps

Please note that the flowcharts generated during the process of traversing the case studies have resulted in large, sprawling media files and charts of a high degree of complexity. As such, whilst screenshots and simplifications are included within the thesis, these cannot encapsulate the full spectrum of detail present in the final products. The story maps, are, therefore, provided as appendices to the thesis, as follows:

- Erica Story - Full Story Map [ .pdf chart ]
- I Saw Black Clouds Story - Full Story Map [ .pdf chart ]
- The Dark Side of the Moon - Full Story Map + Spatial Map of Film Areas [ .pdf chart ]

# Declaration

**I declare that this thesis is a presentation of original work and I am the sole author. This work has not previously been presented for an award at this, or any other, University. All sources are acknowledged as References.**

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