

Negotiating Conceptual and Practical Frictions in Making the Capra Short Film: Extending a Research through Design Artifact with Video

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Abstract

As the practice of hiking becomes captured through personal data, it is timely to consider how technology might support noticing and connecting to nature as well as one's self over time. Capra is a system we designed that brings together the capture, storage, and exploration of personal hiking data with an emphasis on longer-term use. In this pictorial, we unpack our process of making a short film that aims to communicate the workings and experience of Capra to a broader audience. We encountered frictions in mobilizing key theoretical concepts framing Capra as a Research through Design (RtD) artifact in the making of our film. We reflect on tactics for working through such frictions, how they can support future work, and how the filmmaking process can offer a valuable approach for distributing RtD artifacts to broader audiences.

Author Keywords

Research through Design; Short Films; Alternative Research Outcomes; Personal Data; Hiking; Noticing; Unobtrusiveness.

CSS Concepts

• Human-centered computing → Interaction Design; Interaction Design Theory, concepts, and paradigms.

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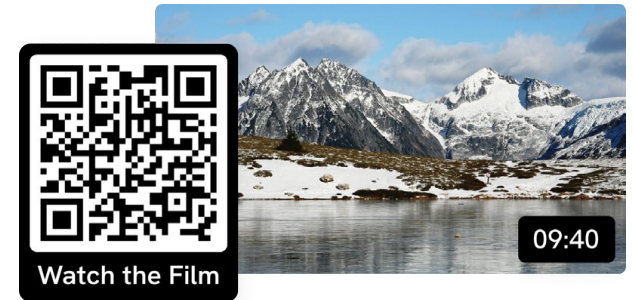
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Introduction

For the most part, the primary audiences for Research through Design (RtD) projects are the Human-Computer Interaction (HCI) and design academic communities. In recent years, there has been a growing interest to develop approaches for distributing RtD knowledge through alternative outcomes (e.g., documentaries, DIY kits, podcasts, tutorials, zines, etc.) [14, 18, 55, 59]. These efforts are united by a desire to package and distribute design research in forms that offer alternatives to an academic research paper. Nascent work has demonstrated that the process of designing alternative outcomes is not merely translational, and can also be generative by providing a refined perspective on an RtD project when expressed in a different form [60]. Yet, such approaches are underdeveloped and more examples are needed to understand their conceptual and practical potential [44, 55, 59]. In parallel, there are calls for attending to the messiness of RtD by offering practical reflections that are “more open about the meandering, confusing at times, and ambiguous explorations in process” [12:2133]. Several recent works articulate opportunities for documenting the mesh of frictions and decisions that unfold within RtD processes as theoretical concepts and design practice influentially work together to arrive at a final outcome (c.f., [6, 12, 19, 26, 37, 46]).

Our research contributes precisely to the intersection of alternative outcomes and RtD process. We explore the medium of video — specifically, the making of a short film to extend and distribute an RtD artifact called Capra. In a recent paper [42], we present Capra as a longer-term RtD



project that inquires into how hikers can collect and explore hiking data in ways that might support noticing and connecting to nature as well as one's self. That paper reports on key frictions and design decisions across our designer-researcher approach that eventually produced the resolved “research product” [41] version of Capra.

In this pictorial, we document and unpack the design process of developing a short film about the Capra RtD artifact. In comparison to other media forms that have been employed in RtD (e.g., zines, podcasts, tutorials, etc.), the grammar and conventions of film supported us to communicate the inner workings of the device in the context of the project's broader conceptual aims through a dynamic, expressive, and easily distributable medium. Film allowed for flexibly moving through time in a narrative enabling us to communicate multiple touchpoints with Capra in a concise and emotive video. We did, however, encounter frictions in mobilizing key theoretical concerns shaping this RtD artifact in our film. Negotiating these frictions required careful iteration in our process. Ultimately, we found that making this short film provided a unique lens on the Capra design artifact itself, refining our understanding of it as an RtD project as we negotiated how to conceptually and practically communicate it for a broader audience.

Our critical-reflexive documentation of the process to create the Capra short film offers a practical design research case illustrating the value of mobilizing this method for the HCI community. In this pictorial, we attend to three key frictions tied to conceptual concerns of Capra and how we worked to resolve them. In this, we aim to stay close to our design research case to

contribute pragmatic, actionable insights for making short films of RtD artifacts for broader audiences. We see this contribution as a worthwhile initial step toward pushing the methodological boundaries of RtD in the direction of short films, which creates opportunities for further developing and theorizing this approach. We also contribute the Capra short film and invite the design research community to consider the role that video might play in their own practices of refining, extending, and distributing alternative outcomes of RtD in the future.

Capra RtD Project: Framing and Background

The availability of low-cost sensors, wearable and mobile technologies has led to people's lives becoming recorded, quantified, and aggregated. These types of technologies are increasingly becoming present in the practice of hiking (e.g., fitness trackers, navigation applications, etc.). Yet, it remains unclear what roles technology should play in mediating people's experiences in and around nature. Researchers have cautioned against technology's potential to disrupt human-nature relations [3, 10, 51], arguing *unobtrusiveness* ought to be a core concept in guiding the design of user experiences in nature [25]. Recent work has advocated for design processes that support *noticing* the rich set of interdependent relations among human, non-human, and other ecological elements in nature (e.g., [1, 2, 9, 30–32]). More broadly, as people continue to accumulate digital records capturing their lives, there is a need to investigate how people will retrospectively interact with their “quantified past” [16] in ways that move beyond a focus on efficiency and reframing data as interpretive, evolving, and entangled [13, 17, 29, 43, 54].

How might digital records of hiking be captured in ways that offer different perspectives on these experiences as they are explored and lived with? In what ways could human-nature relations change as they are considered through different vantage points? And, how might the use of personal data grow, scale, and evolve as a person, their archive and their memories age over time?

In a recent paper [42], we inquired into these questions through an RtD process that resulted in the creation of *Capra* — a system that brings together the capture, storage, and exploration of hiking data. Capra consists of two artifacts: the *Collector* and *Explorer*. The Collector is a wearable camera device that captures time lapse digital photos of hikes from three different angles and encodes them with various forms of metadata. The Explorer is embodied in a book-like form with an inbuilt projector that is the tangible repository for all hikes captured by the Collector, which enables a person to re-visit time lapses of their hikes through different metadata filters. A key objective of the Capra project is to inquire into design qualities that might enable personal hiking data to support ongoing, open-ended experiences — moments of noticing, revisiting, contemplating, and exploring — and how these kinds of experiences might shape a person's orientation to hiking in nature over time.

While Capra is a finished, robust artifact, as an RtD project, its primary mode of distribution is a highly textual, static research paper. In this pictorial, we unpack our process of extending this RtD artifact through creating a short film that offers a dynamic expression of Capra's workings and conveys the experience of using it over time. Our approach to unpacking our process in creating the Capra video is closely aligned with design journey narratives [12, 15, 27]. In the design journey framework, the research team's design process is detailed through a post-mortem narrative that attends to specific design decisions that were shaped by key higher-level concepts. In our case, the design journey is largely situated around three frictions that emerged as we negotiated the concepts of *unobtrusiveness*, *noticing*, and *data scaling over time* in the practical making of our film. Drawing inspiration from earlier pictorials led with visual presentations of design work supported by smaller-sized annotative footnotes (e.g., [27, 37, 47, 48]), we adopted a similar style to foreground the visual qualities of our filmmaking process. Next, we offer a brief review of related work at the intersection of video and

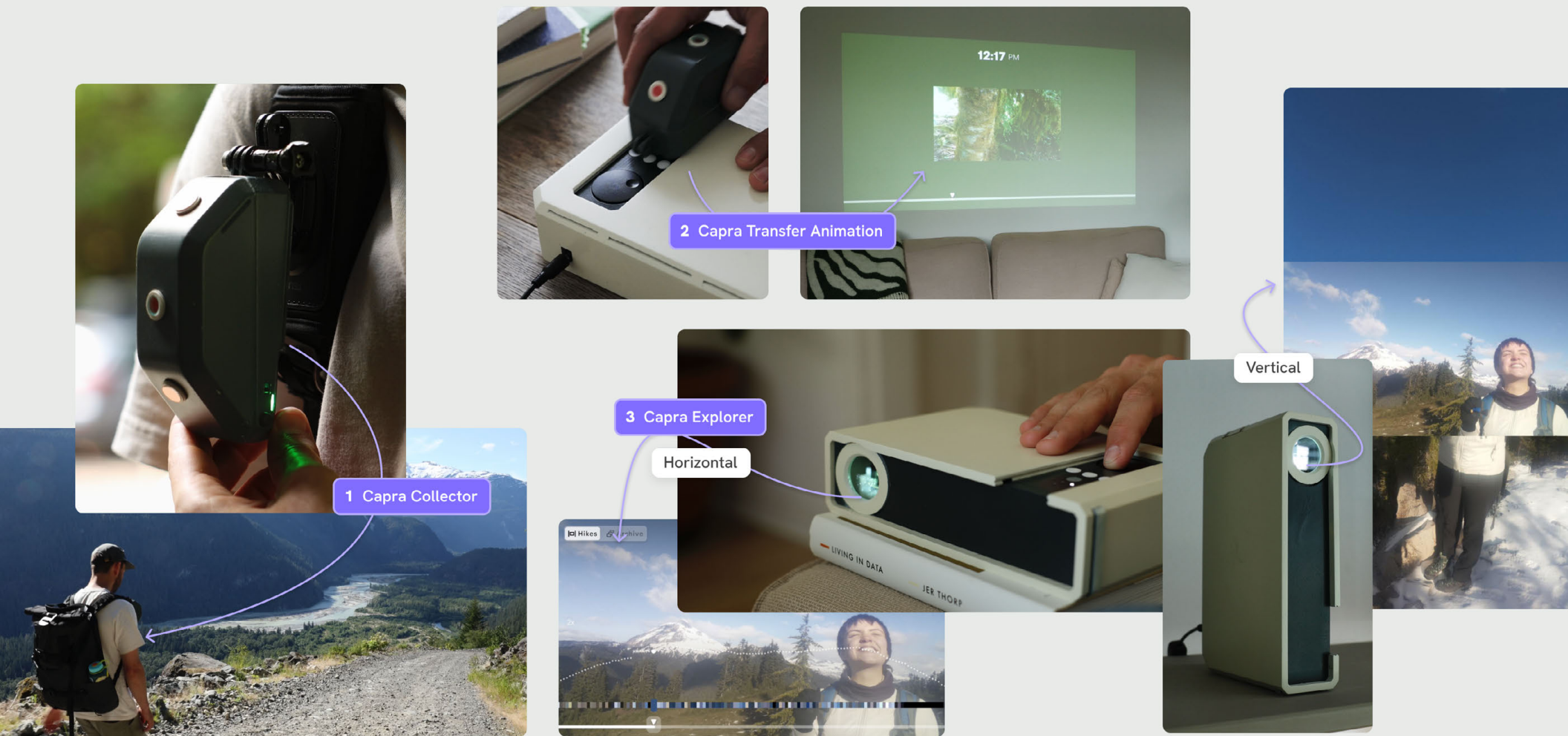
design research to further situate the approach and contribution of this pictorial.

Related Work: Video and Design Research

Video is a flexible and diverse tool that has been leveraged to communicate design research processes and outcomes. This includes explaining research prototypes and interactions [35, 38, 62]. There is a growing amount of research exploring how video can be used for documentary purposes that include documenting design processes [50] and capturing design research [20, 22, 23]. Recent work has explored the potential and limits for documentary filmmaking to generate alternative research outcomes that both capture and distribute RtD processes [44].

Video has also been widely utilized within speculative and design fiction work to explore potential technological futures and open debate among the general public around matters of concern (e.g., [5, 7, 49, 52]). For example, Mancini et al. [36] present vision videos that portray both positive and negative interpretations by users of proposed technologies to engender discussion among viewers. Beyond the critical orientation of design fiction videos, corporations have mobilized video as a medium for envisioning aspirational representations of near future technologies to, in part, gauge public perception (c.f., [57, 58]). Design researchers have also explored how video can offer a novel creative medium for inquiring into the perspectives, lives, and relationalities of non-human actors that include pets [28], mail parcels [11], and domestic things [21, 45, 56].

Collectively, these works make clear that video plays rich and diverse roles in design research. In our work, we are drawn to the medium of video and the practice of filmmaking because they open up a dynamic, alternative form of expressing and extending an RtD artifact beyond a traditional academic paper. Our work contributes a novel design case illustrating how video can operate as a medium that is both explanatory and experiential in understanding and distributing an RtD project.



Detailing the Capra System

Here, we briefly introduce the Capra system to provide the necessary context to understand our discussion of the film (to read about the development of the Capra see [42] or watch the film [here](#)).

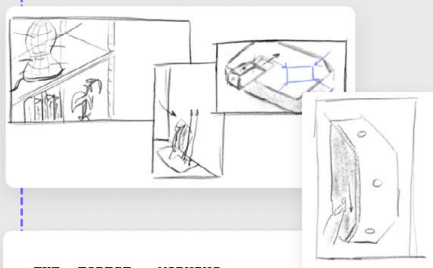
1—Capra Collector has three lenses affixed at different angles that captures Multi-Point-of-View (Multi-PoV) time lapse photos and encodes them with three forms of metadata: temporal, altitude, and dominant color. When worn on the body, the central camera offers a more recognizable PoV, while the other cameras capture photos from more unusual angles (e.g., the tree canopy above or roots

underfoot below). Every 5 seconds a unit of three photos (one per camera) are captured. When beginning a hike, the Collector is turned on to start recording which continues until the end of the journey. There are no other direct interactions; it silently captures data, fading into the background out of direct ‘use’ while on the trail.

2—Transfer Animation is initiated when the Collector is slid into the Explorer. As images are transferred into the Explorer database, three metadata filters are cycled as overlays that subtly compare the current photo being transferred with other ‘related’ photos in the existing hiking archive (e.g., prior images from hikes with a similar timestamp, dominant color, or altitude are surfaced in real-time).

3—Capra Explorer is where all hiking data is stored, interconnected, and interacted with. It enables the user to revisit time lapses of their hikes through three metadata filters. For example, exploring the quality of light throughout the day across hikes, contemplating ecological differences at varying altitudes, or orienting through hikes via a color spectrum. These different perspectives can be applied when exploring a single hike in the archive — offering different durational ways to attend to moments in a hike — or across all hikes—enabling explorations of various temporal, altitudinal, and color-oriented interconnections across all hiking data. The central PoV timelapse is visible when placed horizontally with a metadata overlay; the Multi-PoV is shown when in vertical orientation.

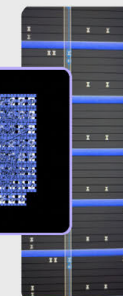
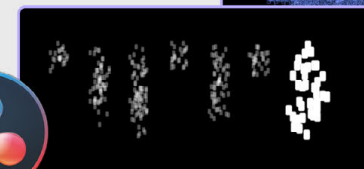
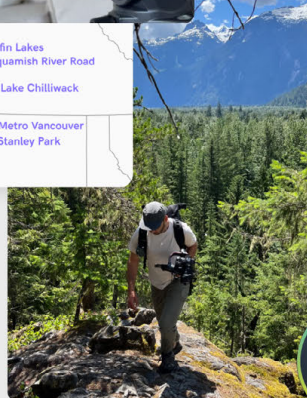
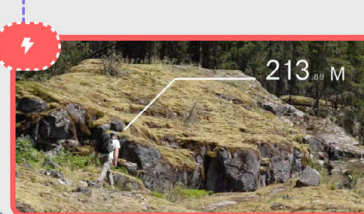
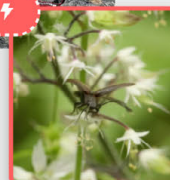
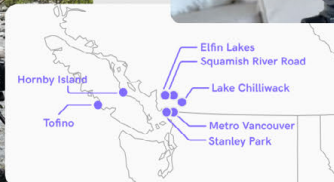
1 Film Process



EXT. FOREST - MORNING

We dissolve through landscapes of British Columbia, mountains, forests and rivers.

Heavy footsteps fall on a forest trail. Birds chirp and wind moves through the treetops.



Script Writing

Storyboarding

Nature Photography

Principal Photography

Editing

Motion Graphics

Color Grading

Sound Design

Pre Production

Production

Post Production

2 Film Overview

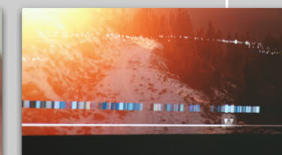
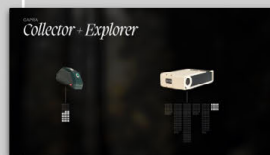
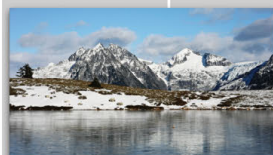
Introduction

Capra Collector Explained

Collector & Explorer / Transferanimation

Capra Explorer Explained

Credits



0:00

1:12

3:25

5:00

9:40

Capra Film: Design Process

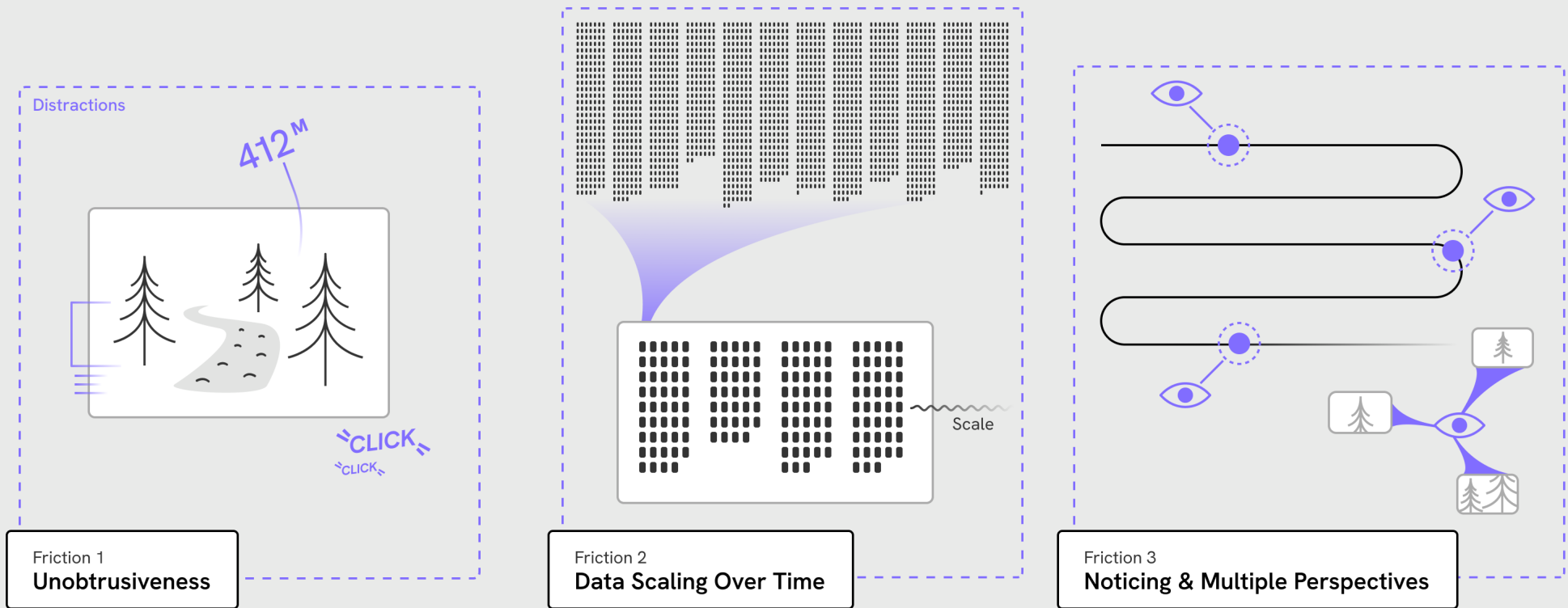
Our team for making the Capra film is primarily composed of three members (Odom, Barnett, & Brand) whose expertise spans interaction design, filmmaking, and HCI research; however, project members, notably White, contributed first-hand data from using Capra, which we worked into the film. We are based in Western Canada and our research took place on the unceded ancestral territories of the xwməθkwəy'əm (Musqueam), Skwx̱ wú7mesh úxwumixw (Squamish), səl' ilw' ətaʔl (Tsleil-Waututh), q' íc' əy' (Katzie), kwikwəʔl əm (Kwkwetlem), Stó:lō Coast Salish, K'ómoks, Tla'amin, Qayqayt, Kwantlen, Semiahmoo and Tsawwassen Nations. As a part

of our process, we informed ourselves through the native-land website (native-land.ca) to critically consider the land that we walked on as a part of this project. Acknowledging traditional territories, nations, and lands can be an initial step toward challenging the underlying colonization bound up in standard Western maps, and lead to further understanding of the complex effects of colonialism.

1—Film Process. Our film process unfolded over two-years, while the Capra system was being refined and tested in the wild. Our process loosely resembled a traditional filmmaking approach that spanned *pre-production*, involving storyboarding, scriptwriting, equipment tests and visual effects; *production* involving principal

photography and capturing seasonal nature imagery; and *post-production* involving editing, color grading, visual effects, sound design and motion graphics. However, conceptually, our process was messy and emergent — we encountered key frictions that required substantial iteration and, at times, revisiting earlier design moves, which we will detail and unpack in this pictorial.

2—Film Overview. The final version of our film runs nearly 10 minutes and is organized around a protagonist using the Collector and Explorer over time. We encourage readers to view the Capra short film [here](#).



Overview of Key Frictions

The frictions that emerged in our filmmaking process are directly tied to the conceptual research aims of the Capra, thus they are unique to this instance. Yet, in unpacking and reflecting on them we arrive at practical takeaways that reveal pathways to how film can be implemented as an RtD method to explain an artifact while expressing the project's conceptual and research aims.

Friction 1: Unobtrusiveness highly shaped the design of the Capra Collector. Unobtrusiveness requires technologies must be designed to "avoid human-nature disruption" [24:7] and ensure "human-nature interaction holds priority over human-computer interaction" [4:293] when in the wild. Yet, in practice, frictions emerged as we struggled to explain what Capra is in the context of a hiking experience, without creating a distraction by drawing too much explicit attention to the Collector. Through numerous failed iterations in exploring annotative overlays, visual effects, sound design experiments, and film script

revisions, we arrived at a meaningful balance of subtle explanation that foregrounded the experience of simply hiking in nature.

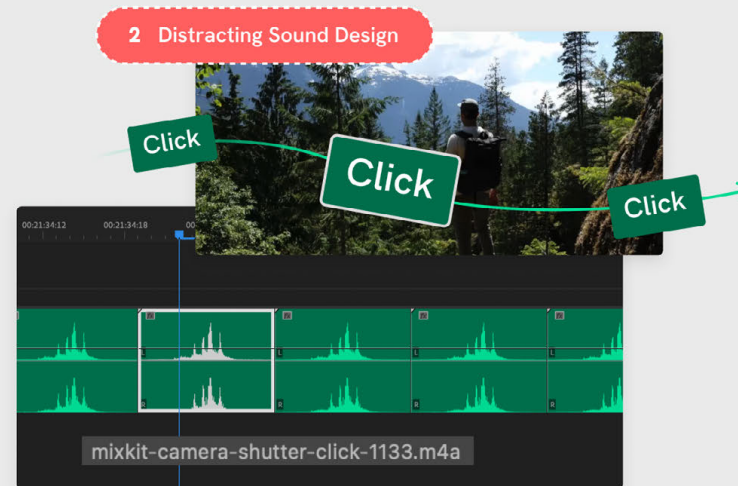
Friction 2: Data Scaling Over Time presented another set of frictions. Inspired by conceptual proposals that reframe data as interpretive [13, 17, 54], local [34], and slow [8, 40], Capra offers an RtD example of how a hiker might explore their data as it evolved across a lifetime. The exacting precision afforded by time, altitude, and color metadata encoded into each photo allows the hiker to seamlessly move between single hikes and the entire archive, offering unique pathways through hiking experiences previously undertaken via these three interconnected metadata modalities. Over time, when on a real hike with the Collector, the hiker may become aware that colors, levels of altitude, or times of the day are forming interconnections to other places, ecologies, memories and moments in the Explorer archive. Yet, expressing this level of scale in an intelligible way was highly challenging. Initially, we felt obliged to show data scaling from an actual two-year-old archive with 61 real

hikes. Yet, the sheer scale of images and data created significant spatial and dimensional complexities. Ultimately, this required finding the right balance of abstraction in our visual communication.

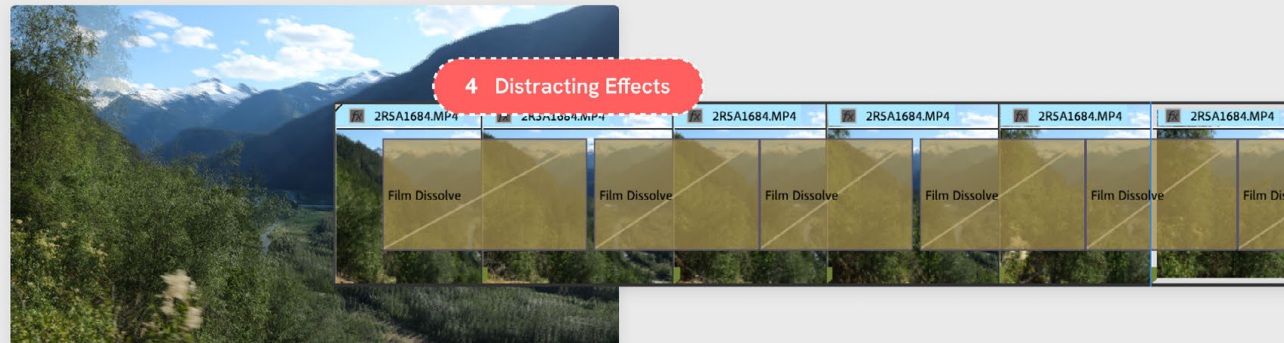
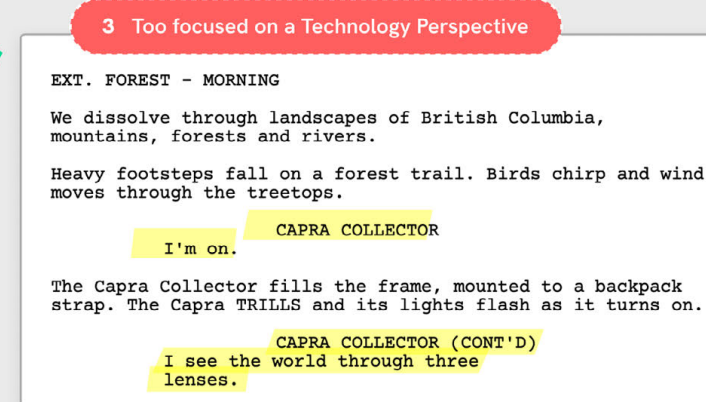
Friction 3: Noticing & Multiple Perspectives is a final conceptual concern of Capra. Prior research that mobilized noticing to account for human-nature entanglements [32, 53, 61] and connectedness [30, 31] inspired the Collector's offset directional cameras which could expand the gaze of the hiker to potentially unseen or unnoticed vantage points. These works equally inspired the open-ended, multi-direction quality of the Explorer's design — a hiker might notice new elements within nature as interactions with it accumulate, potentially extending their consideration of the ecologies they pass through on a hike. Yet, communicating the subtle and nuanced qualities of gaze, nature attentiveness, and journeying through space, time and landscapes required critical readjustments while shooting and planning of the overall film sequencing, adopting unanticipated techniques, and, at times, patience, and restraint.



1 Distracting Data Overlays



2 Distracting Sound Design



4 Distracting Effects

Unobtrusiveness

Making our film was defined by a tension of balancing its two distinct and often opposing objectives: the need to articulate the unfamiliar and somewhat complex nature of what Capra is and does, while manifesting the design quality of unobtrusiveness where the presence of technology does not disrupt the experience of being in nature.

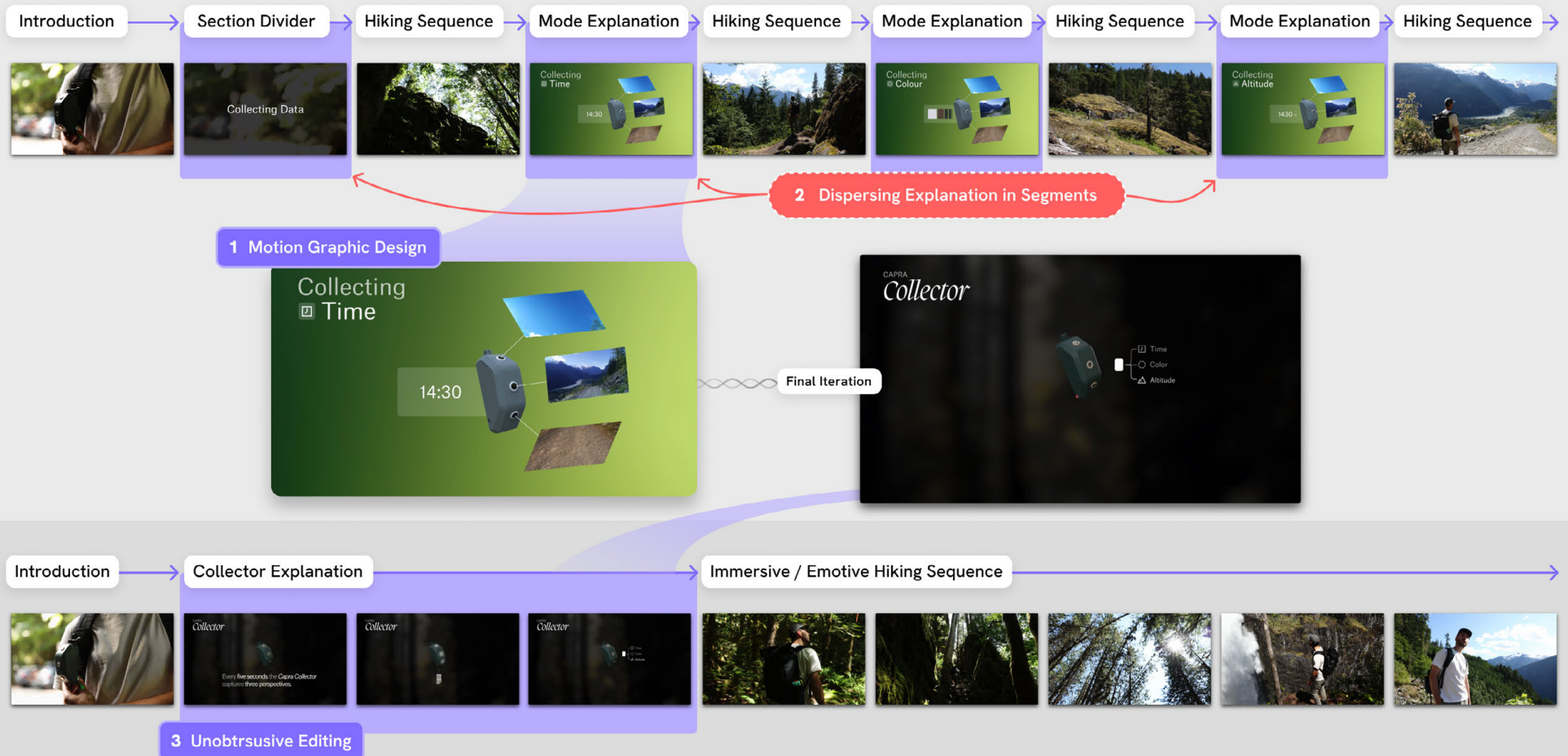
1—Distracting Data Overlays. This tension first played out in the explanation of the Capra Collector. We assembled a montage sequence that conveyed the feeling of being in nature, where the protagonist hikes with the device. We planned to motion-track the Collector and overlay the images and metadata that it captured in “real-time”. As we tested this, we learned it was effective in explaining what the device does, and the frequency and pattern in

which it collects data. However, the overlays made the technological intervention of the device the sole focus of the sequence, which ran counter to our goal of unobtrusiveness. Another design move was needed.

2—Distracting Sound design. Letting go of on-screen overlays, we explored using a camera shutter sound effect to indicate the ongoing data capture to the audience. This remained in the film for a significant amount of time as it initially felt like a good compromise. However, over time we realized it was perhaps even more obtrusive than the visual overlays. The Collector itself is intentionally silent; there are no mechanical shutter mechanisms within it. Our introduction of non-diegetic sound further complicated authentically portraying the experience of hiking with the Collector.

3—Personification. Things got weird. We made a major design move where we experimented with having Capra explain itself — implementing a first-person narration, from its perspective. This allowed us to articulate the functionality in a way that was playful and engaging, but in centering the technology, we drew attention to it far too much. This technique also seemed to break the suspension of disbelief for viewers.

4—Distracting Effects. In the same direction as first-person narration, we created a stylized representation of the Collector’s perspective to insert into the montage. We cut a gimbal-stabilized shot captured while hiking into short, overlapping segments, that faded together. This felt like a poetic way of suggesting what the device was doing, without it obtruding into the nature sequence. Yet it didn’t significantly contribute to the audience’s understanding of its workings.



As an alternative to overlays, we explored creating breakout explanatory motion graphic screens which offered a moment of pause to move outside of the main narrative scene.

1—Resolving motion graphic design. Our early visual design employed bright colors and dynamic compositions to emphasize this shift, which, when edited into our film, were disruptive and out of place. While our first attempt at the motion graphics was disruptive, we noticed the moment of pause this technique offered enabled us to cleanly separate explaining the workings of Capra from the narrative experience. As design iterations continued in this direction, we drew inspiration from the design of the device, and gradually a

visual style emerged that was both effective at communicating and created an appropriate atmosphere — situating the Collector in nature.

2—Dispersing explanation in segments. Yet, the editing decision of where to explain the device also emerged as a point of tension. Initially, we broke up the hiking montage to insert small segments of explanatory motion graphics. Like the use of overlays, this was effective at explaining the Collector, but repeatedly interrupting the hiking sequence also decreased its emotive impact. In sum, it foregrounded the device, overemphasizing its role in mediating human-nature relations.

3—Unobtrusive editing. Ultimately, we moved the explanation of the Collector to a single, extended motion graphic, and then let the audience experience the hiking sequence uninterrupted. While this decision was perhaps less effective at communicating the Collector's functionality (as a more traditional 'demo' video would), it was an appropriate compromise to embedding its inherent unobtrusiveness in the narrative film. These learnings created a technique that we leveraged in producing the rest of the film, such as how we explained the Transfer Animation and the Explorer.

1 Archive “Zooming” Exploration

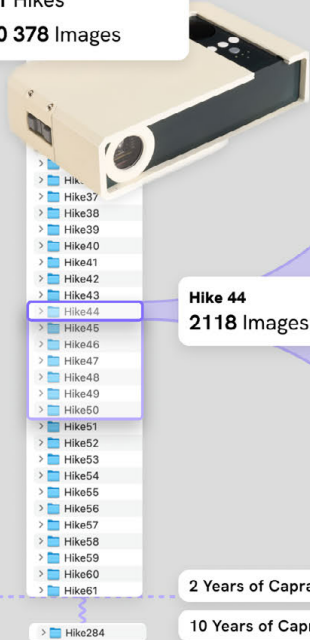


2 The Scale of Capra Data

Capra Explorer Archive

61 Hikes

30 378 Images



Hike 44
2118 Images

2 Years of Capra Data

10 Years of Capra Data?!



Too fine grained & overwhelming

Hike 44
Zoom into a Campfire Timelaps

Hike 44
Image Nr: 1686



Metadata

Altitude
159.81 Meter

Color
120,34,95 (RGB)

Time
2021-06-24 10:58:08

+ 26 additional
values per Image

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1543	1686	1591495924.0	2020	6	6	1152	5	44	1543	23311	159.81	1374
1544	1687	1591495929.0	2020	6	6	1152	5	44	1544	23312	160.38	1567
1545	1688	1591495934.0	2020	6	6	1152	5	44	1545	23313	160.25	1628
1546	1689	1591495940.0	2020	6	6	1152	5	44	1546	23314	160.25	1529
1547	1690	1591495945.0	2020	6	6	1152	5	44	1547	23315	159.63	1271
1548	1691	1591495950.0	2020	6	6	1152	5	44	1548	23316	160.0	1441
1549	1692	1591495955.0	2020	6	6	1152	5	44	1549	23317	160.19	1507
1550	1693	1591495960.0	2020	6	6	1152	5	44	1550	23318	160.63	1615
1551	1694	1591495966.0	2020	6	6	1152	5	44	1551	23319	160.5	1593
1552	1695	1591495971.0	2020	6	6	1152	5	44	1552	23320	159.25	1029

Communicating the Scale of Capra Data

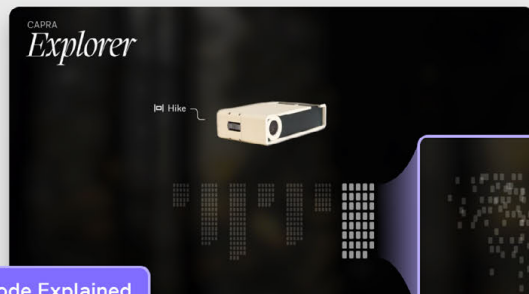
Tensions also emerged in communicating the ‘under the hood’ workings of the Explorer. Considering Capra is a real, robust design artifact and not merely speculative, we initially felt an obligation to show actual photos captured by Capra and incorporate this aesthetic direction in showing the Explorer’s interconnected archive and interaction design. Our journey began by working with a real dataset of 61 hikes captured over 2 years with the Collector that collectively amounted to 30,378 photos.

1—Archive “Zooming” Exploration. Inspired by the notion of latent space (c.f., [33]) — where items within a manifold are positioned in

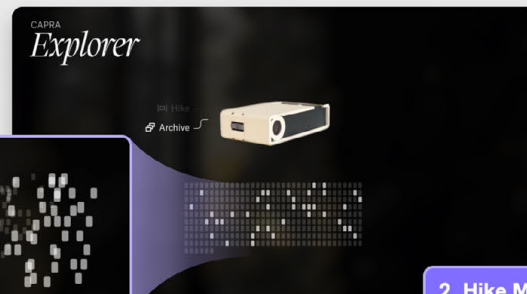
relational proximity to each other against the backdrop of a broader dimensional space — our initial aim was to show an ongoing linear serial stream of photos from a real hike where the view zooms to an up-close level of granularity. Yet, this strategy failed at giving any spatial context to the vastness and interconnectedness of the archive.

2—The Scale of Capra Data. Our next move focused on a position in the archive around Hike 44 which itself contained 2,118 photos (note: here each ‘photo’ is the composite of 3 photos taken by the Collector every 5 seconds). We built visual arrays for Hike 44–50 with their real data and zoomed into a particular part of Hike 44 that featured

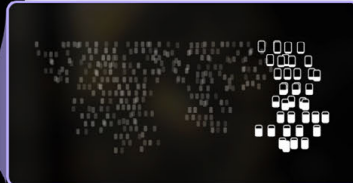
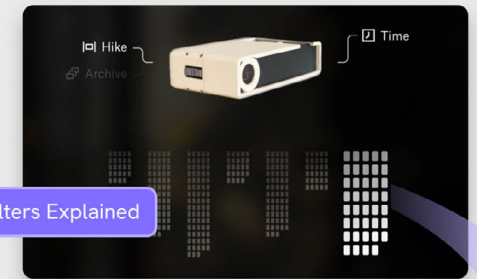
moments near a campfire. Then, while expanding and focusing on Image: 1686, we created overlays to show the highly precise metadata encoded into the photo. Yet, this direction created new frictions. While a sense of authenticity came with using ‘real’ data, the explanation became too technical, and overshadowed the Explorer’s interconnective design qualities. Not to mention working with over 30,000 photos in Adobe After Effects routinely pushed our computers beyond capacity, resulting in crashes and lost design work. We needed to redefine what was most important for the audience and make a conceptual leap in a new direction.



1 Hike & Archive Mode Explained



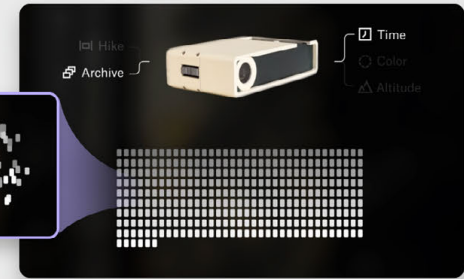
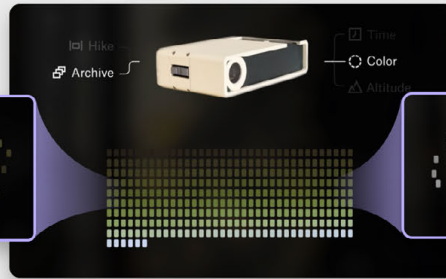
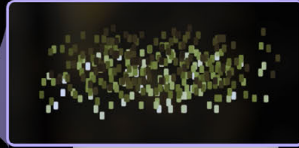
2 Hike Mode Filters Explained



3 Mode Change



4 Archive Mode Filters Explained



Our failed experiments showed we needed a more abstract, versus discrete, approach. We also refocused on how Capra data points connect to each other and the potential for discovery of interconnections across the archive via metadata filters. Leveraging techniques developed in explaining Collector, we decided to make a single extended motion graphic that leveraged abstraction to show scale and interconnectivity, which emerged as a successful and we detail further here (also see the 5:00 minute mark in our film).

1—Hike & Archive Mode Explained. Hike mode is shown first with abstracted arrays indicating particular hikes, with the selected 'hike' data points highlighted. Archive mode is then introduced; the

highlighted data points from the initial hike are re-morphed to where they would 'fit' among all hiking data.

2—Hike Mode Filters Explained. Time, Color, and Altitude are introduced as filters that a single hike can be sequentially explored through. Each mode change triggers a re-morphing of the hike's data and subtle change in iconography—a green-to-white gradient for color, a shift in opacity to indicate sunlight brightness (or lack thereof) for time, a 'depth gauge' type icon for altitude.

3—Hike to Archive Mode Change. With the altitude filter still selected, Archive Mode is engaged illustrating how each relative altitude value tied to each photo in a single hike relationally

interconnects with other photos at similar altitude across all hikes in the archive.

4—Archive Mode Filters Explained. The Color filter is engaged which displays the various color values data in the entire archive and then re-morphs them into a linear gradient, from dark green to bright white. Here, we made a conscious decision to design simple color gradient to illustrate this mode in an intelligible way; in reality, the color gradient across an entire archive is far richer and more complex. The explanation concludes with Time mode becoming engaged, re-morphing photos from all hikes in the entire archive to be clustered together by the time of day they were taken.

1 Finding the Right Perspective

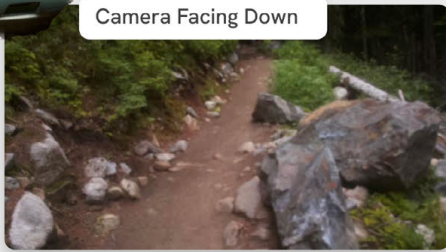
Camera Facing Up



Camera Facing Straight



Camera Facing Down



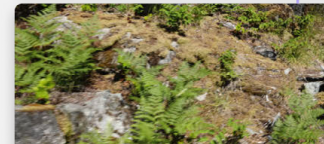
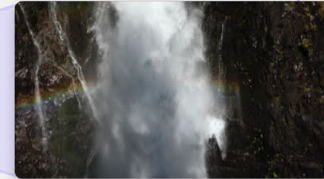
2 The Hiker's Perspective



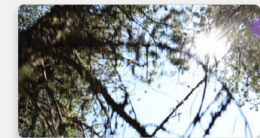
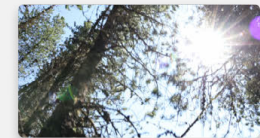
85mm Lens



35mm Lens



3 The Collector's Perspective



Noticing & Multiple Perspectives

Capra is highly shaped by the concept of noticing — both explicitly in the offset lenses of the Collector that capture multiple perspectives and more implicitly through how the Explorer resurfaces time lapse photos from the archive at home.

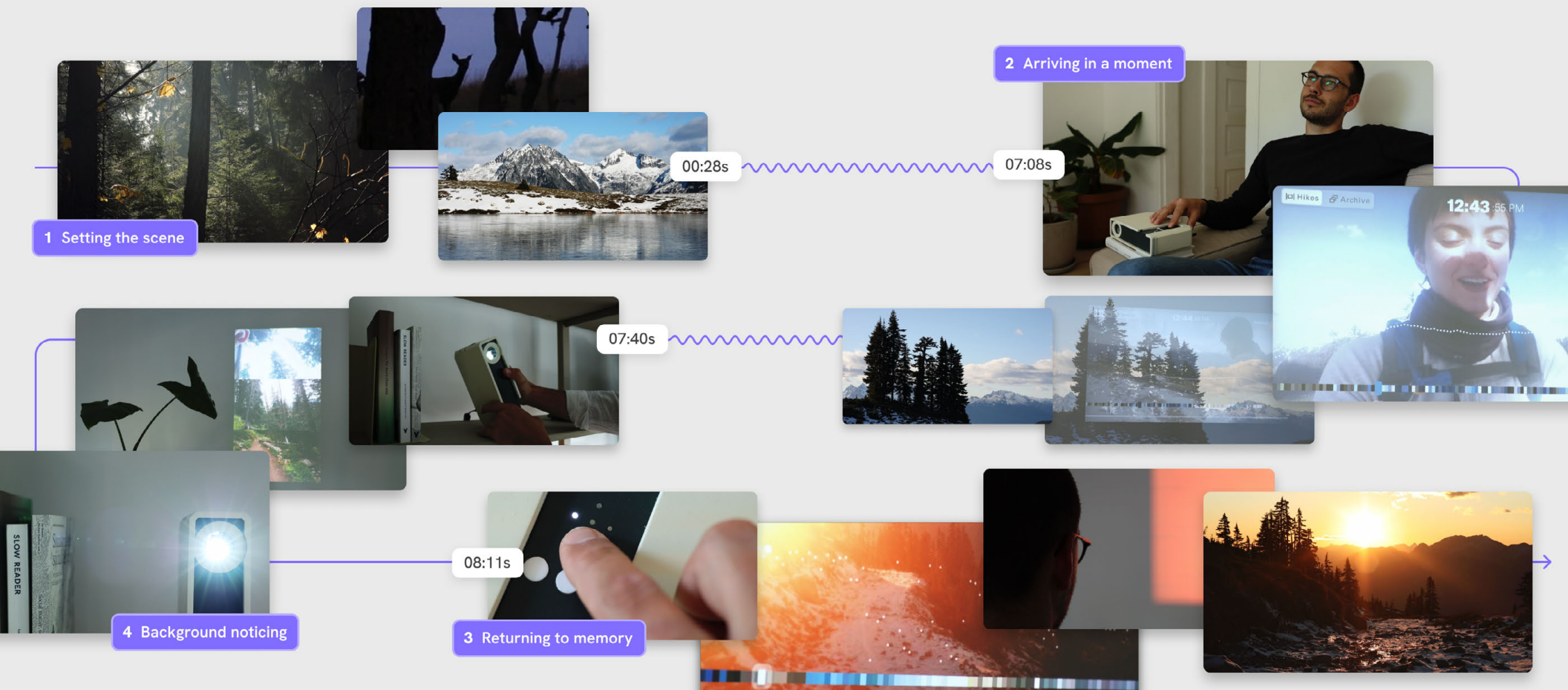
1—Finding the right perspective. The perspectives of the Collector deliberately engage with perspectives of a hiker: the central lens looks out straight ahead, the lower lens looks down to the trail (capturing the richness of life and the detritus of the forest), while the top lens looks up to the sky or canopy. An early goal of the film was to reference these orientations and for the viewer of the film to potentially feel like they were noticing. However, moving from an

abstract goal to a formalized design that could both convey the concept of noticing subtly and work within the broader scope of the film proved challenging.

2—The hiker's perspective. Our first move to translate noticing as a concept to film, was to mimic how someone looks about while hiking. We used a gimbal stabilizer to film from the perspective of a hiker, panning and tilting in the way that someone might turn their head to gaze at details that they notice. We chose a medium telephoto 85mm lens to be able to focus in on individual details. This perspective was distracting: the telephoto lens emphasized the camera movement and increased the amount of parallax. This motion in conjunction with how close we were to the environment created a perspective that was almost nauseating and did not feel like a human gaze. It also

focused in on levels of detail were unrealistic for the Collector to capture (e.g., a small insect on a leaf, precise details of moss hanging overhead). We reshot with a 35mm lens. This perspective felt more human, however, as we edited a rough cut, the motion was jarring and didn't give the audience an opportunity to focus on (notice) individual details in the frame.

3—The Collector's perspective. This led us to draw inspiration from the fixed perspectives of the Collector and stick closer to how it actually operates. We captured images that moved on fewer axes, moving with the forward momentum of a hiker, with only subtle pans and tilts. This succeeded in conveying the idea that opportunities for noticing emerge while hiking.



We faced different challenges while determining how to embody and convey the Explorer's relationship to noticing — the ongoing cyclical quality of living with Capra, where it prompts memory through the surfacing of images, metadata, and their connections. It was difficult to not be too deterministic in the portrayal of the experience, and instead leave them up to interpretation — noticing happens over time; it is accumulative and piecemeal, and we aimed to evoke these qualities. We developed longer scenes that captured nuanced experiences of reminiscence, where the audience could develop an understanding of not just that a memory had been triggered but its emotional significance. Ultimately, we found this was an unnecessary burden that adversely affected the film's clarity and conciseness. While we did not arrive at our final streamlined solution immediately, for brevity, we will prioritize unpacking how we accomplished this.

1—Setting the scene. The film opens with a montage of static nature imagery, that encourages the noticing of subtle movement within the frame (such as a deer in silhouette twitching its ears). These images feel like they are from a neutral point of view, as opposed to the hiking sequence that follows.

2—Arriving in a moment. The protagonist is manipulating the Explorer, progressing image-by-image through the archive. The face of another hiker appears, close and intimate. The movement through the archive slows, lingering on the data points of this moment, suggesting a memory is surfacing. The screen fades gently to a snowy landscape in the same location as the hiker, (in the style of the nature shots in the introduction), hinting at the interplay between the projected images and memory.

3—Returning to memory. This is epitomized by how the film ends. Noticing a red-hued image, the protagonist engages the Explorer's color filter. They are in focus in the foreground of the frame, lit by the succession of red and orange images that appear blurred and ephemeral on the wall in the background. The image slowly fades to a final static sunset, alluding to a possible place entangled among Capra data and a memory. The audience is open to ponder the many potential memories, associations, or sensorial experiences that might be recalled.

4—Background noticing. The protagonist rotates the Explorer, placing it vertically, so that it projects the Multi-PoV timelapse onto the wall. A plant visible to the side. They are mostly absent from this sequence, highlighting the quality of Capra as a background technology [39] — where journeys on the trail unfold indeterminately, fading in and out of perceptual view.

Discussion

We have presented key frictions encountered in the making of a short film that were ultimately overcome to extend the Capra RtD artifact beyond an academic research paper for a broader audience. In this, we illustrate opportunities for future design researchers to explore how finished RtD artifacts and their research aims might be dynamically explained, expressed, and distributed through video. Our work concretely responds to growing calls in the HCI and design communities to: (a) develop alternative ways of communicating research outcomes from RtD projects [44, 55, 59] and (b) critically account for the messy, at times even counterintuitive, frictions and decisions that unfold within RtD processes [12]. While originally developed out of conceptual concerns closely tied to the Capra project, lessons learned in our navigation and resolution of key frictions offer practical techniques that can be mobilized in future work, which we turn to next.

Balancing explanation and conceptional goals

Our efforts to balance the two goals of effectively explaining the Collector, while also inherently conveying the project's research aims of exploring *unobtrusiveness* and *noticing*, was a major challenge requiring us to take a step back and develop alternative strategies. This was manifested in how we iteratively developed the approach of separating narrative and experiential sequences from the explanatory motion graphics, as well as how we developed a restrained method of suggesting moments of reminiscence through gradually fading between projected images in the home and landscape imagery. These strategies emerged from a design process that afforded significant space and time to planning, iteration, and reflection, and illustrate the need to carefully negotiated the complexity of balancing explanation and conceptual goals in practice.

Knowing when to use abstraction

When presenting a highly finished RtD artifact through a short film, it still may be necessary to leverage abstraction over showing every dimension of the working artifact. The Capra system exists as a working technology

with a high degree of fit and finish, developed by an invested team. There was a strong motivation to show the complexity and specificity of the device, however, this created major complications for clarity of communication to a broader audience. Therefore, we needed to develop an approach that was more accessible and intelligible. Through leveraging abstraction, we were able to create an illustrative design language that communicated how Capra's computational logic led to a relatively minimal, open-ended interaction design. This revealed that clear communication that is scoped in detail may be more important than showing raw data and, more broadly, every 'real' aspect of an RtD artifact. In our experience, we found that compromising with abstraction does not need to mean sacrificing authenticity.

Leaning into the specificity of the artifact

We were so close to the Capra system as a design research team that, initially, we found ourselves taking creative liberties in exploring how to represent it (e.g., adding sound effects, giving it a voice of its own, and reimagining its timelapses). We extended too far and, eventually, were able to recognize that the experimental content we created felt untrue to the real working RtD artifact. We needed to return to what the device could authentically do, and then creatively manifest this aesthetic in the film. This constraint provided us with renewed clarity and directly inspired successful design choices, such as how we reference the multiple perspectives that the Collector captures, or in how we were influenced by the open-ended interactions with the Explorer to leave much of the film's depiction of memory open to interpretation.

Film offers a highly expressive medium that requires carefully balancing the specificity of an RtD artifact, with what it could or should be. We found that the constraint of sticking close to the artifact can be an effective technique for maintaining authenticity, while also being a generative resource in the making of a film.

Conclusion & Future Work

The Capra film serves as a case for how films can extend RtD artifacts to both explain them and deeply engage with

an RtD project's conceptual aims. We see the Capra short film as an avenue for scaling up communication of and engagement with this RtD project. As the film embodies the core research aims of the project, it can offer an alternative for 'standing in' for the artifact itself, opening the project up to an audience beyond what can be served by one or a small batch of functioning systems, and the academic community that we publish for. We are planning events to share this video with local communities of outdoor enthusiasts. We envision these events as a space for reflecting on the technologies we bring with us into the wild and for envisioning the values, desires, and dreams that ought to shape technology that accompanies us in nature and at home. Such interactions catalyzed by the video could, in turn, be generative in opening discussions about new visions for hiking technologies in more participatory and open formats. Equally, we anticipate that these sessions may contribute to refining and extending a perspective on the Capra design artifact itself, potentially through prompting new questions to be explored in subsequent stages of research with the real artifact.

Our case of the Capra short film illustrates value that can come from creating alternative research outcomes as avenues for inspiration, scalability, and broader engagement. Yet, our film presents a fictionalized experience of Capra, as opposed to capturing the many varied idiosyncratic possibilities of how it could be adopted in a person's life through lived experiences of use. Such real-world accounts were beyond the scope for our film and this pictorial; however, they do present a clear area for future work in this emergent RtD method.

The contributions of this pictorial are, then, two-fold. First, we closely detailed our process of making of the Capra short film, offering practical techniques that can be mobilized in future work aiming to extend and distribute RtD artifacts to broader audiences. Second, we offer a case that takes an initial step toward pushing the methodological boundaries of RtD in the direction of short films, opening opportunities for further developing, refining, and theorizing this approach through future research and practice.

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This research took place on the unceded ancestral territories of the xwməθkwəy̓əm (Musqueam), Skwxwú7mesh Úxwumixw (Squamish), səl'ilw'ətaʔl (Tseil-Waututh), q'íc'əy` (Katzie), kwikwəo'əm (Kwikwetlem), Stó:lō Coast Salish, K'ómoks, Tla'amin, Qayqayt, Kwantlen, Semiahmoo and Tsawwassen Nations. These locations are rooted within Indigenous lands and nations. We informed ourselves through the native-land web application (native-land.ca) to acknowledge and critically consider the land that we walked on as a part of this project. Acknowledging traditional territories, nations, and lands can be an initial step toward challenging the underlying colonization bound up in standard Western maps, and lead to further exploration and understanding of the history and complex effects of colonialism. This research is supported by the Natural Sciences and Engineering Research Council of Canada (NSERC) (RGPIN-2018-06273), the Social Sciences and Humanities Research Council of Canada (SSHRC) (435-2020-0752), and the Canada Foundation for Innovation (CFI).

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