Chronoscope: A Near-eye Tangible Device for Interacting with Photos In and Across Time

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Figure 1: Chronoscope is a telescope-like Research through Design [5] artifact that enables people to view their digital photo collection on a display inside and to interact with it by rotational controls.

Abstract

With the massive proliferation of digital photos, new approaches are needed to enable people to engage with their vast photo archives over time and into the future. Our demo will feature *Chronoscope* — an interactive near-eye photo viewer ('scope') that uses temporal metadata embedded in digital photos as a design material to encourage curious and temporally diverse explorations of one's personal photo archive. Our demo will enable users to experience alternative ways of engaging with a large digital photo archive that

Figure 2: Looking into the scope shows the interface

Figure 3: By holding the scope, users can peek inside and control the scene with rotations.

Figure 4: In addition to the rotary wheel, two knobs are designed aside for the interactive setting.

emphasizes interactions *through time* and *across time* to encourage rich, open-ended experiences of curiosity, exploration, and self-reflection. This demo paper briefly introduces the motivation, rationale, and implementation of Chronoscope.

Author Keywords

Digital Photos; Metadata; Temporality; Interaction Design.

CSS Concepts

• Human-centered computing~Interaction design process and methods

Introduction

Since the 19th century, photographs have operated as a key resource to support people's practices of self-reflection, identity construction, and contemplation of the future [2]. Today, people's everyday photographic practices are highly mediated by digital devices and online services. These technologies have enabled people to create personal digital photos at scales larger than ever before [1].

The massive and still growing archives pose new challenges for the design and HCI communities. As the digital photo archives grow larger, they become increasingly invisible, lacking the material presence that might attract people to notice and engage with the archive in the course of their everyday lives. This issue can also make it difficult for people to grasp just how big their digital photo archives are and what is contained within them (e.g., [4]). A range of research in HCI has articulated the need for more diverse approaches to experience, explore, re-visit, and live with people's digital photo archives over time in everyday life. Yet, few works have explored how more temporally diverse interactions might be supported [3] (e.g., linear and non-linear conceptualization of time).

This short paper introduces and proposes to demo Chronoscope (Figure 1), an interactive photo viewer that uses rotary sensors to detect physical movements (Figure 3 and Figure 4) and translates the amount to digital values that drive the animation of one's photo collection on the display inside. The animations are designed to give users a sense of both connections and disconnection throughout photo memories by the visual rearrangements based on the temporal metadata of each photo. At the DIS2019 conference, we will demonstrate the fully working Chronoscope prototype with a sample Dropbox account that synchronizes its photo archive with the device.

Chronoscope

Physical Form and Materials

Chronoscope is inspired by the intentional, often focal way 'scope-like' objects are used by people. For example, think of focusing on far away planet with a telescope. Or, rotating a kaleidoscope until a desirable, if not beautiful, geometric form has been rendered. The aesthetics and use of rotational controls might open up new ways of inspiring what a photo viewer could be. Thus, we combine adopted features from a portable telescope, a scientific microscope, and an exquisite kaleidoscope. The three scope examples are design exemplars that can be directly interacted with, or simply lived-with. Collectively, their usage brings together self-initiated action as well as a familiar and intuitive affordance (i.e., rotation is used as a key point of interaction to explore the viewed phenomena).

Figure 5: User Interface inside the ChronoScope Artifact.

The temporal metadata is shown on the top left corner whereas the selected timeframe mode is on the right. The central photo is surrounded by a circular timeline, making the red index indicate user’s location in time. When the user is switching the photos in a timeframe mode, the red index remains where it is while the circular frame rotates to provide a subtle indicator that the new selected photo is at different location in time. In order to emphasize the series of collections, we also include photos right next to the center photo and have them smaller and opaquer. The geolocation metadata is provided on the bottom left for additional hint of memories.

Regarding materials, the use of silicone and quality fabricated plastics offers durable and cleanable materials. It also enabled us to easily use color to accentuate parts of the design and make them easier to use while still holding up over time.

Hardware Implementation
Chronoscope not only hands over the freedom of using rotational movement to switch photos and timeframe modes, but also supports movement through the sheer size of one’s massive photo archive. On a technical level, we achieved this goal by designing an electronic circuit with three rotary switches, 240 x 240 LCD color display and a Raspberry Pi Zero W as Chronoscope’s embedded CPU.

Display of Photo Collection
Chronoscope uses the precision offered by temporal metadata to enable users to interact with their photo archive through three rotational controls on viewing directions, timeframe modes and viewing granularity. When peering into Chronoscope, a single photo tied to the specific time that it was taken (based on its timestamp metadata) will be visible (see Figure 5).

Rotary Control I: Switch between Timeframe Modes
A rotating wheel, as the scope's main feature, controls two directions: navigating forward and backward in time within the selected timeframe mode. Navigating within a timeframe mode occurs through a rotational movement (clockwise to move forward in time and counterclockwise to move backward). We selected physical rotation for this input as a subtle analogy to the circular shape of clocks and the temporal flow evoked by their movement. By rotating the either direction the user sees each photo in relation to a wide spectrum of other photos in the archive. When the user stops the rotation, Chronoscope settles on the specific image associated with where ‘in time’ the device is at in relation to selected timeframe mode.

Rotary Control II: Selection of Photo within One Mode
When switching the bigger knob on the side of the scope, users can seamlessly toggle between different temporal organizations of their archive through three timeframe filters (linear, date, time). During the mode transition, the center photo remains the same while the surrounding photo collection is sliding out and replaced with the one from the new selected timeframe mode.

Rotary Control III: Adjustment of Temporal Granularity
Finally, users are able to decide the number of photos to be forwarded in every rotation unit through the smaller tuning knob (see Figure 6).

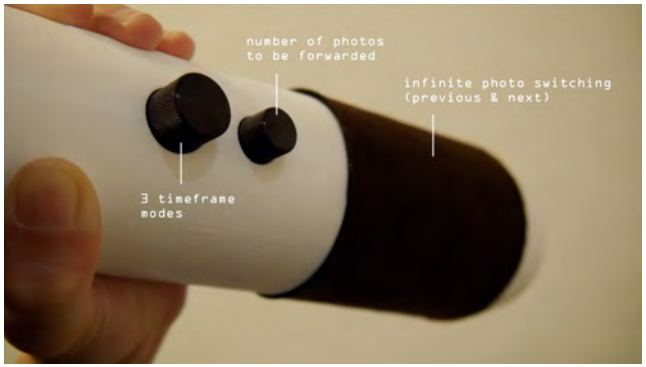

Figure 6: Three physical controls used to select viewable photo, timeframe mode, tune the temporal granularity.

Conclusion & Future Work

Chronoscope aims to contribute to growing calls in the design and HCI communities to create technologies capable of a) opening possibilities for forming relations to and interpretations of our growing amounts of personal digital data and b) express more diverse perspectives on temporality through design. We will demonstrate the prototype at DIS2019 conference and collect people's interactive experience with it. Earlier prototypes will also exhibit the inner structure and electronic components used in our design process. In our future work, we aim to deploy Chronoscope in the context of people's everyday lives. We anticipate this could yield rich insights into a productive application of temporal metadata.

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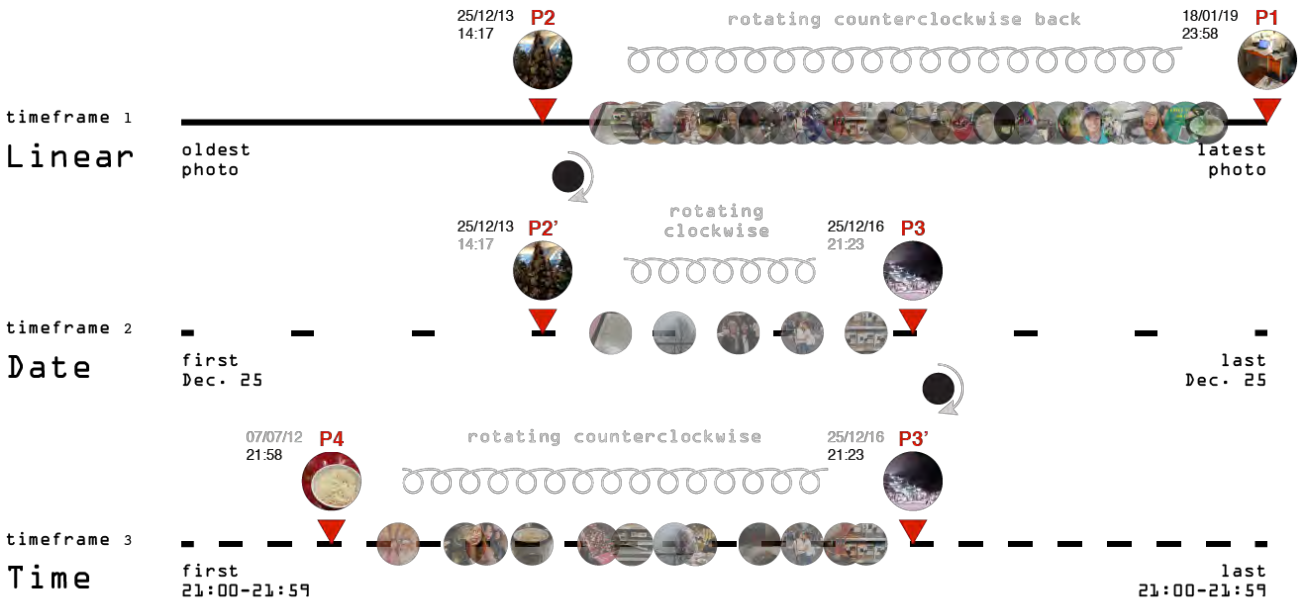

Figure 7: A scenario of moving across the three timeframe modes. Imagine a user turns on Chronoscope and begins at P1 in the Linear timeframe. She rotates counterclockwise back in time to P2, and shifts to Date mode, where she sees the surrounding photos are replaced with new photos upon her arrival at P2'. From P2' to P3, she observes a series of pictures about the time she has spent on Christmas in the past few years. After she switches to Time mode at P3', there are a bunch of photos taken at 21:00-21:59 to explore.

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