Slow Technology is Inefficient but Resilient

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ABSTRACT
This paper presents ChronoTape, a tangible timeline for family history, as an example of 'slow technology'. We discuss how the experience of using ChronoTape has led us to believe that successful slow technology is designed to be inefficient but resilient.

Author Keywords
Slow Technology, Tangible User Interface, Time, Design.

ACM Classification Keywords
H.5.2. User Interfaces (D.2.2, H.1.2, I.3.6)

INTRODUCTION
ChronoTape was designed to allow the long term capture of 'research patina', traces and notes created by a family historian or genealogist in the process of their research [1]. Researchers can write notes on the tape both digitally (photos, text, icons) and physically (pen, pencil), the result being an accumulation of notes and peripheral information along the paper timeline. The experience of designing the ChronoTape system has led us to consider two main aspects of *slow technology* [3]. Firstly, will a less efficient technology aid reflective contemplation? Secondly, can a resilient interface be designed to encourage the long-term use of a system?

The ChronoTape project explores the design-space of 'temporal-tangibles', tangible user interfaces designed for the physical manipulation of temporal media [2]. Temporal-tangible theory concentrates on how time, being an abstract and untouchable concept, can be embodied to allow for control of temporal media using tangible interactions. The focus of temporal-tangibles is on the immediate human-computer interaction, however we found that during the design of the ChronoTape system we were also discussing both how the interface itself would travel into the future and how the interface may alter peoples perception of time.

CHRONTAPE
ChronoTape is formed of strips of paper printed with dates and computer readable markers (fig.1). The device used to read the tape, the ChronoTape reader, back-projects digital notes and information onto the ChronoTape (fig.2).

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Researchers create their own length of ChronoTape by printing out the tape on sheets of A4 paper, cutting the lengths out and taping them together. The act of having to construct your own ChronoTape rather than using a premade roll is that the user gains some attachment to the length of tape before they even start to add notes, especially given that it can take up to half an hour to make a two hundred year length of tape.

Figure 1. ChronoTape on spools. The spools act as both storage and a way of controlling the timeline when on the reader.

ChronoTape Reader
The ChronoTape reader (fig.2) augments the tape with projected digital notes. The reader forms a portable wooden case when closed (fig.3), with the form based upon the style of typewriters and Victorian writing slopes. In order to use the reader, the tape is first wound around a spool. Then in the same manner as preparing microfilm the loose end of the tape is inserted through the reader and attached to the second empty spool before being wound on. This is a skillful operation that has to be learnt by the user, and it can take some time to become adept at quickly loading a new timeline.

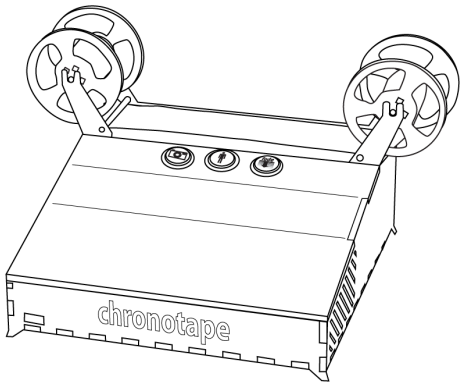

Figure 2. The ChronoTape reader. Digital information is back-projected onto the paper tape. Researchers can write on top of the tape, or make a number of different types of digital note.

INEFFICIENCY AND RESILIENCY

We believe that the design of our slow technology, the ChronoTape, has been reliant upon two concepts: slowness in operation of the technology (inefficiency) and the deliberate design of system longevity (resiliency).

Slow Technology is Inefficient

The efficiency of human-computer interfaces is commonly used as a measure of how good a new system is, with efficiency being rated as desirable and inefficiency as undesirable. Slow technology provides a counterbalance to this desire for speed and efficiency. In addition, the usual test of the efficiency of an interface is performed with new users, whereas it can take people many years to become efficient at using an inefficient interface. However, an inefficient system provides time for, amongst other things, creativity, reflection and play. We also believe that the inefficiency of a system as presented to a new user is also a prerequisite for the skilled use of that interface later on.

Inefficiency is a topic that often arises as a critique of tangible user interfaces, usually accompanied by the statement that the design in question would be more efficient as software. As such we believe there is a natural link between slow technologies and tangible interfaces, which can remain fun and engaging despite commonly being more cumbersome, laborious and time-consuming than the equivalent software. For the task of simply constructing a family tree, the ChronoTape is an inefficient technology compared to online genealogy tools. Where a user of an online tool can sign up and have a large family tree laid out within ten minutes, the ChronoTape can take hours to complete even one small section of a family tree. The extra time taken allows for many peripheral activities to take place including story telling, reminiscing and daydreaming. Self-assembly of the tape is one of the techniques used in the ChronoTape project to deliberately decrease efficiency, but with the potential positive outcome of greater attachment to the self-assembled object as a result.

Slow Technology is Resilient

In order for a slow technology to survive and be passed on to future generations we believe it has to be resilient. This resiliency has to be present at all layers of the design, from the hardware and software levels through to the interaction design level, where for instance maintaining the desire of the owner to preserve and not discard the artifact will be a prime concern [4].

Designing for resiliency requires the consideration of many factors including how the system can be designed to gracefully degrade over time, the recoverability of information and the ability to repurpose the system for alternative and unforeseen uses. Design approaches to tackle these issues include designing for simplicity; designing modular systems; designing robust technology-agnostic systems; encouraging emotional attachment and allowing the system to be easily repaired. Advanced techniques may involve strategies such as encoding information about the design's construction within itself, as a form of 'object genetic code'.

Figure 3. The ChronoTape reader is designed robustly for both portability and long-term storage.

DISCUSSION

The ChronoTape was inspired by a number of existing slow technologies, primarily old typewriters and microfilm. Both are examples of technologies that continue to work for decades with minimal maintenance and are commonly passed down from previous generations. The ChronoTape system currently proves to be a comparably slow technology to these original inspirations. However, the inclusion of digital processing in slow technology potentially remains problematic, with embedded systems being designed for processing power rather than longevity. One possible solution is to make the project open source, so groups of users to share maintenance ideas, allowing the upgrading of digital computing to newer platforms, perhaps by emulation of the older platform.

In regards to resilience, the ChronoTape system has been successfully designed to remain useful even in the complete failure of the underlying digital technology. The tape still stores written notes, and the reader still provides a useful method of navigating through a timeline.

CONCLUSION

In this paper we have presented the ChronoTape project as an example of slow technology and discussed how inefficiency and resiliency can be used as principles for designing new slow technologies.

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