"Strategy is the art of making use of time and space. I am less concerned about the latter than the former. Space we can recover, lost time never." Napoleon Bonaparte [3]

ABSTRACT
As Nam June Paik intuits in his 1976 article “input-time and output-time” [11] our experience and expression of time and events are not connected to each other in a linear fashion (fig. 1). As a result the incidents that create what we decide to express can have little or no relationship to each other, illustrated in the example of Proust, where a momentary incident of childhood takes a lifetime to express [12]. In this sense input-time vs. output-time in our expressions and our creative acts is necessarily unequal.

Figure 1: Nam June Paik with TV’s

If we take these experiential aspects of time and lay them side by side against the abstracted tempo of technology and time-based media, we see a deepening contrast. The sensations of input in a given experience are balanced against the expression of the effects of the engagement into the interaction itself. The rules of temporality at the fundament of digital media cross changes in contemporary language when considering and comparing representations of time.

This presents new challenges to researchers and artists seeking to create digital experiences while allowing for representations and expression of personalised time. From Lifelogging to notions of the Quantified Self [13] we see these contradictions and collisions becoming increasingly apparent and we ask with Martin and Holtzman: “If everyone says time is relative, why is it still so rigidly defined?” [10]

Categories and Subject Descriptors
H.3.1 Content Analysis and Indexing, H.5.1 Multimedia Information Systems

General Terms
Design, Experimentation, Human Factors, Theory.

Keywords
Time, Media, Lifelogging, Quantified Self.

1. PERSPECTIVES OF TIME

Time is often considered to be a constant, immutable ever-flowing inevitability with a single direction, external and uncontrollable, but there are many varied and sometimes conflicting notions of time [5]. (fig. 2) What we may term as natural time is based on observations of physical phenomena, the transit of the sun across the sky overhead, the motion of celestial bodies, and of notions of space and distance, a journey of many days or a walk that takes a morning. Rational time relies on the mechanical measurements of time, and finally in conflict with natural and rational time, experiential time is related to the individual and personal experience of the passage of events.

Figure 2: Napoleon Bonaparte 1812 invasion of the Russia illustrated over time by Charles Joseph Minard

In China, time is commonly conceived of vertically, as a spring or seed with time issuing forth from a point of singularity [5] whereas western tradition, dating back to Heraclitus views time horizontally as a continuous river flowing by the individual [8]. Though critical of Boroditsky’s work on linguistic concepts of time [4] Chen’s recent work [6], though controversial itself, has show evidence of behavioral changes in speakers of languages with different tense constructions, with different approaches to describing time.

Through the historical rise of universal mechanical time, personal and the experiential concepts of time became relegated to notions
of dreams and fancy. The Algonquin people of North America on meeting the chronologically obsessed Europeans referred to this new notion of time as Captain Clock, the mechanical device that ruled the actions of everyone [7]. Since industrialisation the European representations of time have been based on the framework of mechanical time with the timeline or equidistance chronology being the most apparent of these.

2. DIGITAL REPRESENTATIONS OF TIME

Within contemporary interface design for digital media, the timeline is almost exclusively used as the basis of temporal representations. Despite strong discussion and dissent within the field of (time-based) media, the timeline with its fixed, equal, mechanical increments is almost totally dominant. Representations of personal or experiential time, which relates more directly to how we actually experience time, remain relegated to sub-surrealist dreamlike collisions of discrete events or symbols.

![Figure 3: Standard Calendar Layout](image)

As an example, even with the flexibility of digital calendars it is rare to find representations beyond one day, seven days (one week starting on Sunday) and one month or five weeks laid linear fashion on top of one another (see fig. 3). The underpinning data and software constructions have no predisposition to the Romanesque legacy of weeks and months and whilst almost everything else in current digital discourse is available for 'disruption', as Martin and Holtzman point out, time it seems is not on the menu [10].

3. LIFECACHING THE NOW

Gordon Bell’s pioneering early experiments with Lifelogging [1], the social act of storing and often subsequently sharing one’s life events in public fora, and the Quantified Self measurement of Stephen Wolfram [15] can be considered some of the more extreme examples of recording and storing the minutiae of everyday life (See fig. 4). However this practise is now a recognisable trend with a plethora of recording devices and technologies readily available. Modern life caching is considered a form of social networking and typically takes place on the internet. The Quantified Self movement, to incorporate technology for data acquisition in manifold aspects of a person’s daily life in terms of inputs, states, and performance is seeing commercial acceptance from purveyors of the physical products and software services alike. Brands such as Reebok and Nike to aggregators and disseminators of data such as Facebook, Twitter and Google to new entrants with specialised products such as Microsoft HealthVault are all assisting with the increased capture and storage of huge amounts of people’s daily lives.

![Figure 4: Stephen Wolfram's Daily Rhythms](image)

When considering the idea of inputs and outputs in the context of data and emotional effect, this reinforcement of external mechanical time may actually be diminishing our ability to make sense of or otherwise effectively curate time-based media. Even new developments such as the specially designed Memoto Lifelogging camera are posed as recording devices but offer little beyond brute storage for the engagement they capture, mechanistically, every thirty seconds. (See fig. 5 and fig. 6)

![Figure 5: Memoto Lifelogging camera](image)
As we create more and more recordings and representations of our daily engagement (those moments where we are present, actualised and focused) we find that the data produced from intensely subjective personal activities such as Lifelogging or engaging in the increasing variety of recording under the banner of the actualised self, is just that, data.

Figure 6: Memoto Lifelogging

4. TEMPORAL REPRESENTATIONS OF EMOTIONAL OUTPUT

In literature the inherent temporality of the novel is almost uniquely based upon the subjective experience of the characters within a story, chronology is neither fixed, nor flat, nor contiguous but occupies a supporting role to provide context and links between events of importance, events of engagement, for the characters, the writer and the reader. Even from the viewpoint of the author or artist temporality is often unlinked. As with the classic example of Proust [12], a momentary incident in childhood as input takes a lifetime of work to describe as output.

A work of fiction can be said to hold at least three notions of time: The time of writing (the duration of the writing process), the elapsed time within the narrative and finally the time of reading (the duration required to read the text). As such the movement through the text places the reader is multiple simultaneous timeframes as memory in the definition of Susan Stewart “at once impoverished and enriched, presents itself as a device for measurement, the “ruler” of narrative.” [14] It is tempting to propose that Lifelogged events of social media could possibly be regarded in a similar fashion.

Figure 7: Henri Bergson. Illustration from "Of the Survival of Images. Memory and Mind"

The French philosopher Bergson developed his theory of time as a response to the perceived dominance of ideas of mechanical and rational time. [2] He became convinced that time eluded science since the instant one attempted to measure a moment in time, it was gone: He maintained that one can only measure an immobile, complete line, whereas he considered time as mobile and incomplete. From the perspective of the individual, time may speed up or slow down, whereas, for science, it would remain unchanged. Bergson explored the inner life of man, which he saw as a kind of duration, neither a unity nor a quantitative multiplicity. Duration is then ineffable and can only be shown indirectly through images that can never reveal a complete picture. It can only be grasped through a simple intuition of the imagination (See fig. 7).

As we move from systems-orientated mechanistic models of computation, of accounting, of record keeping, or tabulation of statements of fact, toward ubiquitous computing, pervasive media and a social model of computing the notion of engagement changes emphasis. The computer has finally disappeared and receded into the internet of things [9]. This constitutes an important challenge as we begin to address the question: How do we represent the experience of embodied and engaged moments over time?

Figure 8: Logging the Now on Facebook
5. PERSPECTIVES FOR MULTIPLE DIGITAL TIMES

The media we create is evidence of engagement (present, actualised, focused) but after-the-fact analysis ie curation of these discrete pieces of evidence of our engagement is limited to timelines of engagement, mechanical rather than personal. Without a coherent approach to curation we have a mechanistic chronology or a simplistic catalogue that lends nothing to re-experiencing the experience of being actualised at the moment of recording. Our intimate engagement is transformed after the fact to a Fordian production line of mechanical time where the nuance, subtlety and poignancy of being present in the moment is stripped of its temporal context and re-ordered to the tune of Captain Clock [7].

Analog media was originally created as to subvert our common understandings of time and space: at twelve frames per second and above we believe in motion. Film freezes and plays back live action in a different timeframe; radio transmits presence in time across space. Both forms play at displaying these modified experiences as if they were here and now. It can be argued that all media exist solely as manifestations of altered time and as such the experience of both traditional analog and new emerging digital media types is deeply rooted in the distortion and warping of our perception of time. This is of course only possible because chronological time itself is a technological definition, measured and defined by mechanical and chemical processes.

Traditional media has given us the power to control chronological time; can new media strategies give us the power to control our perception of time?

6. REFERENCES