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Sustaining Affective Duration in Discrete Computational Systems

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Abstract:

This study aims to investigate the mechanism by which computational system maintain affective continuity. There is a structural tension between discrete temporality of computational systems and the condition of obtaining affective experience. While computational systems process information in discrete intervals through modular objects and stepwise algorithmic operations, affective experience evolves gradually across time as previous moments continue in influencing subsequent ones. To address this structural tension, this study introduces a viable mechanism by which affective duration can be sustained within computational systems. The controlled modulation - within a temporally organized system - can function as a mechanism for arranging computational variations across duration, and affective reorientation is introduced to assist the interpretation of the way in which controlled modulation restructures affective experience. By reorienting affective experience, modulation may enable the affect that is sustained temporally. Thus, the study builds a framework for understanding the way in which modulation regulates variations. In addition, the accompanied practice-based example illustrates an exemplification for evaluating the operation of controlled modulation.

Keywords: Algorithmic modulation; Affective continuity; Computational systems; Temporal structuring

1. Introduction

With the flourishment of techniques, digital art has been increasingly operated in computational systems, often incorporating machine learning, real-time data streams, and generative algorithms. In this paper, computational systems refer to digital media systems structured through executable code and discrete algorithmic operations. Based on the inherent characteristics, computational systems run in a discrete structure, and generate variability, dynamic transformation through algorithmic responsiveness [1]. As narrative theory suggests, however, temporal coherence enables progressive disclosure and affective immersion [2]. It is argued that emotional experience is not reducible to an isolated instant, since the emergence of emotion necessitates continuous temporal condition [3], and contextual framing. Then affective experience in such computational system is at the risk of experiencing fragmentation or an overwhelming, boundless accumulation.

The operational logic of computational systems had been widely explored in media theory. Manovich conceptualizes digital media as modular units with database logic [1], and after that, Ernst investigates the operational temporality of algorithmic execution [4]. In contrast, narrative theorist, Ryan, emphasizes the continuous temporal structure in which immersion or participation is generated through the gradual disclosure of events and possibilities [2]. Simultaneously, affect theory, as declaimed by Hansen and integrated recently by Seigworth and Pedwell, highlights the temporal nature of affective experience in computational system [3,5]. In addition, recent studies on generative system and AI-based art have incorporated some emerging developments into current creative practice. Except for paying attention on technologies, such as automation, machine learning, studies of AI-based art practice also emphasize on expanding the aesthetic agency of generative systems [6,7]. Moreover, recent discussions in algorithmic aesthetics argue that constraints and parameterization can define the generative structure of computational systems [8].

However, these perspectives are rarely integrated. Media theory focuses on computational structuring, while affect theory emphasizes durational experience. As a result, the relationship between discrete temporality of computational systems and affective duration remains insufficiently examined. This study addresses this gap by proposing controlled modulation as a mechanism. By organizing the way in which variations unfolds, computational systems may support affective reorientation, thus avoiding affective escalation.

Given the above discussion, this paper proceeds in three analytical steps. To begin, it explores the way in which computational systems structure experience through discrete temporality. It then discusses the durational nature of affective experience and the conditions under which affective continuity can be sustained. Finally, the paper proposes controlled modulation as the means to arrange computational variation across durational time.

Accordingly, the contribution of this study lies in two aspects. Firstly, it brings together computational temporality, narrative duration, and affect theory within a unified analytical framework, which provide a space for exploring the way in which affective continuity is sustained in a discrete computational system. Secondly, it conceptualizes modulation as a mechanism for structuring variation, enabling the possibility of affective continuity.

2. Computational Structuring and Discrete Temporality

2.1 Computational Environment

In computational systems, digital objects are organized through numerical representation and algorithmic manipulation [1]. Such digital objects are understood here as computational units, once encoded in digital form, these objects become executable procedures processed by software. Then, their perceptual outputs are not simply a combination of discrete units, but generated through algorithmic instructions that organize objects modularly within discrete temporal intervals [1,4].

2.2 Modularity and Database Logic

The segmentation discussed above do not refer to the division of time into discrete intervals, but rather structural modularity. As Manovich illustrates, a digital object consists of discrete units that retain relative independence while remaining combinable within larger-scale systems. Specifically, all these units can be manipulated separately. That is, they can be independently processed, stored, and recombined by following the database logic [1].

Computational system currently provides the audience with countless images, sounds, texts, codes, and other recordings, which can be put into various collections with different sizes and different applications. Each of these collections can be treated as a database. Both elements in each database and the whole database can be rearranged, substituted, or extended independently [1]. For instance, auditory, visual, actional components tend to be applied as modular units in computational systems, especially interactive processes. These components are operated independently while the whole structure keeps intact.

Such structure illustrates that digital objects develop through segmentation and recombination. In such systems, continuity emerges by following relational arrangement rather than random temporal order.

2.3 Variability and Discrete Temporality

Based on the diversity of database, digital objects can be dynamically segmented, recombined, and reconfigured through algorithmic processes, thus leading to different versions of media objects, Manovich argued this is the variability of digital media [1]. To realize variability, as Ernst argues, algorithm must be carried out in material computational systems, which requires a system clock to execute operations in measurable intervals [4]. That means time is not continuous but sampled into discrete intervals. In this sense, what appears as a seamless flow

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is in fact the rapid succession of discrete units. Computational systems execute operations step by step. Due to this discreteness, temporal continuity perceived in systems occurs as a technologically mediated perceptual effect [4].

2.4 Structural Tension

Variability emerges from modular operation, while discreteness is the characteristic of stepwise execution in computational system. Together, these two conditions shape the emergence and transformation of digital objects [1,4]. Therefore, the coexistence of modular variability and discrete temporality creates a structural condition in which continuity must be organized deliberately. To some extent, continuity can be understood as a perceptual construction that translates discrete operations into a coherent perceptual experience through interface conventions and smoothing techniques [1,9]. This translation presents the way in which stepwise processes is translated into perceptible coherent experience. As theorists of narrative and affect argue, affective experience evolves through temporal continuity, and is shaped by memory and modulation of intensity [2,3], whereas computational systems process through discrete units and algorithmic executions. It is obvious that durational continuity does not naturally occur in computational systems but is dependent on the ways in which digital units are structured across time.

3. Durational Experience and Affective Continuity

3.1 Duration

The discreteness of computational systems discussed above becomes important when considered in relation to affective continuity. Since affect evolves across duration, the discrete structure of computational systems restrains the way in which duration can be sustained. Here, duration is understood as a sustained temporal condition within which affective experience is maintained and adjusted. In such a system, affective continuity emerges when affect is evolved through the duration. In this process, affective experience is composed of a moving span that carries memory into the present and extends toward the future [2]. Then, the present represents a temporally extended span which includes the traces of the past and the anticipation of the future, thus forming a durational structure, where the intensity of affect can be accumulated and regulated.

3.2 Temporal Structuring

Because of the discrete nature of computational systems, continuity cannot exist naturally but has to be organized deliberately. As Ryan describes in narrative theory, temporal continuity is organized through the pacing and sequencing of objects across time [2]. Similarly, recent research shows that algorithmic systems can recombine traces of the past and rearrange temporal sequences to reshape the way in which temporal continuity is structured [10]. Through such arrangement, temporal continuity in computational system emerges from deliberate structuring.

3.3 Affective Continuity

Affective experience is developed through the accumulation and modulation of affect across durational temporality. When experience is segmented, affective continuity is interrupted; when experience is maintained across durational temporality, this sustained development of affect is described as affective continuity. As Ryan suggests, affective experience evolves across duration, through processes such as build-up, accumulation, and stabilization [2]. However, computational systems generate variations by dynamically dividing continuous experience into computational discrete intervals. Therefore, the structural tension remains between the discreteness of computational systems and the durational temporality of affective continuity. Since the discreteness of computational systems cannot be erased, the analysis can be narrowed down to the structuring of variation.

4. Controlled Modulation and Affective Reorientation

4.1 Escalation

Given the structural condition, it is obvious that affective experience is segmented into discrete units in computational systems. Furthermore, discrete units can also be accumulated or escalated. For example, some discrete units, like visual or auditory variation, can be dynamically recombined through algorithmic executions [1]. In this process, the affective intensity may be accumulated faster than it can be accordingly processed. Such amplification may exceed the subject's capacity for reflective processing, resulting in states of overwhelm that make affective reorientation difficult.

4.2 Modulation

To prevent affect from the states of being overwhelmed, curtain regulatory mechanism should be introduced into computational systems. In this study, this mechanism is defined as modulation, which refers to the regulator that dynamically shape the way in which variation is released over time; the speed at which changes occur; the size of the intensity of shift is; and the way in which transformation is staged [7]. As Galloway suggests, computational systems are not neutral structures but organizations that carry implicit normative decisions [9]. That means computational systems has already set the conditions under which variations are structured and regulated. Therefore, arrangement of variations cannot be treated as a neutral technical measure. It entails implicit assumptions about desirable tempos and bearable levels of intensity. Then, the arrangement of variations shapes the condition of affective experience [9,11]. However, without suitable and sufficient restraints, that arrangement may lead to escalation of affective experience.

Digital art practices explore the way in which algorithmic constraints shape aesthetic outcomes [8]. As a type of constraint, controlled modulation shapes the formation of affective experience across duration. Modulation organizes changes across duration by regulating thresholds, pacing variations, or adjusting intensity. If unmanaged, these changes have the potential to accumulate into abrupt shifts. Through such arrangement, modulation creates conditions under which affect can be sustained without becoming overwhelming. Affective experience therefore remains accessible across duration.

4.3 Affective Reorientation

Such regulated conditions create the possibility of affective reorientation. Since affect develops within a durational time span, it can be reflected upon and repositioned across duration instead of overwhelming affective experience. In this study, this process is described as affective reorientation, in which affect remains in the moment when it is perceived, but its direction and intensity are reorganized across duration. As a result, controlled modulation may function as an infrastructure that supports the continuous orientation of affect across duration in computational systems.

5. Practice-Based Illustration

5.1 System Description

The practice-based example is a short audiovisual animation. It illustrates an affective experience by reconstructing a series of digital images and watercolor images created across different moments of personal experience. This two-part framework transitions from a hand-drawn narrative to a generative environment. In the first part, digital images function as visual fragments, each of which retains its original form and becomes part of a temporal sequence. The watercolor images in the second part are algorithmically decomposed, then transited, transformed, and reconstructed. Meanwhile, the accompanied music is arranged into two sections, corresponding to the two-part structure of animation respectively. In the first part, the music includes vocal elements and carries a more expressive affective tone; whereas, the second part becomes instrumental, adopting a more restrained and melancholic character, providing a supportive emotional regulation for the animation. Therefore, the work is arranged as generative sequences composed of visual fragments, musical pacing, and algorithmically arranged transitions. Thus, it provides an exemplification for evaluating the operation of controlled modulation within a computational system.

5.2 Modulation Mechanism

Variation in this case, occurs through several pathways. Visual fragments appear, fade, and are reorganized across the animation gradually. The pacing of transitions regulates the temporal rhythm of these changes. In addition, there is a pause between the two parts, providing a space for transition. At the same time, the change of, from vocal to instrument, music also brings variation that shapes the affective intensity. These variations are paced and adjusted by controlled modulation. In other words, this modulation presents the way in which variations can be purposefully organized across duration to make affect accessible. Therefore, modulation can be considered as a structuring mechanism that translates computational variations into a perceptible temporal flow. To be specific, visual transformations, temporal sequencing, and musical shifting are organized structurally so that transitions gradually disclose. Therefore, variation remains in a temporally extended span including traces of the past, the ongoing present, and the anticipation of the future.

5.3 Affective Outcome

According to this practice-based example, the generative system can maintain the affective continuity by controlled modulation. In this case, when visual and auditory changes are algorithmically distributed across duration instead of abruptly triggered, affective continuity is more likely to be maintained in the audio-visual animation. Therefore, affective intensity is reorganized, allowing the work to reorient the way in which affect is experienced across temporality.

In this sense, the project presents the way in which computational systems operate as infrastructures to support affective reorientation. Through controlled modulation, variations are reorganized carefully into a durational temporal structure that allows continuity to be remained in

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affective experience.

6. Conclusion

This study investigates the mechanism by which computational system maintain affective continuity. It argues that the way in which variation is structured across duration plays a critical role in this context. When variations are deliberately structured, controlled modulation - like regulating the pacing or intensity of variations - supports the formation of affective reorientation and allows computational systems to sustain affective continuity within a sustained temporality.

However, the implementation of such modulation remains a practical challenge. The choice of parameters, such as threshold, pacing, and transition rules, are limited by available data, platform conventions, and the technical limits of generative systems. These constraints shape the path through which affect can be maintained and may reinforce normative patterns for the shifts of affect.

Further analysis may examine the way in which controlled modulation operates in interactive generative media, particularly in real-time interactions or adaptive systems. Examining the way in which audiences experience temporally structured variation in such interactive contexts may provide additional insights into the sustainability of affective continuity.

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