ANIMATED NOTATION "EVERYWHERE" FOR "EVERYONE": A BROWSER-BASED APPLICATION FOR COMPOSITION, PERFORMANCE AND PEDAGOGY

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Abstract

In the world of digital and electronic art the concept of deliverability is generally of little concern: file-sharing is the name of the game. However, technological obsolescence can easily wreak havoc on one's work and it may be prescient to *fix* one's work in a particular form. This can demean the conceptual basis of some works that may be generative or interactive in nature. In the field of Animated Notation, in which motion is a necessary element, some works rely on generative qualities to produce novel notational and compositional approaches. A relatively recent development in this field is browser-based notational systems that circumvent the potential need to *fix* the work in some immutable form, as described above. This paper will explore a new work, The Animated Notation Workshop, as a method for composition, performance and pedagogy in a form designed with inclusivity, accessibility and longevity in mind.

Keywords

Animated Notation, Music Notation, p5.js, Creative Coding, Accessibility, Browser-Based, Application, Improvisation, Education, Inclusivity

Introduction

Western music notation is a traditionally *fixed* system, often printed on paper although digital replications are similarly immutable. This system includes a variety of symbols that represent the key characteristics of sonic events, including pitch/frequency, dynamic/amplitude, articulation/playing style, time-based modulations (i.e., crescendo and decrescendo) and whatever else the composer requires of the performer(s). This system is also extensible which enables composers to design and define their own symbols if an adequate solution doesn't already exist. Graphic notation may be the most well-known example of this but plenty of extensions to the traditional system are in use. [1,2,3,4] There is also an *invisible* layer between what the composer notates and how the performer determines it should be realized: interpretation. This is often context dependent, i.e., a work from the Baroque era may be interpreted quite differently than one from the Romantic. This layer was highlighted, and certainly complicated, with the emergence of graphic notation in the mid-20th century as many of these works sought to engage with performers in less-directed ways, enabling a collaborative approach to the realization of the composer's wishes. Unlike traditional notation, these symbol systems were often created for a single work, fusing a unique visual design with a single composition. Arguably this emphasis on singular notational systems complicates any large-scale interpretive pattern, and with few exceptions the visual aspects of these scores, like traditional ones, are also immutable. The emergence of Animated Notation as a primarily-21st century approach to notation highlights a desire to notate musical concepts that would be difficult if not impossible to notate *and* read with traditional approaches, graphic or otherwise. It is also common for these animated scores to provide notational specificity for performers despite their graphic qualities.

Background

A thorough investigation of animated notational practices is beyond the scope of this paper, but their characteristics will be briefly discussed. In general, animated scores, like graphic scores, often present unique notational systems designed specifically for a single work although there are certainly exceptions to this. [5,6,7] These and other scores often use programming languages and products that are often not designed with music notation as their focus, including but not limited to Processing and OpenFrameworks as well as off-the-shelf products like Adobe After Effects, Touch Designer and others. Unlike products with notation as their focus (Sibelius, Finale, Dorico, MuseScore, etc.), notational systems must be designed from the ground up, informed by the requirements of the composition and what is expected of the performer(s). These scores may be transmitted to performers as executable files, allowing for interactive and/or generative qualities, as browser-based systems [8,9,10] or as a video which renders it immutable but preserves its dynamic qualities. It is also common to create a fixed video version of an otherwise generative score for documentation, archival or performance purposes, as well as a backup/fail-safe for an executable file. Despite how the animated score is created and what form it takes, its dynamic qualities are essential and the relationships between elements within the score must be clearly perceptible. [11] These perceptible,

dynamic qualities will be considered in the following description of The Animated Notation Workshop.

The Animated Notation Workshop: Elements

The Animated Notation Workshop [ANW] is a browser-based application for compositional, performance and pedagogical experimentation. Built with p5.js, the ANW approaches the creation of the score from a *blank slate* "show us your screens" approach [12], associated with live coding as well as other improvisational practices even though the concept of the blank slate is arguable. [13] The ANW includes a variety of notational symbols and event indicators which will be discussed below in reference to figure 1.

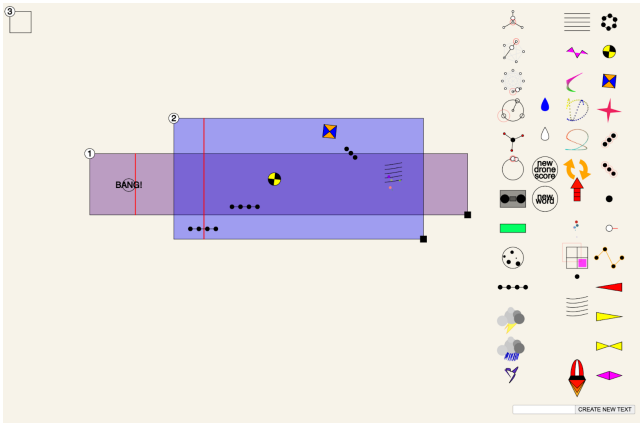

Figure 1. Screenshot of The Animated Notation Workshop with notational symbols on the right and two performer stages on the score stage.

The *Score Stage* is the area in which all notational elements are positioned, i.e., the entirety of the browser window. To the right side of the score stage is a collection of notational symbols. Each symbol is unique in its visual design and does not necessarily represent specific actions by performers. To that end it may be useful to consider how these symbols are defined prior to rehearsal or performance. Each symbol can be described as *local* (applicable to a single performer) or *global* (applicable to more than one performer). At this point the *raindrop* symbol is the only global symbol regardless of how it is used although based on usage symbols can become increasingly global. The notational symbols can be further classified into four types:

- Conventional: symbols that in their design may appear to reference a traditional notational symbol.
- Unconventional: symbols that do not appear to reference a traditional notational symbol.
- Stria: collections of symbols organized along the horizontal axis.
- Text: user-defined words or phrases.

These classifications are not always discrete and will often overlap but may help in defining and explaining the functionality of the score. There are also several *sonic symbols* including loops (a looped audio file that can be turned on and off) and the boombox (a sample player that will trigger at a predetermined time as it traverses the score stage). Lastly, the *Performer Stage* is a resizable window that contains a *traversing attack line*. This line indicates some performer action as it passes through each symbol within the performer stage. Each performer stage is assigned to an individual performer based on the number displayed at the bottom corner and symbols and performer stages can be dragged and dropped wherever one wishes within the score stage. The score will generally be projected from a device or displayed on a monitor large enough for the ensemble to see and ideally it will also be visible to the audience, allowing them to witness the emergent aspects of the score. Please click the following link for a brief video walkthrough: **https://www.youtube.com/watch?v=QxNTO89035E**

The Animated Notation Workshop: Usage

Because the ANW embraces the blank-slate approach to its usage it is necessary to assign a *director* to build the score in real-time. The operation is simple: each symbol can be dragged and dropped, repositioned, and deleted as the director sees fit and performer windows can also be repositioned and resized. When a symbol is positioned within a performer stage the performer associated with that stage will then be expected to produce some predefined sonic response when the attack line crosses it. Note: it is not necessary to predefine the meaning of these symbols, but as mentioned above it may help clarify the sonic palette of a performance. The director may then add additional symbols, creating a series of sonic events based on their relative position within a single performer stage. This approach can be repeated for each performer and their respective performer stage, creating a texture of overlapping patterns in which symbols can be added, deleted or moved to alter the current texture. Performer stages can also overlap one another to create interesting temporal relationships between performers as the same symbols are executed at different times. Given the nature of the endlessly looping, traversing attack lines it is likely that recognizable patterns will emerge, but it is by no means necessary to engage with such compositional practices. In fact, there is no idealized approach to score creation nor any expected outcome.

Inclusivity and Accessibility

When designing the ANW, inclusivity was a strong consideration. To simplify the process of building the score the author took advantage of what might be considered a general familiarity with touchscreen technology: everything is drag and drop with no need to learn the specifics of a new language or complex functionality. Furthermore, the order of events/symbols is inconsequential, i.e., you can't do something wrong or *break* the score. Whatever one does is simply

part of the creative act and is as right or wrong as one's musical ear decides. Lastly, the ways in which symbols are defined can be customized to the musical abilities and tastes of the performer(s). However, it would be incorrect to tout these characteristics as infallible in the context of inclusivity as the physicality of these processes may still preclude engagement. Research into inclusive interfaces for musical participation, [14, 15, 16, 17] and "types of design[s] oriented towards what it is spontaneously innate and natural in the users' actual sensorimotor system" [18] may inform better design choices and interactive options. For instance, eye tracking technology may be a viable solution [19, 20] along with others. [21]

Regarding accessibility, the Covid-19 Pandemic highlighted the common misconception that internet access and personal device ownership is universal. Issues regarding accessibility impact not only creative access and expression but health, [22] ability to social distance [23] and access to education [24] amongst others. This is often referred to as the "digital divide" and is certainly not limited to the Pandemic, [25] often represents little or no connectivity in poorer households, [26] lower percentage of device ownership for persons with disabilities, [27] and less coverage in rural areas when compared to more urban ones. [28] Given these statistics, any suggestion that personal device ownership and internet access is universal is clearly flawed while the need for improved connectivity around the world is an important project**.** Still, it is the authors hope that *if* one were to have access to an institution of some sort, be it one of higher learning, a community center, church, etc., the single score approach, which is not limited to this project alone, may be able to be read by all performers, reducing the strain on resources. As mentioned earlier, the notational symbols can also be defined in ways that best fit each performer's abilities, theoretically enabling access to a compositional and performance experience without specialized equipment, traditional musical education or virtuosic abilities.

Pedagogical Potential

The ANW at its foundation is an example of what might be referred to as Creative Coding. In the late 1960s, *Compos 68* began exploring the combination of computer technologies and visual art along with many other artists [29] and is now a common term with extensive resources in the visual arts as well as music. [30, 31, 32, 33, 34, 35, 36, 37] Coding is also at home in the classroom, from the early days of LOGO [38] to the technology-rich smart classrooms of today. [39] As a tool built from the ground up using the very approachable p5.js programming language, the ANW introduces pedagogical opportunities to explore how it was built and how it might be extended. This may come in the form of studying function or symbol design in the code, making clear suggestions for changes, and immediately seeing these changes on the score stage. Students may also find themselves desiring additional symbols. This not only represents a kind of inquisitive approach to the topic but a chance to dig into the fundamentals of programming as they learn to create new designs with code. These changes can also be applied in real-time when an ensemble is present, even just fellow classmates, enabling the students to not only *see* the results but to *hear* them, creating a recursive process of notational and compositional innovation.

Conclusions and Future Work

The title of this paper intentionally has "everywhere" and "everyone" in quotation marks as the ANW is certainly neither. However, given the ways in which the ANW can be used, it is fair to assume some degree of access and inclusiveness based on its availability and openness, but this is still only a small step.

The possibilities for browser-based animated notation systems are vast and may represent a more stable environment regarding dissemination and longevity. Generative and interactive components may also benefit as there are no additional technologies beyond internet connectivity, a device and some way to present it. Potential opportunities may include more integrations with the WebAudio API and other data sources native to the web as well as the possibility for distributed performances. Lastly, a more robust method for sharing the code for pedagogical and development purposes is an essential step.

The ANW continues to be developed and its current build can be accessed here: http://ryanrosssmith.com/workshop/index.html

Acknowledgements

Thank you to Daniel McKemie for his stellar suggestions.

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