An Elementary Method for Tablet

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ABSTRACT

This paper proposes the creation of a method book for tablet-based instruments, evaluating pedagogical materials for traditional instruments as well as research in human-computer interaction and tablet interfaces.

Keywords

Wacom tablet, digitizing tablet, expressivity, gesture, mapping, pedagogy, practice

1. INTRODUCTION

In 2006, Christopher Dobrian asked whether the 'e' in NIME (expression) was being adequately addressed by researchers and performers of real-time computer music.[10] He went on to define musical expression as "the nuance that a live performer adds to the available materials." Examining whether or not machines can be expressive is beyond the scope of this work. In the case of a live performer, the possibility for expressive nuance is constrained by the sensitivity of the interface/instrument and the performer's ability to take advantage that sensitivity.

It is difficult to be expressive on a new instrument because the fact of its newness means that the performer has not had the time to learn it[1]. The activity of instrument building is very involving, and it is hard to resist the temptation to keep building until the last possible second. It is important to schedule time to learn to play our instruments, but even with days or weeks of practice we are still beginners. It has been suggested that it takes more than a decade to learn a musical instrument.[16] Furthermore, traditional instrumentalists are aided by centuries of pedagogical materials and methods, which demonstrate that there is more to practicing and learning than just playing repertoire. With a newly developed instrument it is hard to know how to practice; nobody else has ever learned to play this instrument and there is no body of repertoire to suggest how it could be played.

This paper addresses the question of how to practice by proposing a method book for tablet-based instruments. Suggesting that more emphasis be placed on expression was the first step. With the focus now on expression, we can inspire performers to practice by showing them how. The strengths and weaknesses of the pedagogical methods of traditional instruments are examined first. These methods are

then compared to research on human-computer interfaces, with the goal of combining the best of both fields. Finally, the creation of a new method book for tablet-based interfaces is proposed, and the details of this book are described.

2. INSTRUMENT PEDAGOGY

Many musicians choose new instruments specifically to escape the baggage that comes with a "classical" instrument. As someone who plays both, I appreciate the freedom of being in uncharted territory with an interface I have designed. I am not worried about playing in all twelve keys, memorizing excerpts, or learning riffs. However, I also miss some of the discipline: the focus of playing the same warm-up exercise or the same bit of repertoire over many years and coming understanding how my own technique develops. Traditional method books tend to have a few different kinds of material: Études (short musical pieces focussing on a particular musical skill), exercises (scales, patterns, etc.), and practical advice (how to practice, how to hold the instrument, etc.)

2.1 Études

Études are the quintessential pedagogical material, and represent both the best and the worst of learning an instrument. Études range from music that is extremely expressive and wonderful, such as Chopin Opp. 10 and 25 or Bartók's Mikrokosmos, to pieces that are, at best, mechanical and utilitarian. Students of the piano are probably familiar with method books by Hanon [14] and Czerny [6,7]. These methods are explicitly designed to develop the physical skills of playing the piano. Although widely used, they are often criticized for their emphasis on repetition and lack of musicality.[27] It is clear that physical skills are required to interpret virtuosic repertoire, but teachers [23] question the need to develop these skills in a context that is not expressive and may even cause physical damage.

If there is any element that pushes students away from classical training, it is here. This kind of étude, as part of an overall curriculum, can be successful in developing a certain dexterity, but that dexterity is useless without musicality. It is important for students to tackle challenges that are beyond their current abilities, and to work. But it is also important for students to be mentally, as well as physically engaged [11]. If one must learn to play octaves, for instance, it would be better

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[1] There are performers in the NIME Community – Michel Waisvisz with The Hands (http://www.crackle.org/TheHands.htm) and Laetitia Sonomi with the Lady's Glove (http://www.sonami.net/lady_glove2.htm) are two examples – who have devoted substantial time to developing their own personal performance practice, and to great effect.

to learn by playing Chopin Op. 25 no. 10, rather than just scales in octaves.

2.2 Basic techniques

The most successful methods address the development of executive skills in a larger context of attentive practice and musical development. When physical skills need to be practiced, they should be focused on specifically and with the same intensity as music making. This describes the approach of Joe Allard [19], who strongly influences David Liebman's method (see table 1). [17] Liebman does not offer the student any musical études, instead he devotes the first seven chapters of his book to the act of making a sound with the saxophone, covering the mechanism part by part, offering visualizations and physical exercises. His discussion of expressive techniques covers devices such as pitch bends, portamento, and vibrato, but does not address how to be expressive, as defined above, but presents techniques that could be used for "furthering one's personal expression, so long as it is within the bounds of artistic and musical taste." Finally, he offers advice on practicing, which make it clear that Liebman expects the student (or teacher) to find other sources for études (e.g. [21]) and repertoire that will round out a whole curriculum.

Table 1. Chapter headings from *Developing a Personal Saxophone Sound* [17]

Chapter One	Overview of The Playing Mechanism
Chapter Two	Breathing
Chapter Three	The Larynx
Chapter Four	The Overtone Exercises
Chapter Five	The Tongue Position and Articulation
Chapter Six	The Embouchure
Chapter Seven	Reeds and Mouthpieces
Chapter Eight	Expressive Techniques
Chapter Nine	Practicing

In a two-hour practice session, one hour is devoted to different categories of tone exercises, 20 minutes to sight-reading, and 40 minutes to "scales, arpeggios, and intervals … in order to learn the alphabet of music." For a method book to function in the context of "new" music and new interfaces, the possible alphabet(s) of music would need to expand beyond these patterns. Also, there is no expressive music making in this practice session – that happens at some other point. The point of practicing is "to insure that the needed and physical and technical manipulations occur quickly and efficiently, so that a musical idea is immediately transferable from ear to mind with the soul (emotions) monitoring the entire process."

2.3 Practical Information and Advice

A third type of material in a pedagogical method is practical information and advice. Steve Lacy offers a wealth of information in his book *Findings* [15]. In addition to standard fare, such as fingering charts, he advises against smoking and poetically describes the rigors of life as an improvising musician. This book also has exercises and études.

The Inner Game of Music [13] moves away from the category of method book entirely, offering exclusively advice in prose. With no musical examples, this is still an important addition to instrument pedagogy. Like the methods above, the authors

understand that other texts will provide the missing pieces of the curriculum. In the case of the tablet method, there are no other methods to fill in the gaps. It will be important that all three of these categories are represented.

3. STYLUS and TABLET RESEARCH

3.1 An extremely short history

Figure 1: Bert Sutherland at the TX-2, with light pen [1]

The first appearance of a pen-computer interface is the Lincoln TX-0 computer from the MIT Lincoln Laboratory in 1957 [31]. There are many music-specific implementations of tablet and spatial interfaces, including Fairlight CMI[2] (although not for real-time performance), Xenakis UPIC [18], Buxton SSSP [5], Boie/Mathews/Schloss Radio Drum [3].

3.2 HCI

Much can be learned about tablet and stylus interfaces from literature of human-computer interaction.[22] An important early study of pointing technologies was done by Paul Fitts in 1954.[12] His formulation, now referred to as Fitts' Law, predicts the time required to rapidly move to a target area, as a function of the distance to the target and the size of the target. This work has been expanded with the Steering Law, [1] which deals not just with targets, but also with trajectories. This work shows that tablets out-perform other input devices (mouse, trackpoint, touchpad, and trackball). While both laws have wide reaching implications for designers of interfaces, the focus on untrained movements limit applicability of authors of method books. However, the underlying metrics for evaluating interfaces (indexes of performance) could be applied to evaluating performers and their progress. Also, selection of mappings and gestural situations are especially critical when preparing an instrument for students. [25]

4. A TABLET METHOD BOOK

4.1 Why Tablet?

It would be impossible to write a method book that addressed the entire range of instruments that arrive at NIME. While practicing and learning can be addressed in a general context, the details of implementation and developing performance skills are specific to an instrument. Since specific skills are critical to understanding performance practice, it is desirable to develop a whole method, from basics to real music, around one instrument as an example for other instruments. The Method for Table could potentially spawn a whole series: Method for Wii Remote, Method for Footswitch, etc.

Previous work [29] surveyed musical work with tablets, and presented reasons why digitizing tablets make good interfaces. Briefly, the tablet interface offers:

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2   http://en.wikipedia.org/wiki/Fairlight_CMI

- Low cost
- Easy availability
- High resolution output data
- Fine temporal resolution
- Multiple axes of control

These qualities are even more important in choosing the focus for a method book than they are for choosing one's personal instrument. It would be impractical to write a method for a unique interface, no matter how good it is. The desire is for people to use this text, either for individual practice, in groups, or in the classroom.

Tablet interfaces offer other benefits as an instrument for beginners. Stylus-based interfaces outperform other pointing devices, such as joysticks, because they leverage the high bandwidth of the thumb and finger in combination [2]. Most performers come to the tablet with pre-existing pen skills, and physical demands of the instrument are such that they are attainable by a large number of users. (There are no issues with handedness, for instance.) Tablet interfaces have been part of the NIME community since the beginning [26] and are now are well established, appearing both in performance and print [8, 24, 29].
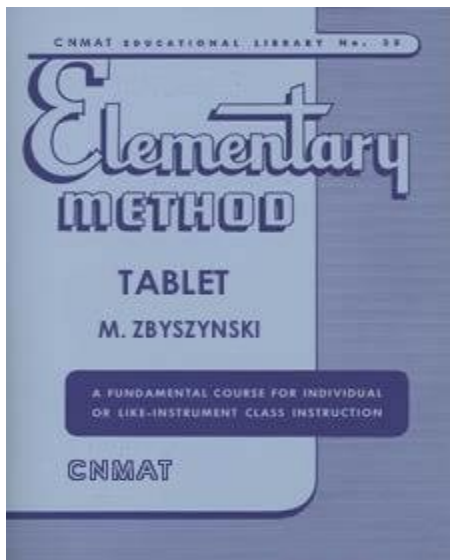

Figure 2 An Elementary Method for Tablet

4.2 The Method

The method book will have three basic sections: Practical Issues, Basic Exercises, and Études.

The practical issues section covers topics of getting situated with a tablet interface, including a discussion of which tablet to acquire (sizes and models, strengths and weaknesses), the use of alternate pens, etc. Setting and adjusting the driver and sensitivities for musical performance follow, then recommended software implementations and conventions specific to the method book. The exercises and études in the method use Max/MSP[3] and Jean-Marc Couturier's Wacom Object[4]. They are programmed so that students can use the free, runtime version of Max, and distributed under a Creative Commons License[5] that allows sharing in a non-commercial context. (It is also worth considering implementing some of

the method in Pd[6], to be compatible with the largest number of possible users.) Incoming tablet data is mapped using an Open Sound Control [28] wrapper, which is part of the CNMAT Max/MSP/Jitter Depot. [30]

Figure 3: An exercise based on Engraver Script by Willis A. Baird (http://www.zanerian.com/BairdLessons.html)

The second section consists of basic exercises, analogous to scales and arpeggios of classical instrumental technique. Their nature as interactive software means that some of the pitfalls of exercises (e.g. mindless repetition) are avoided. While the instrument mapping should stay the same, the content and difficulty of an exercise adapts to the level of the student. An alternate model for these exercises is a computer game[9].

The third section is the largest and most musically interesting. It consists of études by a number of composers. For example:

- M. Zbyszyński's *News Cycle #2* [29] requires the player to pull lines from a video stream to generate sound.[7] A Fitts-esque exercise involves quickly and accurately putting the pen down in a zone on the tablet surface.
- *News Cycle #2* also uses the buttons and sliders on an Intuos3 tablet, and requires the user to switch pens.
- N. D'Alessandro's HandSketch [8] controller uses a polar coordinate system, calibrated to the ergonomics of a performer's arm. This mapping is presented, and calibrated for individual users. Individual gestures (forearm for pitch, fingers for intensity) are practiced in isolation and in combination.
- Ali Momeni [29, 20] uses multiple interpolation spaces: one controlled by the tip of the pen and one by the tilt. While initially difficult, this complex spatial navigation scheme has huge expressive potential.
- Matthew Wright [29] employs a scrubbing metaphor, where a click on the tablet defines the material to which a long trajectory is applied.[8] This method also generates multiple spaces and navigation challenges.

In addition to myself, I have already invited other members of the NIME Community to contribute, and I anticipate involving additional composers in response to this paper. Études should be short, focused pieces that deal with a technical issue from the composer's musical practice. Hopefully, the pieces will be more in the model of Chopin than Czerny, fully formed pieces of music and not simply exercises.

Further important topics will be addressed in an appendix or the Advanced Method. These include:

- Études and exercises that are intended for use in pairs, or larger groups are also desirable in this section.

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[3]   http://www.cycling74.com/
[4]   http://cnmat.berkeley.edu/
[5]   http://creativecommons.org/licenses/by-nc/3.0/

[6]   http://crca.ucsd.edu/~msp/software.html
[7]   video at: http://www.mikezed.com/music/nc2.html
[8]   video at: http://www.youtube.com/watch?v=4dTcSeDTq84

- Extensions to the tablet interface by employing an alternate controller in the other hand, including the Qwerty Keyboard, fader boxes, and FSR's.
- Material that has a more explicit connection to the use of the stylus in other arts, such as writing, drawing, and painting – Calligraphy or sumi-e inspired études.

5. ACKNOWLEDGMENTS

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