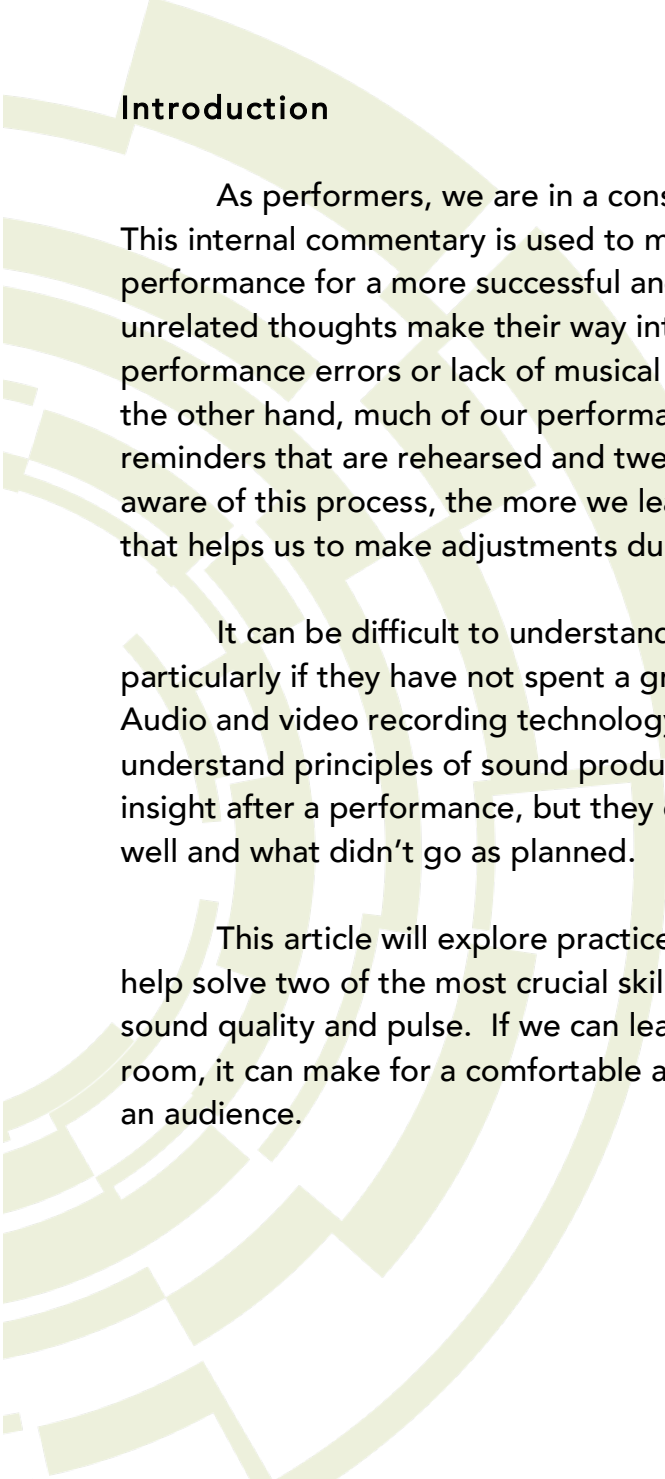# PERCUSSION ANALYTICS: USING TECHNOLOGY FOR REAL-TIME PERFORMANCE FEEDBACK AND LEARNING

Thad Anderson

## Introduction

As performers, we are in a constant mode of real-time analysis and self-assessment. This internal commentary is used to make adjustments and enhancements during performance for a more successful and musical playing experience.  At times, negative or unrelated thoughts make their way into our stream of consciousness.  This often leads to performance errors or lack of musical control (sound quality, stability of pulse, etc…).  On the other hand, much of our performance mindset is made up of positive cues and reminders that are rehearsed and tweaked in the practice room.  The more that we are aware of this process, the more we learn to rely on and trust this instinctual commentary that helps us to make adjustments during successful performance outings.

It can be difficult to understand or explain this process to younger musicians, particularly if they have not spent a great deal of time on stage in front of an audience. Audio and video recording technology is a common and useful way to help students to understand principles of sound production and pulse control.  These techniques allow for insight after a performance, but they don't offer visual data that can help us learn what went well and what didn't go as planned.

This article will explore practice methods and exercises that use analytical data to help solve two of the most crucial skill sets that are at the forefront of every performance: sound quality and pulse.  If we can learn to utilize this analytical method in the practice room, it can make for a comfortable and confident performing experience when in front of an audience.

## Analytics

Before we delve into the process, let's first get a glimpse of how it might work outside of the performance field.  This mode of real-time perception and personal commentary is a form of analytics.  Analytics is the process of obtaining optimal or realistic information based on existing data.  To put it simply, it is the science of analysis.

Analytics is a part of our every day lives.  If you are a web developer, you are constantly reviewing data to help boost traffic to your website for a better user experience.  If you drive a smart or hybrid vehicle, your dashboard provides you with real-time information such as fuel efficiency or if you are using an electric motor versus the combustion engine.  This provides a more engaging driving experience and the real-time feedback provides useful data to enhance all-around performance.

A key concept here is optimization.  Once we have data or feedback, it is in our best interest to do something with that information.  Optimization is the process of selecting the best element(s) from a set of alternatives.  If a musician knows how to make a proper adjustment for better tone quality, for example, this will enhance the overall performance.

We all know how beneficial recording practice sessions or run-throughs can be; we are able to step out from behind the instrument and hear ourselves as if we are audience members.  These exercises offer the same benefits with the added bonus of a visual reference and actual data.  Many performers (like myself) are visual learners and can benefit from experiencing visual feedback in addition to listening.

## Equipment

Before we learn details about the exercises, let's first outline some of the equipment and software options that are suggested to make the most of using these practice methods:

*Computer:*
Either Apple Macintosh or standard PC desktop or laptop

*Digital Audio Workstation (DAW) software:*
Consumer level: Audacity (freeware), Garage Band, or similar
Professional level: Logic Pro, Ableton, Pro Tools, Cubase, or similar

*Microphone:*
Built-in computer microphone (not ideal due to control and placement)
External USB microphone (such as the Audio Technica AT2020, Blue Yeti, or similar)
Standard condenser microphone connected via XLR and audio interface

Though it is certainly possible to utilize these exercises using Audacity and a built-in computer microphone (the most economical option), it is ideal to have DAW software that can support a click track and a headphone output for monitoring the metronome during performance.  This will allow the user to take full advantage of these exercises' capabilities.  The most common setup I use with these exercises includes an Apple Macbook Pro laptop, Logic Pro X, and a Blue Yeti Pro large diaphragm USB condenser microphone.  The Yeti is nice because it also serves as a basic audio interface with a standalone headphone jack for running a click track.

## Exercises

Below are two exercises that help with learning to process real-time analytics as they pertain to playing percussion instruments.  Each exercise is intended to relate and transfer well to all percussion instruments and areas.  For the sake of demonstration, I typically use a practice pad, but it is certainly possible to work on each of these exercises on a snare drum, timpano, marimba, or any other instrument.

### Exercise 1: *Stick Control* by George Lawrence Stone

With this exercise, we are primarily looking to analyze sound quality and consistency through—you guessed it—controlling our implements.  Using the first few pages of *Stick Control,* we will use a variation that has been passed down through generations.  With this variation, we will add an "invisible" or check bar before each line in the *Stick Control* variations.  This check bar will be played with a single hand (either the right or left).  When teaching this exercise, I like to bring up the scientific method (remember this from fifth grade?).  Important components of the scientific method are establishing a control (something that is consistent) and a variable (something that evolves or changes).  With this exercise we have just that: the check bar of eighth-notes played in one hand serves as a control and the sticking permutations that Stone lays out in his book give us many different variables.  The hand that plays the check bar of constant eighth notes is determined by the last hand that is used in permutations provided in *Stick Control*.  Below is an example of how the exercise works using the first four variations in Stone's book (figure 1):

Figure 1: Sample excerpt of this exercise using George Lawrence Stone's *Stick Control.*

Once the basic exercise is learned, it's time to turn on the microphone, set your input levels, and start recording.  Using a four beat count-off, start the recorder and then perform the first eight lines of *Stick Control* in this manner.  Initially, the goal is to perform all eighth notes at an even volume or amplitude using the control (same hand sticking) as a model for the variable (sticking permutations). Once a pass-through has been recorded, take a look at the audio region in your digital audio workstation. It should look something like this in Audacity (figure 2) or Logic Pro X (figure 3):
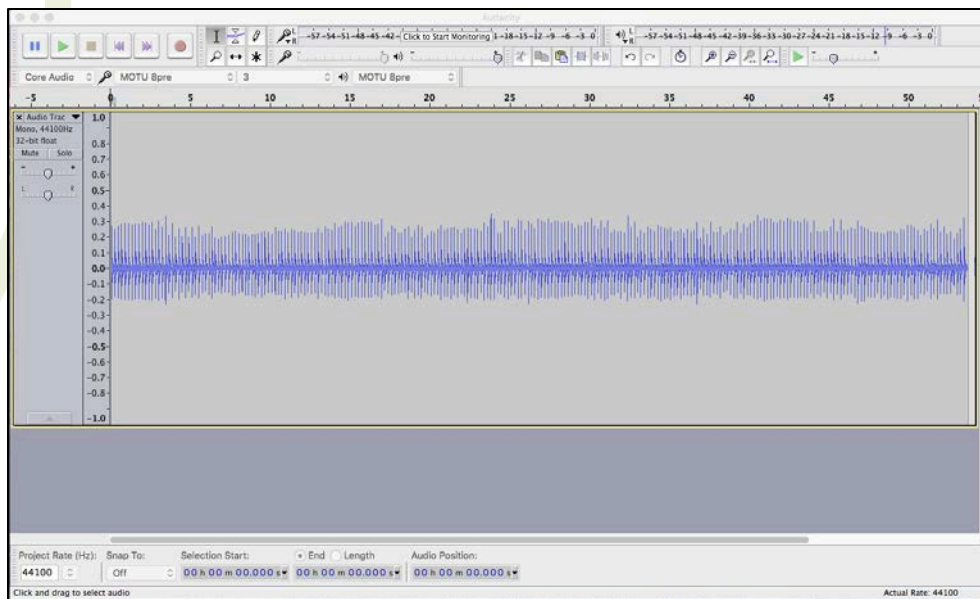


Figure 2: Lines 1 through 8 of *Stick Control* recorded using Audacity.

*Figure 3:* Lines 1 through 8 of *Stick Control* recorded using Logic Pro X.

Here you see each strike of an eighth-note visualized with a digital sound wave. Properties such as amplitude and transient patterns or spacing can be examined for consistency, shape, and alignment.  For this particular exercise, the goal is to match the varied stickings with the constant stickings. Therefore, we should see an even amplitude and spacing all the way across the audio region.  Figure 4 offers a closer look at line 3 of the exercise:



*Figure 4:* A closer look at measures 9 through 12 of the recorded pass-through.

Now that we have zoomed in on 32 eighth notes, we can better see inconsistencies and tendencies such as the balance of each hand and control of sticking variations. By witnessing this type of feedback in real-time and after the performance, we can use this data to gain better insight on how to react and improve in various performance opportunities as they relate to control of volume and balance.

**Exercise 2**: *Progressive Steps to Syncopation for the Modern Drummer* by Ted Reed

This second exercise focuses on pulse control. Using Ted Reed's classic *Progressive Steps to Syncopation for the Modern Drummer*, we can use his basic eighth-note syncopation exercises to work on subdividing and placing notes properly in time. To get started with this exercise, you will want to select a syncopated eight-bar phrase from somewhere within the book. Once you have selected a phrase, go ahead and record the rhythmic passage with a metronome or click track. It will end up looking something like figure 5:
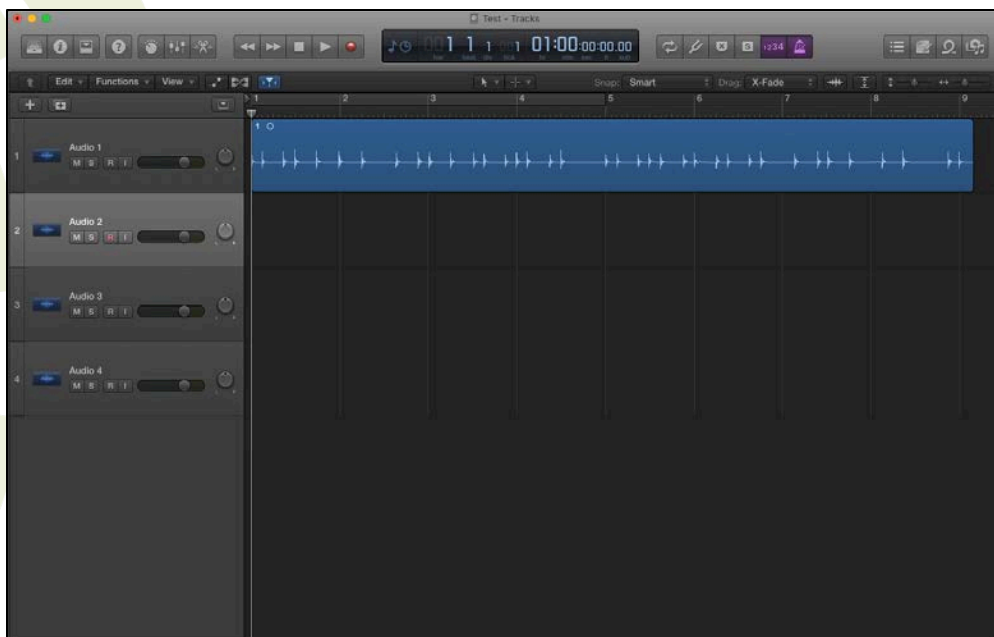


*Figure 5:* A syncopated eight-bar phrase from Reed's book.

Notice that I have loaded three additional audio tracks into this DAW project. Now that the eight bar take has been recorded, these additional tracks will be used to create a round. This initial audio region can be pasted into the second track. Once it is pasted, slide the audio region so that it begins on the second beat of the first bar. It should look something like figure 6:
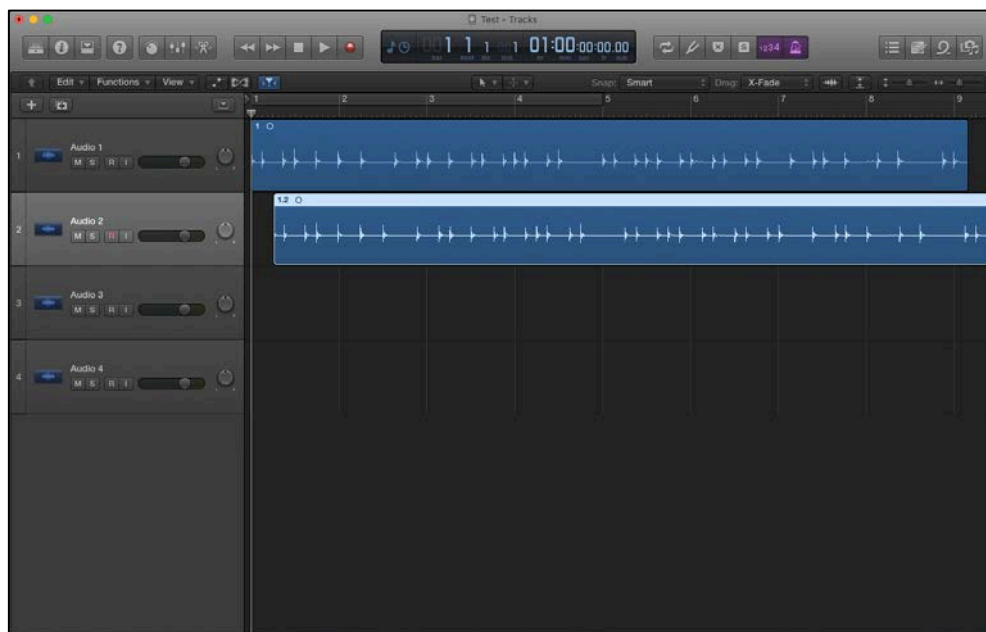
*Figure 6:* A one-beat round created by overlapping the same recorded audio region.

Playback of this newly formed "duet" will expose even the slightest of beat placement inconsistencies. In a perfect world, we would see and hear a perfect displacement of eighth-notes and silence, but that is easier said than done. For an added step, you can paste the same audio region two more times and space them out at various beats. For example, here is a four layer version spaced out at the downbeats:
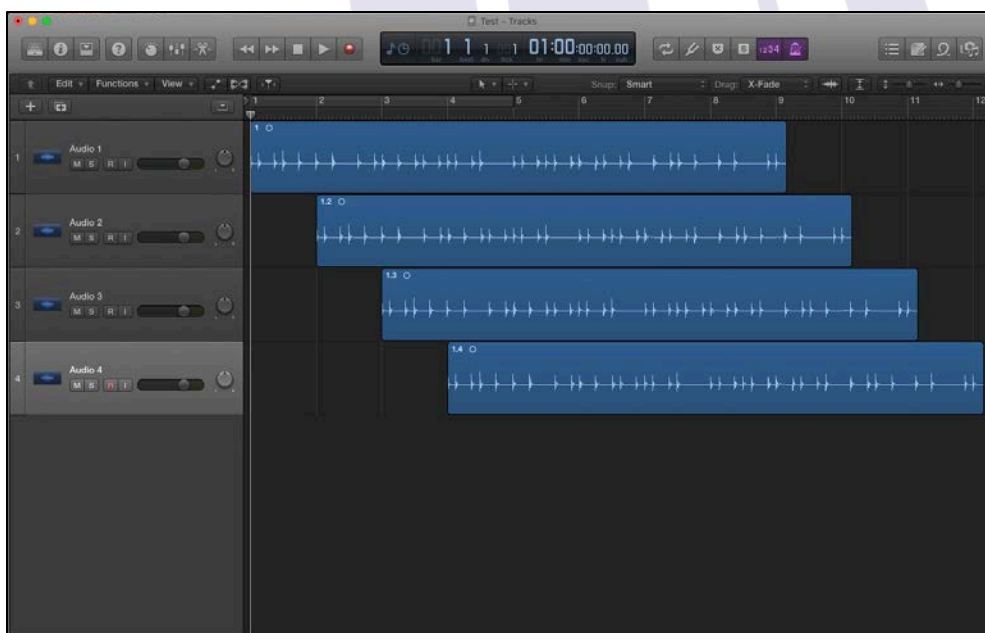


*Figure 7:* A four-layer round built off a single eighth-note syncopation recording.

In addition to experimenting with counterpoint or rounds from a single rhythm-based recording, you can also try looping techniques and overdubbing additional live recordings creating duets with yourself.  The possibilities are endless.  New methods will only reveal more data that can better help a performer hone in on specific skillsets necessary to be comfortable on stage as a soloist or with other musicians.

## Conclusion

There are additional exercises that I use to work on fundamentals, but these are two that will help percussionists begin to heighten their awareness for this type of analysis and optimization.  The ability to see and hear tendencies in real time and to make the proper adjustment is an invaluable way to understand how our mental awareness works while on stage in front of an audience.  It also helps us to better appreciate the fine technical details and skills that are required to develop a mature musician into a great performer.

I would encourage you to explore using technology for analytical data to help improve specific components of your own playing that need attention.  Use the exercises and books presented here, or simply make up your own exercises.  This is the best way to learn about tendencies, good or bad, and how to make the proper adjustment. •

**Thad Anderson** (b. 1980) is an Assistant Professor of Music at the University of Central Florida where he coordinates the percussion studies program and teaches courses in music composition and technology. Joining the faculty in 2009, Anderson also presides over the Collide Contemporary Music Series and Festival. Anderson is a versatile performer and pedagogue with focused interests that span contemporary music, historic American percussion ensemble repertoire, composition, design, electro-acoustic music, conducting, and technology.

Additionally, Dr. Anderson is highly active in the Percussive Arts Society community where he is a past President of the Florida chapter and a member of the Music Technology Committee. Dr. Anderson completed his undergraduate work in Music Education at the University of Central Florida and received his Masters of Music and Doctorate of Music Arts in Percussion Performance from the University of Texas at Austin.

Thad Anderson plays Yamaha percussion instruments, Vic Firth sticks and mallets, Zildjian cymbals, and Remo drumheads.