

### **A 3-Dimensional Geography of the Double Bass**

#### **Mapping and Convention as Interface in Instrumental Performance**

The double bass presents a vast physical plane to navigate in performance. With a large playing surface lacking visual or tactile demarcation (a fingerboard without keys or frets, and few discernable landmarks) even basic musical functions rely heavily upon a precise, comprehensive internal map.

This “map” – a position chart that structures the blank space of the fingerboard into pitch patterns in the mind’s eye – is the primary interface between player and instrument. The conceptualized map as interface is then gradually translated into kinesthetic, spatial knowledge (“muscle memory”) expressed through fingering methods in the left hand, and developed with deliberate practice and repetition. The interface thus becomes embodied – a practical, internal map of a conceptual, external space.

In the last century, progressing bass technique has required this interface to evolve, creating many varied (and sometimes competing) methodologies of fingerboard mapping and internalization, and delineating different technical “schools” of bass playing. Modernizing musical languages and pedagogical practices continue to expand and synthesize the available mappings. From the widely used orchestral foundations of Franz Simandl’s *New Method for String Bass* (1881) and François Rabbath’s streamlined and soloistic method of fingerboard organization in *Nouvelle Technique de la Contrebasse* (1977) to the mappings demonstrated in video format on Mark Dresser’s “Guts” (2010) or David Allen Moore’s “Fractal Fingering” (2019) the modern bassist is fortunate to inherit a rich, diverse, multi-generational interface.

Most of these available mappings are still overwhelmingly designed for the standard linear musical functions of the bass within a jazz or western classical context, in which it must provide fundamental support within an ensemble, playing one note at a time. For this reason, only one pitch layer is thoroughly and repeatedly mapped – that of the fully-stopped fundamental note – and the mapping need only be represented in two dimensions. However, a two-dimensional interface is unable to account for the full, multidimensional nature of the instrument’s pitch content.

## **Polyphonic Potential of the Double Bass**

In reality, multiple concurrent pitch layers inhabit the entire geographic territory of the double bass. An accessible lattice-work of natural harmonics (higher notes resulting from the vibration of the string in fractions) is overlaid on every position. Each pitch node contains both a fully-stopped pitch and a natural harmonic. Hundreds of dyads can be achieved across strings within the same left-hand position, with sounding intervals as wide as 3 octaves and a fifth, or as close as a half-step.

This incredible intervallic variety across a vast fundamental frequency range (approximately 41 Hz – 784 Hz) means that bass harmonics are more than an added color or cadenza showpiece – they are a whole other plane of accessible pitch material overlaid on familiar territory, and can be used simultaneously with more traditional modes of playing to form an augmented, multi-layered approach to the instrument for the composer, explorer, and improviser. In combination with its penchant for resonance, the bass thus transforms from a linear supporting instrument into a solo voice capable of complex harmonic and polyphonic musical expression.

These multidimensional, organ-like capabilities of the instrument require a multidimensional interface that has not yet been developed and circulated. Systems of natural harmonics on the bass have been extensively studied and documented using staff notation, but are only loosely or linearly documented in chart form, and are primarily studied in isolation from traditional charting systems of fully-stopped notes.

### **A Personalized Interface in Three Dimensions**

I consider the bass the pipe organ of the string family. My work seeks to experiment with and understand the instrument's extremely resonant, polyphonic, soloistic qualities via improvisation, composition and performance. I consider a spatialized geographical mapping to be the most direct tool to organize these vital layers of information, facilitating study, composition, and fluent improvisational use.

At the outset of my artistic research, I envision creating a three-dimensional mapping of the fingerboard across all four strings, thoroughly depicting two concurrent levels of pitch systems and the many angles of relationship between them. The research, construction and documentation of this three-dimensional "interface" will comprise the initial stage of my artistic research project at NTNU, and be ready for partial presentation and performance at the time of the ICLI 2020 conference in Trondheim. The foreseeable steps in this interface construction process are outlined in the section "Developing an Interface for Polyphonic Creative Practice".

However, within my creative practice there is yet another layer of pitch material. Due to their similarity in range and timbre, I also use my singing voice to augment the existing pitch system of natural harmonics. Therefore, three layers of pitch material are

interacting rather than two, and one of these layers is corporeal and extremely personal, with no visual plane to chart or reference as on the double bass.

This is why I consider the development of this instrumental chart or interface as “personalized” – because, although it can be useful and re-orienting for bassists worldwide, its development will be guided and tempered by the personal musical expression I hope to uncover with it, reliant upon the third layer that is my own voice. In this way, perhaps my voice can be perceived as another interface, which directs the development of the main interface in question.

### **Developing an Interface for Polyphonic Creative Practice**

Though I already use fragments of this envisioned three-dimensional system in my current creative practice, I have not yet developed a thorough mental model of it. Unlocking my instrument’s polyphonic potential lies in developing and understanding the relationships between its harmonic layers. Therefore, the first research question undertaken at NTNU will be as follows: How may I explore, study, organize, notate and thoroughly map the harmonic systems of the bass so as to develop a more comprehensive, polyphonic use of its multiple pitch layers, and their intervallic relationships?

I will first create a 3-dimensional visual model or diagram of the concurrent layers of pitch material available in any given position, including fundamental and natural harmonic. This will be my basic, personalized interface. Similar to how a fashion designer works with dress forms, or a cartographer studies and represents changes in elevation, this model will give me new perspectives on how these different layers work together and relate to each other in a conceptualized 3 dimensional space, and objectively reveal new pitch patterns and combinations.

I will then investigate all physically possible combinations available to the left hand between these two layers, and document them using traditional notation, organized according to *both* playing position and sounding interval. Harmonics are commonly notated in a form of tablature that communicates only playing location, and is not clearly linked to an appendix or reference document that provides sounding pitch. I want to also catalogue and communicate the sounding pitches of each dyad, so that it is useful to composers who do not play bass, or as a personal aid when searching for new compositional perspectives on my instrument without it immediately in-hand.

In assembling this model, my approach should develop an understanding and practical application of the harmonic systems so comprehensive that their pitch content is easily trackable across different tunings of the instrument. Also, in preparation for the development of successful notation, amplification and recording techniques for this multidimensional approach to the bass, my research should be able to systematically

reveal and organize comprehensive information about frequency content (Hz), pitch class (note name) octave position (A3, for example) and partial number (which division of the string is being activated) of each harmonic or fully-stopped node.

At this time, information about the required bow speed, placement and pressure for each combination – in other words, the right conditions to successfully sound these dyads – will remain within my intuitive practice. Myself or other bassists may choose to thoroughly map this information in the future. Similarly, geographical mappings of other classifiable pitch layers, such as false harmonics and multiphonics, may be added to this model in the future.

Within my creative practice, I expect the process of researching, constructing, and embodying this personalized interface to be a catalyst for new and more polyphonic solo compositions. I will perform one of these short new compositions, for voice and multilayered double bass, at the ICLI 2020 conference in Trondheim.

Eventually, I may also seek to circulate this new interface together with a short set of concert etudes for publication, in the spirit of Stefano Scodanibbio's *Sei Studi* or the various musical pieces of François Rabbath. For this format, I imagine composing 5-8 brief movements, alternating between bass alone and bass and wordless voice.

#### **ABSTRACT:**

The double bass presents a vast physical plane to navigate in performance, composition, and improvisation. The player must rely heavily on a comprehensive internal map of the fingerboard – a geographical interface, first conceptualized in the mind's eye with position charts, and then embodied through practiced choreographies of the left hand. In the existing canon of instrumental technique, most spatial mappings available for study and use are represented in two dimensions, due to the overwhelmingly linear function expected of the double bass in ensemble playing. These mappings do not account for the multiple pitch layers that coexist within every square inch of the fingerboard. A new, three-dimensional interface must be developed in order for the player to conceptualize and navigate these layers together, rather than in isolation, and give voice to the polyphonic, organ-like qualities of the double bass as a solo instrument.

#### **Media Links:**

<https://soundcloud.com/jordansand/sets/presentation/s-jsIfU>

<https://www.youtube.com/watch?v=vqkJQux0LTo>

*Extra note:* The mapping of the playing surface of the bass and the movement of the left hand has been compared to rock climbing – the careful coordination of anchored movements on a sloped vertical surface, according to visualized patterns and routes.