Integrating Live Computer Tools into the Creation, Adaptation, and Performance of Japanese Noh Theatre

Austin Oting Har

University of the Virgin Islands, St. Thomas, VI, USA 00802-6004
Correspondence should be addressed to Author (austin.har@uvi.edu)

ABSTRACT

This paper introduces the technical and aesthetic issues of integrating live computer tools into the creation, adaptation, and performance of Noh. My method is based on a thematic analysis of the audio processing utilized by Joji Yuasa in his 1961 musique concrète adaptation of *Aoi no Ue*, the classic Noh. Yuasa's adaptation is used as a template for developing real-time audio processing tools for performances of Noh. Through Yuasa's formal training in Noh and closeness to its traditions in his selection and application of audio processing techniques, I am expanding his vision from the studio to the stage in collaboration with certified Noh instructor-performers from *Theatre Nohgaku*, the Noh ensemble led by Richard Emmert. Sound reinforcement, wireless audio, wearable technology, gestural controls, third-wave human-computer interaction, and the differences between authentic Noh, Noh-expansion, and Noh-inspired works are discussed to foster interdisciplinary, practice-based collaboration with Noh ensembles. Initial findings from the thematic analysis are then presented alongside designs and recommendations for Max/MSP packages for the five categories of Noh. As a 650-year-old UNESCO-protected traditional art that is experiencing youth disengagement, the goal is to ignite interest in Noh amongst digital natives by integrating live computer tools into its traditional practices with a high degree of authenticity.

1 Introduction

Noh (Nō, 能) is a traditional performing art from late 14th century Japan that combines music, chant, dance, mask, costume, poetry, and drama with intense concentration and physical discipline. Performers are trained by masters through stages from childhood into adulthood. Presented by five official schools and rooted in Shintoism and Buddhism, Zen in particular, within the world of Noh aesthetic and spiritual experience are of the same kind [1].

Today, Noh is a UNESCO designated "Masterpiece of the Oral and Intangible Heritage of Humanity" and at a crossroads between the traditional and the current. In 2013, the Permanent Delegation of Japan to UNESCO warned of the "marked decline" of youth interested in Noh [2]. Some veterans and scholars call for new methods and attractions to engage digital natives [3] [4] [5], with some identifying the "low [vocal] tones" and medieval dialect as being "difficult for modern audiences". Indeed, during my first experience of Noh in Tokyo and Kyoto, a Japanese writer friend likened their relationship with Noh to Westerners having to read Shakespeare at school. But while Shakespeare and Zeami may be comparable in terms of literary genius, and Noh can be enjoyed for its literature alone, its music and dance are more central to the lived experience of a performance.

At the start of each National Noh Theatre performance guide written by Richard Emmert, a Professor Emeritus of Japanese Performing Arts and certified Kita school Noh instructor based in Tokyo whom has taught me since 2021, it states: "at the theatre, seeing, hearing and feeling should take precedence over reading" [6]. Noh's music and dance

- the seen and heard aspects of a performance - should be of interest to third-wave human-computer interaction (HCI) research in dance and technology, but have yet been explored. The interweaving of digital technology into the fabric of daily life presents both challenges and opportunities in attracting digitally-native generations to Noh, and recent recommendations from third-wave HCI research to explore the role of improvisation and the cultural dimension of performers' interactive relationship with technology align with my particular method of integrating live computer tools into Noh [7].

I begin by contrasting the views held in Japan towards integrating technology into Noh. The Japanese who studied or worked in the West are referred to given name first then family name; otherwise the traditional Japanese order is used (surname first). I then survey the characteristics of Noh and traditional Japanese music, then the practical and aesthetic principles of Noh performance practice and other Zen arts. Noh's traditions provide the criteria by which degrees of authenticity are measured between "Authentic Noh", "Noh-expansion", and "Noh-inspired" works. These terms and distinctions are used by Noh ensembles today [8] [9] and are crucial because of the growth of "Noh-inspired" works in recent years that bring elements of Noh into a Western music framework instead of the other way around, as is the case of "Noh-expansion" where Noh is the foundation and a foreign element is brought in. I discuss these distinctions with respect to three electroacoustic adaptations of *Aoi no Ue*, the classic madwoman-subcategory Noh based on the classic novel *The Tale of Genji*, which were created between 1960-1961 by three important 20th century Japanese composers: Jōji Yuasa, Toshiro Mayuzumi, and Michiko Toyama [10] [11] [12]. I argue that Yuasa offers the best template for adapting Noh with live computer tools in a way that is faithful to Noh's traditions. While working within Noh's traditions, Yuasa also shows his closeness to the characters and drama of this particular play in his use of audio processing.

I then elucidate my approach to expanding Yuasa's vision from the studio into both traditional and non-traditional Noh stages. I give recommendations for live sound reinforcement, wireless audio, wearable technology, live set-up, and for the electronic musician being a trained instrumentalist within the Noh ensemble instead of an audio engineer. I discuss my recommendations in relation to third-wave HCI research in Western opera and technical and aesthetic considerations for spatial audio processing in Noh

performances via channel-based, object-based, and scene-based diffusion. Yuasa's *Icon* (1967), which employs channel-based diffusion in alignment with traditional Japanese aesthetics, offers a blueprint for spatial audio processing in performances of Noh [13].

I then present my initial findings from the thematic analysis of Yuasa's *Aoi no Ue* and my initial designs and recommendations for the Max/MSP packages which are to a large extent based on these findings. This analysis is being done with Emmert and is beyond the introductory scope of this paper; its full form will be published separately as will the Max/MSP patches, both supported by my forthcoming residency at UC Berkeley's CNMAT (Center for New Music and Audio Technologies). Initial findings include Yuasa applying the most transformative processing (e.g. looping) on specific words and phrases at highly poetic moments of the text. I conclude by outlining the shorter-term aim of finishing the Max/MSP packages for the five categories of Noh, and the long-term aim to ignite youth interest by performing both new and classic Noh with Noh ensembles that utilize these live tools to the highest possible degree of authenticity - to expand Yuasa's legacy in preserving Noh's traditions in societies shaped by new technologies.

2 Aesthetic & Technical Considerations

Noh, like other Zen-influenced Japanese arts such as poetry, calligraphy, painting, flower arrangement, ceramics, and tea ceremony, is a Way (*dō*) art where training is an "ascetic discipline", like *zazen* and wearing the precepts, that leads "by stages toward spiritual enlightenment" [1]. By combining together its own music, dance, masks, costumes, literature, and drama - each highly refined - into a cohesive whole with a spiritual foundation, Noh is a mature expression of this union and one of the most sophisticated theatre arts in the world [14].

In the 20th century, technological advancements changed societies and in Japan the tensions between the traditional and the modern became a recurring theme in the works of her leading artists including the film director Ozu Yasujirō and the Nobel Prize-winning author Kawabata Yasunari. In the world of Noh, caution was expressed by Tanizaki Jun'ichirō in his influential essay on traditional Japanese aesthetics, *In Praise of Shadows*:

> Japanese music is above all a music of reticence, of atmosphere. When recorded, or amplified by a loudspeaker, the greater part

of its charm is lost… we prefer the soft voice, the understatement. Most important of all are the pauses. Yet the phonograph and radio render these moments of silence utterly lifeless [15].

Were the Noh to be lit by modern floodlamps, like the Kabuki, this sense of beauty would vanish… the older the structure the better… it is an essential condition of the Noh that the stage be left in the darkness in which it has stood since antiquity… huge auditoriums may have something to recommend them, but in such a setting the true beauty of the Noh is all but lost [16].

But Tanizaki was not totally against integrating technology:

… had we invented the phonograph and the radio, how much more faithfully they would reproduce the special character of our voices and our music…. These machines are the inventions of Westerners, and are, as we might expect, well suited to the Western arts. But precisely on this account they put our own arts at a great disadvantage [15].

Here, Tanizaki illuminates the way that technology can, to a traditionalist, engage faithfully with Noh's traditional aesthetics and performance practice. By collaborating with certified Noh instructors and performers from an official school, live computer tools that suit "the special character of [Japanese] voices and music" can be designed. While the goal is to interest youth, both Japanese and non-Japanese, we must first listen to its traditions. Yuasa, as I will show, being both formally trained at an official Noh school during formative years, and a composer, is likely the closest model we will have for "faithfully" processing Noh's traditional vocals and music with live computer tools. The enduring foundation of Japanese culture on Yuasa, despite having worked abroad in his adulthood including as a professor at UCSD, is seen in his sentiment that "Japan… adheres to tradition as a structure that frames thought" [17].

We must also consider the views of current Noh performers, instructors, and scholars. Nakamori Kanta, a Noh veteran teaching his son, observes that "[Noh's] low, extended [vocal] tones can be difficult for modern audiences… we need to create new attractions… to attract new fans" [3]; Kodama

Ryūichi, a professor at Waseda University, says "attracting a new audience of young people is one of the common challenges facing all of Japan's traditional performing arts -- kabuki, Noh, and bunraku" [4]; and Miyake Akiko, a professor at Yokohama National University, argues that "Noh theatre has to adapt to the needs of modern society in order to raise the interest of young people… new digital technologies might be a contemporary solution" [5]. Miyake advocates for the creation of digital libraries with audio-visual recordings of Noh performances. Likewise, in the wake of Covid-19, UNESCO highlighted the "socially-beneficial applications of digital technology" [18]. In line with all of these views and Tanizaki's, and in collaboration with Emmert, I am integrating live computer tools into Noh in such a way that faithfully preserves its traditional aesthetics and performance practice.

Traditional Noh and Japanese music
Sung, chanted, and spoken passages from the soloists (e.g. *shite* and *waki*) and the Chorus, and non-verbal cries from the drummers comprise Noh's unique vocal music. Instruments consist of three drums (*ōtsuzumi*, *kotsuzumi,* and *taiko*, the latter used only in some plays) and one flute (*nohkan*). Rhythmic and timbral manipulation are key. Noh's rhythms are a complex weaving in, weaving out, and overlapping of matched and un-matched patterns: "unlike Western music which always keep a tight vertical correspondence between two lines… two different temporal natures interpenetrate one another" [19]. Pitch is mostly relative to a singer's natural range where prosodic qualities like stresses and flourishes are emphasized. Together with the soloists, the drummers who cry out shape the distinctly Japanese experience of space (*ma*), the "pause" Tanizaki noted. Decades of training to master the complex techniques of a specific vocal or instrumental role, and the idiosyncrasies of each play, is required.

In addition to these Noh-specific traits, Yuasa states that traditional Japanese music is highly sensitive to "three gestural aspects of sound" [20]: *i) shifting pitches ii) shifting tempi iii) significance of small notes*. I will discuss these three gestural aspects in relation to gestural controls and wearable technology on pages 9-10. These three aspects align with three audio processing techniques: pitch shifting, acceleration/deceleration of time-based audio processing (e.g. delay), and granular synthesis. Pitch shifting within the context of audio processing shares the same meaning as the Japanese usage, but the latter two pairs are only indirectly correlated. What Yuasa

means by "small notes" is that they are not used just ornamentally, as may be the case in much of Western music. To take Yuasa's consideration to the case of granular synthesis, for example, means processing grains purposefully, not arbitrarily.

Jo-Ha-Kyū
The order of Noh plays in a day-long program, the structure of a play, the pacing of bodily gestures, and every musical progression in Noh is often described as following the *jo-ha-kyū* tripartite structure: "things begin slowly, then they speed up. Then they end rapidly" [21]. This is often very subtle. *Jo-ha-kyū* is found across many Japanese arts but is most vital in Noh and Gagaku. In Gagaku, there is a clearer separation between these three in terms of speed; Noh's use of the term is much broader.

Crucially, for Noh performers, *jo-ha-kyū* is practical. They practice with *jo-ha-kyū* at the forefront of their minds. *Jo-ha-kyū* is what gives intensity and intention to each of their movements and every aspect of their performance. As a certified Kita school instructor, Emmert has rarely heard his Noh teachers refer to aesthetic principles like *yūgen* and *hana* while he is being taught, but *jo-ha-kyū* is. *Yūgen* and *hana* appear and are sometimes experienced by audience members; they are terms that critics and laymen talk about while Noh performers vary widely in their willingness to discuss them. Moreover, *yūgen* is most talked about in plays with the most poetry - 2nd and 3rd category (warrior and woman) and some 4th category (miscellaneous) - but not in dramatic plays like the 5th category (demon). *Jo-ha-kyū* concerns every category, every micro and every macro aspect of Noh. When integrating live computer tools into Noh, all audio processing must likewise adopt *jo-ha-kyū* - and not in the way of Gagaku, but in the way of Noh. On pages 12-13, in my initial designs and recommendations for the Max/MSP packages, I highlight the need for *jo-ha-kyū* in live pitch shifting and delay, for example. This also links to two of the key gestural aspects of Japanese music that Yuasa identified: shifting pitches and shifting tempi.

Traditional Aesthetics of Noh
Noh shares traditional aesthetic qualities with other Zen arts such as: ceramics, poetry, calligraphy, tea ceremony, and painting. According to Hisamatsu Shin'ichi, the eminent Zen scholar, there are seven "interrelated characteristics": *Asymmetry, Simplicity, Sublime Austerity, Naturalness, Profound Subtlety, Freedom from Attachment, and Tranquility* [22]. Each one is equally important; together, they form a

perfect whole. Terms known to foreigners including *wabi* (simple, austere beauty), *sabi* (rustic patina), and *ma* (space, emptiness) are contained within these seven. Their common source is the self-expressing, "prior to form" Zen Activity that is not just artistic but also beyond art, "something toward which art should aim". To a Noh instructor like Emmert, getting rid of the extraneous and thus getting to the essence are stressed. The aesthetic qualities of *simplicity* and *sublime austerity* are therefore, perhaps, most consciously engaged with during actual training and performance in Noh.

Figure 1. The Stone Garden of *Ryōan-ji* Zen temple in Kyoto, photograph by Austin Oting Har

Two points must be made. First, Noh not only arose alongside the growth of Zen in the late 14th century, Zeami, the genius behind Noh, was a lay monk at a Zen temple [23]. That this happened while he was taking over his father's theatre troupe and developing Noh means that any adaptation with live computer tools must pay attention to these seven characteristics. Second, foreign usage of these terms differs from their original meaning. Each one contains all: Asymmetry is not just asymmetry, but an Asymmetry that contains Simplicity, Sublime Austerity, Naturalness, Profound Subtlety, Freedom from Attachment, and Tranquility [22]. For example: "*wabi* reaches its peak of austerity in emptiness… a central and pervasive idea in Buddhism" [24]. Emptiness carries a negative connotation in Western minds; to Buddhists, the term has various meanings across ontology, phenomenology and meditation. In musical aesthetics, Yuasa says, "space is not a vacantness, but a substance containing emptiness" [25]. It is the sensation of being in a rhythmic limbo during "the pause", a living pause, that Tanizaki identifies as "most important" in Japanese music. Yuasa expresses this in Noh's practice as such: "the *hayashikata* [an instrumentalist in Nō] nails each beat to an endless cosmic expanse" [26]. To an architect, emptiness is purposefully using space to enjoy the dance of light and shadow on a wall. The seven

interrelated characteristics of Zen art must be understood within its cultural context.

To elucidate the nuances of each characteristic is beyond the introductory scope of this paper. To give but one example, when engaging with *simplicity* and *sublime austerity*, which are of the most practical concern to Noh performers, the latter of which is linked to *sabi*, the beauty of rustic patina or of being seasoned and aged like an old pine, as a general principle I am designing live audio processing tools that are not too clean, to be employed in a minimal manner, directly, simply, and with vintage models (e.g. early 1960s spring reverbs) as a model.

Yūgen
Within the world of Noh, *yūgen* (profound subtlety) is the "highest principle" [24]. There is much written about *yūgen* within the context of classical Japanese poetry and some of that is relevant here because the Noh play is a combination of prose and poetry. Zeami and Yuasa's definitions of *yūgen* in Noh, and an important definition of *yūgen* in poetry, are discussed here. But, to reiterate, *yūgen* is a quality that appears and applies to plays with the most poetry. You do not tell a Noh performer to add more *yūgen* to their performance. *Jo-ha-kyū*, on the other hand, is practical and spoken of during training.

According to Andrew T. Tsubaki, a decorated Noh scholar, Zeami advanced *yūgen* beyond the "beauty of gentle gracefulness", from a "realm" to a "world", where it became identified with other terms, especially *sabi*: "the serene simplicity of the aged or the feeling of tranquil loneliness" [27]. He explains:

> Today the concept of *sabi* is jealously guarded and respectfully practiced in the world of the Nō theatre… Zeami's concept of *yūgen* was the basis for developing the beauty of *sabi*… [28].

Zen's influence on Zeami's *yūgen*, again, cannot be overstated. From Zen came Zeami's and thus Noh's preoccupation with the opposites of "abundance" (*yū*) and "nothingness" (*mu*) [28]. Within the historical and cultural context of Noh in the Muromachi period, "abundance" refers to "[the] elegance and magnificence of the artistocrats" and nothingness points to the "directness and frugality" of the samurai warrior. In terms of movement, Hisamatsu describes this fusion as follows: "Nō may be regarded as the bodily expression of Zen… gestures are full of meaning and life, and are of an extremely vivid and

basic nature" [29]. The abundance of Noh requires nothingness as a negative factor that actively denies it from which the audience's experience of *yūgen* arises. These opposites are in a dynamic relationship; "the feeling of mutability" is attributed to Zeami's *yūgen* alongside the qualities of elegance, calm, and profundity [30] [31] [32]. Yuasa similarly defines *yūgen* as "profound and quiet elegance… a quality of Nō… comprehended within a religious world that totally transcends human individuality" [26]. On pages 11-12, I show how Yuasa engages with *yūgen* in this way in his adaptation of Zeami's *Aoi no Ue*.

Hana
Hana translates to "flower" in English, and Zeami uses this term metaphorically throughout his treatises. Like *yūgen*, you do not ask a Noh performer to add more *hana* to their performance; to Noh performers, again, it is not nearly as practical as *jo-ha-kyū*. *Hana*, rather, is a special inner quality of a performer that allows them to captivate an audience through their unique beauty and presence.

Hana can be found in a very young actor, one with an appeal beyond technique. Amongst Zeami's 20+ essays on Noh, his *Fūshikaden*, "The Tradition of the Flowering of Expression and Form", *Kakyō* "The Mirror of the Flower", and *Kyūi* "The Nine Levels" describe different types of *hana* that manifest at different stages of training. Central to these is his idea that "full flowering (*hana*)" can only be achieved through "extended training and technical mastery" [33]. In *Kakyō*, Zeami further differentiates between three types of Noh performance: i) *seeing*: appealing to the physical aspects of a performance such as singing, dancing and costumes ii) *hearing*: appealing to the relationship between rhythm and emotion in singing and dance as achieved by performers' energy iii) *Mind*: not in an intellectual sense, but as a pre-lingual, unmediated experience of enrapture with a performer whose "inner dynamism and concentration… does not rely on a spectacular effect or on emotional stimulation to hold his audience" [33]. This last type involves performers with a full flowering *hana*. From a practical standpoint, these may be understood as three types of experiences of Noh that audience members may have.

When designing live computer tools for Noh, to engage practically with *hana* means to adopt a *person-specific approach*. Audio effects parameters should be tailored to each ensemble and each soloist's aura and individuality. This approach is found in contemporary composers such as Ken Ueno [34].

This entails what I call a *custom job approach* to adapting each unique Noh play with live computer tools. I will elucidate this on page 13.

Authentic Noh, Noh-expansion, and Noh-inspired
These terms and their distinctions are not mine; Emmert raised them early during my studies with him in 2021. Noh ensembles comprised of non-Japanese with training in Noh and Noh professionals in Japan are typically involved in performances of classic Noh as well as contemporary works that include foreign elements. Emmert's ensemble, *Theatre Nohgaku*, based in Japan and the US, has since 2000 created and performed both authentic Noh and "Noh-expansions" [8] - the latter a more recent term that Emmert shared with me. *Mu:Arts*, based in the UK, has presented "Noh Reimagined" since 2016, a series of festivals including performances of classic Noh alongside "premieres of ambitious commissioned, works, inspired by Noh" [9]. While Emmert is a certified Noh instructor, the founder of *Mu:Arts*, Akiko Yanagisawa, is not.

A problem arises when people say that something is Noh when it is not. These distinctions are necessary out of respect for Noh's traditions. The few qualified to make distinctions are those who are certified Noh instructors and/or professional performers. The most authentic Noh is, of course, Noh performed without live computer tools by one of the five official schools: *Kanze, Hōsho, Konparu, Kongō,* and *Kita*. Emmert informed me that it is not absolutely necessary for authentic Noh to be performed on a traditional Noh stage in Japan; performances are sometimes held outdoors or in venues where slight adjustments are needed to the stage. Beyond these necessary conditions for authentic Noh as they were and are performed, the definition might also include newer Noh that are not written in medieval Japanese. Classical Japanese language Noh is no doubt considered the most authentic, but there are cases of contemporary Japanese language Noh, also English Noh, French Noh, and Spanish Noh. Despite being of a different language, these all utilize Noh's traditional literary forms, music, chant, dance, instruments, costumes, aesthetics, and performance practice. These include the English-language Noh "Eliza" (1985) and "Oppenheimer" (2015) by Allan Marrett, a Professor Emeritus of Musicology at the University of Sydney [35] [36].

Following this logic, if a work be it an adaptation or a new work adopts Noh's traditions except for one element (i.e. the language, but the way that the language and vocalization style used must still both follow Noh's traditions), then this is sufficient grounds to claim authenticity. The distinction between an "Authentic Noh" of this kind with a "Noh-expansion" is that the latter brings foreign elements like a violin or other Western instrument into Noh's traditional forms, and in a transformative way. The distinction between a "Noh-expansion" and "Noh-inspired" work is that the latter rather brings some elements of Noh into a foreign tradition, like Western opera or art music.

Anyone can wear a Noh mask, but that does not make it a Noh. Anyone can wear a Noh costume; that does not make it a Noh. What makes it Noh is that the people performing have a training of their voice and of their movement. Emmert distinguished this to me between: i) *internal elements* (how they hold their body and use their voice, including instrumentalists) ii) *external elements* (Noh stage, masks, costumes, and story structure). The internal elements are more fundamental, and what makes it Noh proper.

Articulating these differences is important because there is a growing number of "Noh-inspired" works: from Karlheinz Stockhausen's *Telemusik* (1966) [37] to works by Iannis Xenakis [38] to Benjamin Britten's *Curlew River* (1964) [39] to Kaija Saariaho's *Only the Sound Remains* (2016) [40] to Andrew Thomas's *Ever Deeper Flood* (2016) as part of *Mu:Arts'* "Noh Reimagined" [41] [42], to already announced premieres in *Mu:Arts'* 2024 'Noh Reimagined" by Hollie Harding and Ben Nobuto [43]. In playwriting, there are Noh-inspired works including Mishima Yukio's *Five Modern Noh Plays* (1955), and in musical theatre, *Sunwatcher* (2023) by Tidtaya Sinutoke and Isabella Dawis [44]. "Noh-expansions", on the other hand, include several produced by *Theatre Nohgaku* such as *Blue Moon Over Memphis* (2015) and *Gettysburg* (2018), the latter of which brings violin and harmonica into the Noh ensemble and into most of Noh's traditions [45].

Using live computer tools in "Noh-inspired" works is not new - but bringing them into "Noh-expansions" or "Authentic Noh" is new. Prior examples were all "Noh-inspired" works that bring in elements of Noh into a foreign framework (e.g. Western art music) instead of the other way around, as is required of "Noh-expansions". In addition to Saariaho's *Only the Sound Remains* (2016) and Thomas's *Ever Deeper Flood* (2016), this includes *Matsukaze* (2011) by Toshio Hosokawa, a leading contemporary Japanese composer, which adapts the classic Noh play by

Kan'ami and Zeami into a Western opera [46]. Another example of an adaptation of classic Noh, and one that features live electronics more prominently, is the *Mu:Arts* "Noh Remixed" work *OM* (2016) by Mariam Rezaei. Rezaei remixes a Noh performance with DJing techniques [47]; her delay effects on the drums from 13:00 resemble those used by Toshiro Mayuzumi in his adaptation of *Aoi no Ue*, which I will discuss in the next section.

Here, it is appropriate to revisit what Tanizaki wrote about bringing foreign Western technology into Noh. To integrate live computer tools that "faithfully" process traditional Japanese voices and music [15], each step, including the designing of the live audio tools, must be done in collaboration with a certified instructor of traditional Japanese vocal and/or instrumental music, and certified in Noh specifically in this case. By working with Emmert and using Yuasa's work as a template, with Yuasa also being a composer who was trained in Noh, my method offers a higher degree of authenticity: to *integrate* live computer tools into Noh, instead of incorporating them into a "Noh-inspired" work. Whether this method produces "Noh-expansions" or "Authentic Noh" will be open to debate.

Three Electronic Adaptations of *Aoi no Ue*
With these distinctions in mind, I turn to three electroacoustic adaptations of *Aoi no Ue* by three Japanese composers - Jōji Yuasa, Toshiro Mayuzumi, and Michiko Toyama - all done between 1960-1961. Mayuzumi graduated in composition at the National University of Fine Arts and Music in Tokyo then studied at the Paris Conservatory. Toyama was a leading female Japanese composer who went to Princeton University and studied with Edgard Varèse. Yuasa, conversely, was a pre-medical student at Keio University who, asides from training in both Noh and Western music as a youth, is a self-taught composer.

There are three reasons why Yuasa's *Aoi no Ue* is the best template for integrating live computer tools into Noh with faithfulness to its traditions:

1. Yuasa is the only one with formal training in Noh music theory and performance practice at an official Noh school (Hōsho). His musical language has its foundations in Noh: "it does not even seem excessive to say that all the issues arising in my musical creation exist in the world of Noh" [48]. Although Mayuzumi studied traditional Japanese music (but not Noh), and not until he was 28 [49], Yuasa was a Hōsho pupil who practiced and performed Noh throughout

childhood to adolescence - crucial years of linguistic and musical development [50]. The discipline also extended to his family; his father also practiced at the Hōsho school, and his cousin Tatsuji, whom Emmert knew well, was a professional Noh flautist.

2. Mayuzumi's adaptation does not employ nearly as much audio signal processing on the vocals as Yuasa does - and vocals are the most important part of Noh music because of the significance of Noh's text. Nakamori, the Noh veteran teaching his son, specifies Noh's vocals as being difficult for modern audiences and new attractions being needed for digital natives [3]; Yuasa, who can relate to Nakamori as a Noh-trained performer, perhaps shared this concern six decades prior as almost all of the audio processing that he employs in his *Aoi no Ue* is on Noh's vocals rather than its instruments [10]. Mayuzumi rather replaced the flute with sine tones, pitch shifted some Noh vocals but left them there (whereas Yuasa actively pitch shifted vocals) and applied delay noticeably on the drums [11]. It is important to note that Yuasa very rarely uses drums at all, and when he does, they are almost never processed with delay; his focus is Noh's chants, songs, and drum calls (the drummers' nonverbal cries and vocalizations). While Mayuzumi's use of delay in this context was perhaps a major technical achievement in 1961, in my view, the way that he uses delay on Noh's drums detracts from the experience of *ma* that is fundamental to Noh rhythm. His delay is too linear, unchanging, and does not engage with the accelerations and decelerations that are characteristic of Noh rhythm and traditional Japanese music.

3. Toyama utilizes spoken English over a tape with Western instruments [12]. She clearly intended her *Aoi no Ue* as a "Noh-inspired" work within the Western art music tradition, as opposed to Yuasa and Mayuzumi's efforts towards authenticity.

Yuasa's Noh training in formative years and subsequent faithfulness to Noh's traditions in his selection and application of audio processing techniques makes his *Aoi no Ue* the best model for integrating live computer tools into performances of Noh where authenticity is important. While Yuasa's adaptation would be classified as a "Noh-expansion", on both technical and aesthetic levels it is more authentic than Mayuzumi's. What Mayuzumi did more authentically than Yuasa is that he does not appear to have recomposed the original text much, whereas Yuasa skipped certain sections whilst adapting the original text chronologically. I will

further discuss this in pages 11-12 with regards to the thematic analysis.

Sound Reinforcement for Noh

Traditional Noh theatres in Japan are purpose-built for performances of Noh. The Noh stage (*butai*) is a flat area about 5.5 metres square joined to a bridgeway (*hashigakari*) from which the performers arrive and leave [51]. Behind the stage is a back area (*atoza*) where instrumentalists (drummers and flautist) perform; the chorus performs in the side area (*jiutaiza*) facing the bridge. These dimensions are more or less the same for Noh theatres in small, large, indoor or outdoor venues (e.g. old shrines).
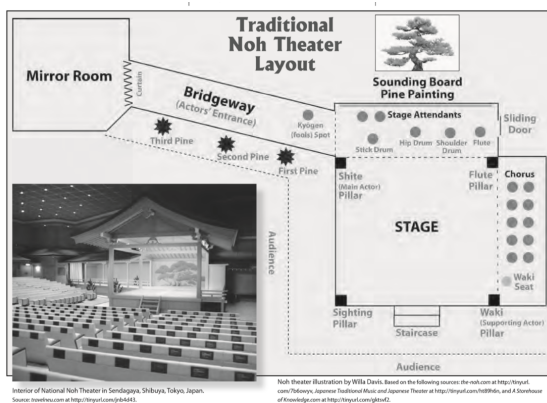

Figure 2. Layout of a traditional Noh stage [50]

Noh performances, traditionally, are unamplified. The natural acoustics of the Noh stage is fundamental to the performance; the wood also enhances the resonance and clarity of voices and instruments. I felt this first-hand, seated close or far from the stage. In my experience, amplification is only used in indoor venues before a performance if the *shite* (main soloist) addresses the audience. Sound reinforcement at official indoor venues today is thus used by official Noh schools only in this capacity. Small venues only have one basic microphone and speaker, whereas big venues like the National Noh theatre in Tokyo, which records videos of the 4-5 performances that they sponsor each month, have a wider selection of equipment - but for recording rather than performance. Performances held outdoors, however, do sometimes use sound amplification.

Outside of Japan where few purpose-built Noh stages exist (essentially there is only one functional Noh stage outside of Japan, in Southern France, which was donated by the Kita school), performances are held in non-traditional venues: concert halls, local theatres, universities, cultural centers, and outdoor areas with a focus on Japanese culture such as the Pagoda in San Francisco's Japantown. Sound reinforcement thus varies widely depending on the venue. This means that a *site-specific performance* is likely when integrating live computer tools into Noh.

Figure 3. The Kyoto Kanze Noh Theatre, photograph by Austin Oting Har

According to Emmert, certain traditional Noh theatres might be open to performers bringing in their own speakers, but they would be very cautious about where to place them, making sure that everything is properly protected. No shoes or socks are permitted when walking and working on stage; a *tabi* (special kind of sock) must be worn if installing speakers on stage and slippers must be worn when off stage. The venue's willingness also depends on the day; they may have a busy schedule or be doing repairs. Nonetheless, speakers may be brought in to a traditional Noh stage provided that these precautions are met. In this event, spatial audio processing, which I will discuss on pages 10-11, may be explored.

Wireless Audio

Emmert informed me that wireless microphones are used in outdoor Noh performances. My approach to integrating live computer tools harmonizes with this. Since Noh soloists perform wearing masks and costumes, small wireless microphones are easily hidden and do not inhibit their performance.

Wireless audio is also recommended because having cables onstage would negatively impact a performance both practically and aesthetically. The *shite* and *waki* soloists dance on the stage, and like the other performers, they enter and leave via the bridgeway. Having cables on the stage could cause an accident or at the very least be on their minds and thus restrict their performance. For the drummers and flautist, a wireless microphone may be placed nearby. For the Chorus, cables may be used because they are seated and the soloists do not perform in the *jiutaiza*.

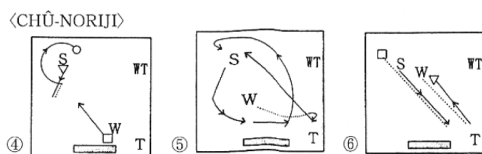Figure 4. Costume and mask worn in *Aoi no Ue* [53]

Figure 5. Soloist's movement on the Noh stage in the *Chū-Noriji* dance toward the end of *Aoi no Ue* [54]

The Electronic Musician: Set-Up and Role
If performing on the Noh stage with the ensemble (*hayashi*), the live electronic musician would sit either in the *atoza* or *jiutaiza*. In either case, a small desk is required for the electronic musician's laptop, wireless audio receiver, and any other live controllers. A power socket thus must be close by. According to Emmert, there is likely a power socket behind the Bridgeway on the wall side, and one behind the *juitaiza*. In modern venues with a sound booth located off stage, the electronic musician could be conceived as a live audio engineer. Power sockets would be available and cables would be easily hidden.

But because live audio signal processing is obviously happening and the audience will be curious about its source, placing the electronic musician in the *atoza* is more appropriate than in the *jiutazia* or off stage in a sound booth. Moreover, they are performing an instrument like the drummers and the flautist. I do not see a strong argument that having their live equipment on stage would visually distract or detract from the performance. Based on my experience working as a live audio engineer, the real-time audio signal processing that live audio engineers handle is primarily volume-based. Positioning the electronic musician off stage thus minimizes their role, the full scope of their real-time instrument-based

contributions to the live performance. Another practical reason for placing the live electronic musician in the *atoza* is so that they can directly interact with the performers they are processing: the soloists, other instrumentalists, and the Chorus. Lastly, in having the electronic musician involved in every step of the process, from studying the text, the dances, and the music unique to each Noh play, it is only appropriate that they should also be treated as such during the performance.

Third-Wave Human-Computer Interaction (HCI)
When integrating live computer tools into Noh today, HCI research over the past two decades must be considered. Within third-wave HCI, designing computational support for dancers is an emerging research area in Western new media arts [55]. Designing live computer tools for Noh's widely ranging dances should also be of interest, and there are two specific recommendations from recent third-wave HCI research on dance and technology that resonate profoundly with Noh performance practice: i) to learn from improvisation ii) to investigate the cultural and sensorial aspects of a dancer's relationship with live computer tools [56].

Noh ensembles undertake minimal and condensed rehearsals before a performance unlike Western opera. Spontaneity and intensity are emphasized; having fewer rehearsals primes Noh's performers to be very aware of what the other performers are doing as they are only formally doing it for the first time. For professionals, a *mōshiawase* (speak through) is undertaken where suggestions such as emphasizing a line or lengthening it slightly are given. The ensemble will skip over the solo *waki* section at the start and the *ai kyogen*, and go straight to the *shite/waki* interaction. It also is not done in full custome, only masks; only in actual performance is full costume worn. If touring, performers retain their "edge" by swapping roles (e.g. having a different head of Chorus). Soloists will often have already played the part; if they have not, they will undertake a significant amount of individual rehearsal of their part, but never during the *mōshiawase* group rehearsal. Spontaneous living responsiveness is likewise cultivated in the instrumentalists in their shaping of *ma*.

Different Noh plays have different dances at different extremes of intensity and emotion. Some are very slow, calm, and subtle like the *jo-no-mai* dance performed by the Zo-onna in *Hagoromo*, while others, like *Aoi no Ue* which has a madwoman wearing the Hannya mask, have the soloist stomping

thunderously about. Some Noh, like *Yamanba*, also involve banging props like a walking stick.

With this context in mind, designing computational support for Noh's different dances should take three things into account: i) the nature of the dance, which is identified by the category of Noh play ii) the audio processing technique(s) and ranges appropriate to that dance iii) the delicate relationship in the meaning-making process between the Noh performer and the technology (i.e. the live audio tool and/or parameter). While in third-wave HCI research this "meaning-making process" is described as being "abstract" [55], it may be less so the case in Noh given the very practical nature of *jo-ha-kyū* as applied to every macro and micro facet of Noh, from a dance to a single hand gesture. Along with the *mōshiawase*, *jo-ha-kyū* is the other cultural aspect unique to Noh that will affect their dancers' lived experiences with technology. The most important cultural aspect in a Noh performance, as discussed on page 4, is practical engagement with the *jo-ha-kyū* tripartite structure - not in the way of Gagaku, but in the way of Noh.

Wearable Technology and Gestural Controls
Utilizing wearable technology in contemporary Western art music has grown over the past decade and received attention in third-wave HCI research. Examples includes microphone headsets connected to Max/MSP and motion sensing video game controllers mounted on a glove worn by opera performers [57]. To extend this kind of research into Noh, into performances where authenticity is key, gestural controls should also be mapped according to the *jo-ha-kyū* tripartite structure: "things begin slowly, then they speed up. Then they end rapidly" [21].

Small motion sensors can be utilized by Noh soloists as gestural controllers that directly affect the live audio processing chain while they are dancing and/or performing other smaller movements. Like the small wireless microphone hidden in their costume, a small motion sensor can be hidden in clothing over their limbs or on a prop. To use the example of stomping in a dance, a stomp of a certain force can be mapped to a specific audio processing tool (e.g. feedback) and to a specific degree that is aligned with *jo-ha-kyū*. Likewise, stomps of lesser force can be mapped on a scale that triggers lesser degrees of the effect. The soloist may also be given the option of stopping the audio processing chain entirely if they are so compelled at a particular moment. In addition to the many types of dances, Noh performers also execute small movements including hand gestures that

symbolize, for example, weeping. These can also be mapped to trigger specific audio changes or effects that interact with their vocal performance.

In addition to *jo-ha-kyū*, the specific audio effects that these gestural controls influence could additionally be linked to the three gestural aspects of traditional Japanese music that Yuasa identified: shifting pitches, shifting tempi, and significant small notes - as well as the audio processing techniques that Yuasa utilized in his *Aoi no Ue*. Of the latter, this could include the soloist altering the rate of a very transformative effect (e.g. looping) on a specific word or phrase while they perform it. This ties into one of the initial findings of my thematic analysis that I will discuss on the following page.

Spatial Audio: Channel-based, Object-based, and Scene-based Diffusion
The audio processing strategies described thus far can be explored on traditional Noh stages in Japan with even the most basic system as well as non-traditional stages with more complex live sound systems. The three spatial audio techniques that I survey here are limited to stages where more complex sound systems can be set up. This includes traditional Noh stages which, as discussed on page 8, may allow speakers to be brought in and set up with caution.

There are two common issues when utilizing spatial audio of any kind. First, the number of "sound-objects" that an audience can perceive when they are moved across speakers in a two or three-dimensional space is small [58]. Listeners can usually hear only "one object in detail and two or three objects with adequate aquity" as they are being moved across the speakers (e.g. left, right, up, down, diagonally, closer and farther away). Second, sounds with higher-frequency components or continuous tones are more difficult to locate, and sounds with low-frequency components can easily drown out higher frequencies. In Noh, spatial audio processing on the flute (*nohkan*), which is both continuous and comprised of higher frequencies, may thus produce limited results.

There remains the aesthetic question of how to move the other sounds of Noh (the different types of vocals and drums) in a way that expresses the seven characteristics of Zen art - and the practical question of how to move them in such a way that adopts *jo-ha-kyū*. On this note, we should consider another of Yuasa's works, *Icon* (1967), which was praised by the Tokyo University professor Minao Shibata as "a delicate and refined manipulation of sounds very

much in the spirit of traditional Japanese art, and something we should preserve and cherish" [13]. In *Icon*, Yuasa employs 25 "very narrow bands of white noise recorded in five channels (five bands for each channel)", which "fly around along five speakers like a spider's web". *Icon* thus provides a model for using *channel-based* spatial audio in a way that expresses Japanese aesthetics and also provides a method for potentially allowing more than three sound-objects to be perceived: precise, narrow band-pass filtering.

While *channel-based* audio is the long-standing format where sounds are recorded and reproduced linearly with each input channel directly correlated to an output channel, *object-based* and *scene-based* audio are recent developments and thus not explored by Yuasa. The shift from *channel-based* to *object-based* diffusion in the 2000s created new options for user-controlled interactive sound design. By having positional metadata attached to each individual sound and placing them as objects in a 3D scene, *object-based* diffusion offers more flexibility in both speaker setup and audio production [59]. Representing sounds as objects allows them to be moved in various ways when a listener interacts with them or changes their position, like voices in video games. *Scene-based* diffusion, employed in virtual reality headsets, uses the Ambisonic audio format and special microphones to record a 360-degree sound field.

The different available rendering processes are beyond the introductory scope of this paper, but are influencing my development of the Max/MSP patches. We must remember that audience members do not move from their seats during a Noh performance, but *object-based* diffusion can also utilize *channel-based* recordings as objects and also Ambisonics B-format recordings [59]. A digital audio workstation (DAW) such as Ableton, which is recommended for its Max for Live capability, is also commonly used for both *channel-based* and *object-based* spatial audio. This aligns with my design approach for the Max/MSP packages.

3 Analysis of Yuasa's *Aoi no Ue* (1961)

The thematic analysis is currently being done in collaboration with Emmert using a recording of Yuasa's *Aoi no Ue* and Emmert's performance guide of *Aoi no Ue* as performed by the Kita school of which Emmert is a certified instructor. The analysis in full - with excerpts of traditional sheet music from Zeami's *Aoi no Ue*, translations of the text, and a transcript of Yuasa's 30-minute adaptation at minute-by-minute increments - will exceed 8 pages and is

beyond the scope of this paper. Refinements may also happen during my residency at CNMAT to develop the Max/MSP packages, which are partly based on this analysis.

With this data and transcript, themes are being identified and a narrative crafted to generate insights and connections between Yuasa's selection and application of audio processing techniques and Noh's traditions. This includes Yuasa's engagement with the practical tripartite structure of *jo-ha-kyū* and his aesthetic engagement with the seven interrelated characteristics of Zen art, namely *yūgen*. *Hana* is hard to discuss because Yuasa's piece was not performed, but he did record famous Noh performers. The role of Zyunosuke Okuyama, the sound engineer with whom Yuasa created *Aoi no Ue*, is also being considered [58]. For now, I present these initial findings.

Three Noh vocalists: the Kanze brothers Hisao, Hideo, and Shizuo of the Kanze school
Bird songs
Water drops
Bowed glass
Vibraphone (warped)
Rubbing of beads
Crumpling paper and/or rocks
Generated electronic sounds

Table 1. Sounds employed by Jōji Yuasa in *Aoi no Ue* (1961)

Spring Reverb
Looping
Delay
Feedback
Time stretching
Pitch shifting

Table 2. Audio Processing Techniques employed by Jōji Yuasa in *Aoi no Ue* (1961)

Some of Yuasa's audio processing techniques are used on certain vocal techniques throughout the entire piece, while others are used only at highly poetic moments. As discussed on pages 4-5, *yūgen* is only talked about in Noh with significant poetry, those primarily of the 2nd and 3rd categories, as well as some 4th category plays. *Aoi no Ue* belongs to the

madwoman subcategory of the 4th category (miscellaneous) and is itself based on a chapter from the classic Japanese novel *The Tale of Genji* by Murasaki Shikibu. Commonly attributed to Zeami, *Aoi no Ue* is regarded as the most refined of the madwoman plays performed in the repertoire of official Noh schools. The fact that three important Japanese composers - Mayuzumi, Toyama, and Yuasa - decided to adapt the original Noh play further underscores its cultural value. Because of its poetry, and because its two central characters are aristocratic women (recalling Zeami's *yūgen* being a fusion of the elegance and magnificence of the aristocrat with the frugality and directness of the warrior), *yūgen* is central to this particular 4th category play.

I think that Yuasa's conscious engagement with *yūgen* is seen in his selection and application of a spring reverb [61]. Let us revisit Yuasa's definition of *yūgen*: "profound and quiet elegance… a quality of Nō… comprehended within a religious world that totally transcends human individuality" [26]. This transcendent religious world of Yuasa's *yūgen* aligns with an influential reading of *yūgen* in poetry by the hermit monk Chōmei: "overtones that do not appear in the words alone… an unseen world hovers in the atmosphere" [62]. Chōmei's texts are compulsory reading in Japanese school curriculums and thus were likely studied by Yuasa. Hisamatsu, the Zen scholar, moreover highlights the "infinite reverberations" of *yūgen* [22]. These qualities of overtones and of reverberations in *yūgen* relate to auditory perception, and I argue, guided Yuasa's selection of a spring reverb over other reverbs that were also available to him in 1960-1961 (e.g. chamber reverb) because it imparts more color and metallic overtones.

My second initial finding of interest is Yuasa's closeness to the original text in his use of audio processing. By adapting *Aoi no Ue*, this means it is likely a favorite Noh of his (at least at that time) and one he may have become familiar with while a student at the Hōsho school. In Yuasa's own words, he "recomposed" the original text [60]; deep attention would have been spent on both the meaning and the sounds of his selected words and passages. Whilst progressing chronologically through the text, this is evident in how he skips certain passages to emphasize certain other passages or words and utilizing the most transformative effects (e.g. looping) on these specific words or phrases. Looping only occurs at highly poetic and dramatic moments of the text. By looping these words or phrases, not merely over seconds but over minutes, Yuasa enhances what Hans Ulrich

Gumbrecht, the Stanford University literary theorist, calls the "simultaneity of presence and meaning effects": a quality unique to poetry [63]. To a Noh-trained composer like Yuasa, engaging with *yūgen* as Noh's highest aesthetic principle thus also happens in this manner, and perhaps in other ways as well.

Yuasa's engagement with the other six aesthetic characteristics are now being analyzed - alongside two major concerns with wide-ranging implications for adopting Yuasa's *Aoi no Ue* as a template for integrating live computer tools into the other categories of Noh. Firstly, Yuasa's engagement with *jo-ha-kyū* on macro and micro levels of his *Aoi no Ue*. Secondly, his approach to the two singing styles of Noh: *tsuyogin* (strong/dynamic singing) and *yowagin* (soft/melodic singing). As a madwoman subcategory play within the miscellaneous 4th category, *Aoi no Ue* utilizes a combination of both *tsuyogin* and *yowagin*; the 1st, 2nd, 3rd, and 5th category plays also utilize *tsuyogin* and *yowagin*, but either separately or in different combinations. Being two fundamental cultural aspects of a Noh performance, and as a Noh-trained composer adapting a classic Noh, consistency may be found across Yuasa's utilization of audio processing techniques that are specific to these two singing styles and the omnipresence of *jo-ha-kyū*.

4 Initial Max/MSP designs and recommendations

I am adapting the audio processing techniques utilized by Yuasa in *Aoi no Ue* (1961) into Max/MSP patches for live performances of Noh. Techniques and technologies not available to Yuasa in 1961 are also being explored including the spatial audio processing techniques discussed on pages 10-11 and others which I list below. These patches - tailored for each of the five categories of Noh - will be completed at my research residency at CNMAT.

As discussed on page 4, *jo-ha-kyū* should be observed in each of these techniques given its practical application across all macro and micro levels of Noh. For example, with shifting tempi, one of the three gestural aspects of traditional Japanese sound that Yuasa identified, which in a Noh performance happens noticeably in the drumming, accelerations and decelerations of time-based audio effects such as delay should "begin slowly, speed up, then end rapidly" with the *jo-ha-kyū* tripartite structure and as a cohesive whole. This will ensure a more faithful engagement with traditional Noh music and aesthetics than the delays used by Mayuzumi in his

adaptation of *Aoi no Ue* and by Rezaei in her Mu-Arts "Noh-remixed" DJ performance.

Adapted from Yuasa's *Aoi no Ue* (1961)	Newer Techniques not used by Yuasa
Spring Reverb	Spatial audio (channel-based or object-based)
Looping	Gestural controls with wearable technology
Delay	Sidechain compression
Feedback	Envelope follower
Time stretching	Granular Synthesis
Pitch shifting	

Table 3. Proposed Live Audio Tools for Performances of Noh

To advance Yuasa's vision from the studio to the Noh stage, additional practical issues must be considered. For example, Yuasa utilizes pitch shifting on the vocalists throughout his *Aoi no Ue* but important modifications are required from a practical live standpoint when being performed by one live electronic musician who is also simultaneously processing other performers within the ensemble. This is seen in the example below.
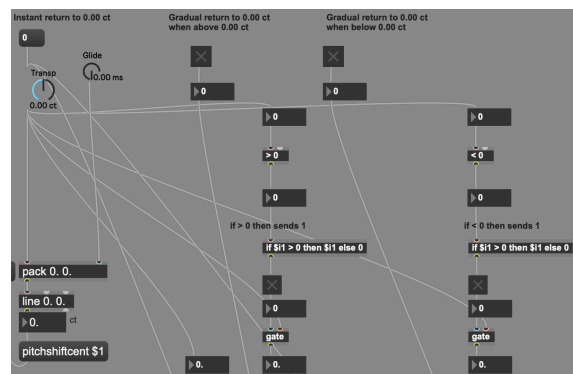

Figure 6. Example from my Max/MSP patch for pitch shifting

While the "pitchshift~" Max object is already well suited, at least two additional components must be created: i) to instantly return to a pitch transposition of 0.00 cents ii) to gradually return to a pitch transposition of 0.00 cents from a pitch shift starting from either above or below 0.00 cents. These two additions are necessary for a live Noh performance that employs pitch shifting because the electronic

musician will have to return a pitch shifted vocal to 0.00 cents - either immediately or gradually - while also controlling other tools. Ideally this is also mapped to *jo-ha-kyū*. Similar considerations must also be made when designing other live tools.

Because of the Max for Live API, Ableton Push is the recommended live controller. Modular synthesis can also be considered, and certain modules may influence the design of certain tools. For instance, I am using the "Beads" module by *Mutable Instruments*, for its intuitive storing and processing of grains, as a reference in my design for a granular synthesis patch. Complex techniques like granular synthesis that require recording samples into a buffer in real-time can be designed in various ways; understanding what is both necessary and beneficial to a Noh performance is crucial. In addition to "Beads", the A-119 envelope follower by Doepfer may also provide a blueprint for a patch or an alternative to live sidechain processing.

Archival research into the audio tools that Yuasa used will be beneficial. For example, there are numerous ways also to design a spring reverb, but knowing that Yuasa created *Aoi no Ue* with Okuyama between 1960-1961 at Sogetsu Art Center [60], through archival research it may be possible to find the specific model of spring reverb they used. Moreover, designing vintage-style audio processing modules will resonate with the aesthetic qualities of Zen art.

Two considerations. First, the user interface must be simple. During youth outreach events to engage digital natives, interactive workshops may be held where children can process Noh performers using tablets connected to the Max/MSP patches via MIRA. This aligns with recent studies on tablet-based education in music production [64] [65]. Second, the *custom job approach* is to be stressed. This is not only to engage with the unique *hana* of a soloist, but also with the unique characteristics of each category and subcategory, and what is unique about each play. Audio effects parameters should also be tailored for the particular Chorus members; even the instrumentalists, the drummers and the flautist, are sometimes referred to as a character rather than just an ensemble, thus this also applies to them. In the case of *Aoi no Ue*, other madwoman plays - including popular ones like *Dojoji* and *Kurozuka* - differ in several ways (e.g. characters, songs) whilst belonging to the same subcategory. Moreover, this custom job approach applies also to the curation of pre-recorded sounds that may be triggered as samples during a

performance, such as those curated by Yuasa which are specific to the dramatic context of *Aoi no Ue*. This is perhaps most clearly seen in his use of a very dry sound of rubbing beads in a crescendo as seen in Table 2 on page 11. The drama of Zeami's *Aoi no Ue*, and the chapter of *The Tale of Genji* on which this play is based, centers on a spirit exorcism that is being performed by a priest who rubs rosary beads. It may be most appropriate for *Aoi no Ue* to be the first adaptation of a classic Noh with live computer tools - or at least have it as part of the initial program.

Each performance of Noh, whether an adaptation of a classic or a premiere, has a value beyond its categorization. There are about 240 plays in the current repertoire of the five Noh schools. As Zeami recommended: "Get a firm grip of the seed as it appears in the original source… the seed is the character who performs the central action in the source upon which the noh is based" [66]. To do this is to design then tailor live computer tools with a *person-specific approach* toward performers' unique aura, sound, and movement in their portrayal of characters, and with a *custom job approach* for each play within each of the five categories, and also for the specific Noh school's performance style.

5 Conclusion

Interdisciplinary, practice-based collaboration with certified Noh instructors at each stage - designing Max/MSP packages for live audio processing, workshops, performances, and youth outreach - is necessary in order to faithfully integrate live computer tools into Noh's traditions. The design and application of live computer tools must harmonize with a Noh performer's unique portrayal of their character through sound, dance, and gesture. Faithfulness to Noh's traditions - aesthetics, forms, and performance practice - when expanding Yuasa's vision from the studio to the stage will further advance third-wave HCI research beyond Western contexts by learning from the cultural dimension of Noh performers' relationship with technology, including their practical engagement with *jo-ha-kyū*. With these measures in place, Noh schools and ensembles with an interest in engaging young people in Noh may find utility in my approach.

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