TRANSFANTASIES FOR FLAUTO TRAVERSO, COMPUTER MUSIC, AND DANCE

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TransFantasies is an interdisciplinary composition for Baroque flute (flauto traverso), computer music, and dance. A crucial component of the work is an interactive hardware and software environment that provides the opportunity for the players to shape aspects of the work during the performance. This essay discusses the influences that inspired the work and presents an in-depth analysis of notable elements of the composition. Primary issues include compositional models for gesture-based composition, historical performance practices, interactivity, and relationships between music and dance. The final component of the essay details the software component designed to create the composition. It also discusses music technology in current practice and its role in this particular work. At its core, TransFantasies is concerned with those moments where computer-influenced decisions and human behaviors collide.
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PART I

CONCEPTUAL IDEAS AND ANALYSIS
Introduction

TransFantasies is an interdisciplinary work for Baroque flute (flauto traverso), computer music, and dancer. The title of the work refers to the fantasia, which was an instrumental composition “whose form and invention spring solely from the fantasy and skill of the author who created it.”¹ The fantasia relied heavily on improvisation, and its forms varied significantly. Typically, fantasias were written for a solo instrument. In this work, four participating forces contribute to invention: traverso, dancer, computer musician, and a computer-mediated environment.

An integral component of this composition is a set of hardware and software tools that allow the performers and the computer environment to listen and respond to each other throughout the course of the piece. An Xbox Kinect controller is used for motion tracking, and custom software was written to schedule events, track input data, and process audio.

This paper is divided into two sections: influences and analysis. The influences are limited to digital transformation and interaction, eighteenth-century influences, and dance and collaboration. The section on analysis features a selection of notable elements of the work, namely musical materials, elements of the dance, and software design.

Influences on Composition

*Computer Music: Transformation and Interaction*

Since the 1940s composers have created musical compositions featuring synthesized sound assembled on tape or other media.\(^2\) This has allowed them to explore alternate tunings, rhythmic structures, and sound transformations that were otherwise impossible. Precise digital control of an entire work became possible with the advent of computer music scripting environments, beginning with Max Mathews’s MUSIC 1\(^3\) and continuing to current systems including the environment used for *TransFantasies*, Max/MSP. Max/MSP is a real-time system, allowing the transformation of sounds and the scheduling of events to happen during the course of a performance.

Compositions that retain a connection with the origin of a sound while exposing it to transformative procedures are a particular source of inspiration in this piece. A primary concern in creating *TransFantasies* was to maintain a relationship between the computer and the *traverso* throughout the composition. The computer processing extends the natural possibilities of the instrument through the use of modifications that gradually recontextualize the instrument, all the while referring to its original sonic identity.

Beyond the mere transformative potential, the computer can listen, learn, and make decisions during a performance. In this type of music, generally called interactive computer music, human and computer can influence each other in varying degrees.


*Visage* is an example of acoustic source material recontextualized through electronic manipulations. In this piece, the composer recorded Cathy Berberian’s voice speaking various phrases in English, Italian, and Hebrew. Sound effects and other vocal inflections were also recorded, as well as a wide variety of synthesized sounds, which were combined with the vocal recordings. The resultant form is far removed from the original context, as the emotional quality of the sound is favored over the semantic meaning of the words. Everything flows from the emotional content of the voice; even the most extreme synthesized timbres thus retain a strong connection to the voice throughout. The electronic elements serve as a means to heighten and shape the emotional content through wordless rhetoric.

Gestures, “sound objects,” and levels of memory are notable elements in *Transfigured Wind* for flute, tape, and orchestra. Reynolds’s developmental procedures and use of sound manipulation rely on memory through referencing the flute and its behaviors at earlier states in the composition. The modification to which the material is subjected never alters the timbre of the flute beyond recognizability. Furthermore, Reynolds gradually introduces his audience to the sound world contained in the piece, and when a new sound environment is established, a reference to the original is always apparent.

*Pluton* for piano and computer was the first composition to be written using an environment resembling today’s Max/MSP. It was written using the Max/FTS environment, running on the IRCAM Signal Processing Workstation. In this interactive work, input data from

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the pianist is combined with predesigned algorithmic data structures to aid in shaping the live
signal in real-time. As the composer explains “the various attacks of the sounds, their duration,
intensity, pedal action and resonance are fed in real-time and the computer applies the image of
the piano sound in all its spectral temporal evolution, over the sounds of synthesis.” Pre-
designed algorithms are used in tandem with live input data to create an intimate, complex, and
rapidly changing connection between piano and computer sounds.

In TransFantasies, scripted opportunities allow the traverso player, dancer, computer
musician, and computer-mediated environment to respond to and influence each other. These
moments are of principal interest as they provide a context for the interdisciplinary ensemble
members to interact with each other much as a chamber group of musicians would in performing
acoustic music.

The piece also contains many predesigned materials. These include fixed media sound
sequences that were shaped in advanced, default parameter settings and automatable shapes, as
well as predefined behavioral states. These states determine the behavior of sound objects and
the ways in which input data is used to influence their behavior. Thus, the piece is loosely
scripted in advance, but relies on decisions made in real-time by the performers.

In terms of digital signal processing, TransFantasies attempts to gradually introduce the
listener into the sound world. This is done through the gradual introduction of sound materials
(acoustic and digital), degrees of change, and interactive behaviors. The materials featured are
highly referential and rely on recurring gestures and gradual changes in sound modification to
convey a sense of progression over time.

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5 Philippe Manoury, Considérations (toujours actuelles) sur l'état de la musique en temps réel [Considerations (always present) on the state of music in real time] revue l'étincelle, IRCAM, no. 3, 2007.
Baroque Flute Techniques and the Chamber Music Concept

A primary consideration in writing music for an acoustic instrument is to highlight the natural capabilities of that instrument. The Baroque flauto traverso is a one-keyed wooden flute that was a common wind instrument used during the eighteenth-century. It has a unique set of characteristics and TransFantasies incorporates these idiomatic features as well as other Baroque idioms.

First and foremost, the flexible tuning capabilities of the instrument must be addressed. It is not a fixed tempered instrument and players are accustomed to tuning to different fundamental frequencies. In fact, the eighteenth-century traveling traverso player had to be comfortable playing in a variety of temperaments as many different European cities had unique tuning systems. For the most part, seventeenth and eighteenth century unequal temperaments featured a displacement of the syntonic comma (21.5 cents) within the octave in an effort to ensure that selected intervals within a key were justly tuned. This resulted in other intervals being slightly wider or narrower, based on how the comma was distributed amongst the instrument’s gamut. One of the most common temperaments used in the period was one-sixth-comma meantone, in which slightly tempered thirds are favored and four perfect fifths are slightly flatter than pure.

The pitch level of the instrument as a whole is also variable. Current professional orchestras that perform period music often use flutes tuned at A-415. Other common pitches include A-430 and A-435. TransFastasies was written for a one-keyed traverso tuned at A-415 and must be performed with this flute type as the intervallic material, timbre relationships, and computer music component have been designed specifically for this tuning.

The traverso is a wooden instrument that produces a limited dynamic range, in

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comparison to the modern flute. It can be both calm and forceful, but never reaches the brash intensity of its modern metal counterpart. It requires more air to produce a tone, thus resulting in more air noise in the total sound. While performers often complain of this as an unwanted byproduct of playing the instrument, the character of this airy tone has been embraced in TransFantasies. Several written gestures and digital sound textures were conceived in order to promote wind-based timbres.

The traverso was always considered as an intimate instrument, as its hollow timbre and limited dynamic range make it difficult to project over large forces. Most of the eighteenth century music featuring the instrument is either for flute solo, small chamber ensemble, or a large ensemble with carefully balanced textures and relatively infrequent tutti passages. In many of these multi-movement works, the flexibility of the instrument is highlighted in the ritornello-based movements, while sensitivity and expressiveness are featured prominently in the slow movements. TransFantasies features both types of playing in an effort to demonstrate the variety of characters the instrument is capable of producing.

Music for traverso was most often performed in small rooms or chambers during the eighteenth century. The distance between the audience and performer would have been fairly small, resulting in an intimate connection. This is mentioned because chamber music today is often performed in large halls. In this case, the level of intimacy is removed as most of the direct sound from the player is diffused throughout the space before reaching the listener. Furthermore, in public concert performance during the eighteenth century, it was quite common for the audience to sit close to the performers or to move around in the space. Movement during a performance allows one an alternating perspective, which results in the listener being privy to different aspects of the sound.
TransFantasies attempts to exploit the intimate nature of this instrument through its musical design, staging, and seating arrangement. In reference to the latter, the performance space should be set up with chairs for the audience in concentric circles. The performance takes place in the center, and the performers are never more than twenty feet away from the audience. A diagram of the intended staging is given in Figure 1.

![Performance space design](image)

Figure 1: Performance space design used in TransFantasies

The playing techniques featured in TransFantasies that are unique to the instrument and its historical practice are flattement and a fast double-tonguing articulation referred to as did’ll. Flattement is a vibrato-like effect available on traverso for slight pitch bending produced through altering the finger position. Though this ornamentation was rarely notated, Johann Joachim Quantz, Jacques-Martin Hotteterre, Charles Delusse, and others wrote extensively on its

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9 Johann Joachim Quantz, *On Playing the Flute*, Edward Reilly, trans. (Boston: Northeastern University Press, 2001), 79. First described in print here in which an articulation must be double-tongued while produced two syllables—“did” and “ll.”
performance.\textsuperscript{10} It was used most often to color sustained pitches, especially at cadential points. There are a number of instances in the piece when the performer is instructed to use flattement (as well as other bending techniques such as breath vibrato and quarter-tone pitch bend). This is a useful method to add slight alterations in timbre.

The double-tonguing \textit{did’l} is an articulation pattern popularized during the Baroque period. This articulation is used as a method to create dynamic variety on repeated notes. The presence of this articulation emphasizes strong downbeats and was abandoned in the classical period due to an overwhelming interest in equality among articulations. Articulation is a leading parameter of gestural shaping in \textit{TransFantasies} and the \textit{did’l} articulation often serves as a vehicle to develop motivic material.

This composition is consciously influenced by the concept of chamber music and its evolution. Chamber music was aptly named to distinguish instrumental music that was intended for performance in a small room. This was in stark contrast to larger ensemble music, which was performed in churches, courts, civic centers, or other large rooms. During the seventeenth century and beyond, composers actively wrote music with these spaces in mind. Theodor Adorno claimed that chamber music is “characterized” by the fact that thematic material is distributed among several musicians.\textsuperscript{11} This intimate handling of motivic material throughout all the participating voices allows each player to take part in a musical conversation in a more exposed manner than that which is possible in a work for large ensemble. An important aspect of chamber music is that the fabric of the music is woven in part by each player. That is, each player has an active role in playing motives and contributing to their development. In eighteenth-century musical genres, the players made adjustments in speed, dynamic shaping, and

\textsuperscript{10} Janice Dockendorff Boland, \textit{Method for the One-Keyed Flute} (Berkeley: University of California Press, 1998), 33.

articulative effects based on their interaction with the other participating members. In *TransFantasies*, the computer and all three performers share principal motivic material, as well as responding to and influencing the decisions of their partners in the performance.

The criteria for determining chamber music must be expanded to address the range of modern music. Originally intended for limited dynamic output in a small room, several modern compositions with loud dynamics are denoted by the composer and/or the publisher as chamber music. *Antechrist* by Peter Maxwell Davies is a good example of one such work as it pairs string and wind instruments with a gong, tambourine, and bells. There are moments in the piece where the dynamic output is much louder than what would have been expected of chamber music in the eighteenth and nineteenth centuries. The increasing use of technology in music also affects the definition of chamber music. *Noa Noa* by Kaija Saariaho for flute and electronics requires speakers, a reverberation unit, fixed media playback, and a sound engineer to control aspects of the electronic sound. In this work, the flute player is expected to interact with the technology, and the engineer is expected to adjust levels and other parameters of the performance in real-time. The amount of interrelation and feedback required between the live player, electronic sound elements, and the sound engineer is the same as in acoustic music with traditional instruments.

*TransFantasies* features unconventional forces in a small room for an intimate intermedia performance. The relationships among the players and the computer, particularly in terms of the influence they have on each other, is not unlike that found in the music of Quantz, J.S. Bach, and their contemporaries. The players are expected to adjust volume, speed, and articulation throughout the piece based on the responses of each other. Motives are also shared and developed by the performers and computer in an attempt maintain a strong connection among the
forces throughout the piece. In this manner, a conscious attempt has been made to reference quantifiable elements of chamber music, while at the same time including expansions to allow for technology and dance.

Dance, Intermedia, and Collaboration

Isadora Duncan and Martha Graham pioneered modern dance as a reaction to classical ballet in the early twentieth century. A striking feature of modern dance is that it is often performed without costume and in bare feet. Choreographers such as Robert Ellis Dunn, Anna Halprin, and members of the Judson Dance Theater pioneered postmodern dance as a reaction to the presentational constraints of modern dance in the early 1960s. Their work proposes that any and all movement can be considered dance and anyone can be considered a dancer. TransFantasies combines static and active choreography with the exploration of character, shape, and intimacy.

Dance is a powerful medium for expressing emotional content through non-verbal communication. Particularly in solo dance, a high level of intimacy is shared between the performer and the audience. The dancer is exposed in the space, leaving the audience to focus on a single body. In doing this, the audience is privy to the emotional soul of the performer, as expressed through her movement. This sense of intimacy can be magnified in performance environments where the performers are among the audience. The dance in TransFantasies is a study of character and intimacy in a performance space with a predesigned seating arrangement. It is a dance composed specifically for live performance with close proximity between audience and performers; the perspective and emotional response the piece requires do not translate readily to documentation or to a larger space. In addition, the presence of an audience is a vital
component as the dancer will interact and react with the audience throughout the course of the piece.

My interest in combining dance and computer music resembles that of instrument-driven interactive computer music in that I wish to create an environment in which the dancer, *traverso* player, and computer can influence each other through a computer-mediated environment. To accomplish this, motion-tracking data from the dancer is used to influence sound file playback and live signal processing of the *traverso*’s sound. As part of the dissertation preparation process, I wrote an etude for dance and computer music using motion tracking with the Xbox Kinect controller. This etude proved to be a fruitful venture as Ilana Morgan and I developed a shared language of material together with a software component to facilitate the necessary interactive environment.

The roles of dance and music vary throughout this piece. The opening section is dominated by music. When the dancer first enters the performance space, dance becomes the focal point of attention. There are other instances in the piece where the two forces are equal, and times when their roles exhibit varying degrees of significance. *TransFantasies* not only aims to explore a variety of roles between dance and music but various modes of interaction as well. In reference to the latter, the content and gestures contained in the music and dance can simultaneously support or disagree with one another, appear unrelated, or serve to reference or translate ideas from either media.

For *TransFantasies*, collaboration was an integral part of the composition procedure. In addition to Ilana, I chose to work with Kimary Fick, a skilled and expressive *traverso* player with tremendous knowledge of music of the eighteenth century. Both Kim and Ilana are highly experienced working with technology as well, allowing for a shared vocabulary of resources and
concepts. A shared language of communication is a tremendous asset to the collaborative process. Furthermore, we all have a level of respect for one another as artists—a necessary condition for collaboration.

Working closely with particular players when writing acoustic media allows one to personalize the piece to the players and to learn their perspective on the material as it is written. If the partnership is successful, they will end up championing the work through future performances and/or compositions. Working closely with the player is even more important when a technological element is involved as it allows both parties to gain familiarity interacting with a specific software/hardware environment during the development process.

In the case of TransFantasies, shared input between the collaborators occurred quite frequently. Kimary provided a great deal of information about historical contexts for chamber music in the eighteenth century and about the capabilities of the traverso during the preparation of the composition, as well as frequent feedback on the idiomatic nature of the materials chosen. This piece was written specifically with her in mind, and the material is thus tailored to her strengths. Examples of these include her abilities to sustain expressive gestures and to improvise indeterminate passages.

In working with dance, certain criteria were given to Ilana in advance such as the desired energies within each section, the expected length, and the performance venue possibilities. She then decided on a performance space orientation to best suit the Xbox Kinect controller’s camera sensing capabilities and her intended dance. As she was defining her character and choreography, we met regularly and crafted the nuances of the composition together. Her movements were recorded and studied for common patterns. Those patterns were then used to influence musical responses within the given sections.
Dance, *traverso*, computer musician, and computer-mediated environment is an unusual ensemble. While music for dance has a long history, there are relatively few examples in the contemporary art canon that feature dancer, live musician, and computer-mediated environments. Works such as *Biped* by Merce Cunningham, Gavin Bryars, Paul Kaiser, and Shelley Eshkar combine live music with dancer-influenced motion capture technology. In *Biped*, pre-recorded motion is used influence video graphics that projected throughout the space. Several works featuring motion capture have been used to influence changes in visual images but few exist in which motion is used to influence changes in sound processing. Furthermore, *TransFantasies* combines input from both the dancer and the *traverso* player to influence change over time.

The idea of integrated media is not new; Wagner’s concept of *Gesamtkunstwerk* (total artwork) was perhaps the most influential modern concept of a new hybrid art form based on equal contributions of all participating media.\(^{12}\) More recently, Dick Higgins, a member of the collective Fluxus, coined the term *Intermedia* to explain new hybrid art forms that were much more than the sum of their combined forces.\(^{13}\) Early examples include happenings, performance art, and visual poetry. More recent forms include film music, music video, and dance film.

Throughout my studies at the University of Oregon and the University of North Texas, I have focused primarily on creating intermedia. In *TransFantasies*, I present an environment in which dance, acoustic, and electronic music are fused with computer-networked behaviors. This will serve as a platform for future collaborative works.

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Analysis of Composition

Musical Materials

Pitch as a Function of Timbre

As the traverso is not a fixed-temperament instrument, its gamut offers multiple enharmonic fingerings and tunings, and many different unequal intervals. Each pitch the instrument is capable of producing has a distinct tone color. In an effort to categorize the notes the instrument can produce, Kimary Fick proposed the descriptions shown in Figure 2.

![Tone color chart for the traverso](image)

Figure 2: Tone color chart for the traverso

Timbre relationships between pitches was a primary compositional concern in TransFantasies. Sharps tend to sound brighter, while flats tend to sound darker. The following pitches serve as the germinal collection in the work due the plethora of possible relationships of neutral, bright, and dark colors they offer.

![Germinal pitch collection used in TransFantasies](image)

Figure 3: Germinal pitch collection used in TransFantasies

A sub-set of this collection, the tetrachord [E-D#-A#-B] is highlighted throughout the composition. This pair of semitones suggests the key of B-Major; however, its use in this work
focuses on its properties as a collection with two semitones and a diminished fifth.

Alterations to the collection are made for the purpose of timbre development and are either brief diversions or transpositions of the germinal set when considering the normal form of the row \( \{013478\} \), or 6-Z19 according to Allan Forte’s classification of pitch sets.\(^{14}\) The ostinato material in the “Ostinato and Petals” section of the work (rehearsal letter E) features transpositions of the set rooted on G (lowered scale degree 6 in B Major) and C (lowered scale degree 2). This additional half-step related perfect fifth preserves the intervallic content while developing new relationships between neutral, bright, and dark timbres.

The semitone interval is crucial in both melodic and harmonic functions in *TransFantasies*, and in highlighting the relationships among dark and bright tones. In the example found below, the tonal quality of A\(^b\) (respelled here as G\# as the fingering is identical) is firmly established before giving way to an extended development on the brighter tone of G\(^\#\). This is the first time in the piece that this relationship is featured and it lays the foundation for future appearances and developmental procedures.

![Figure 4: Excerpt from the opening highlighting the interplay between G-G#](image)

Role of Gesture as Phrase

The musical discourse of *TransFantasies* is driven by its gestures. Gestures made up of very few pitches—often just one—bring attention to the tone color of the *traverso* and serve as

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the primary materials of the work. Gestures of a single pitch are defined by repetition with variations in speed, articulation, and dynamic shaping. In most cases, these gestures are combined with others to form phrases, hearkening back to the relationship between motives in Baroque and early Classical music.

An example from the opening gestures of the piece is found in Figure 5.

![Figure 5: Opening four gestures of flute and computer duet](image)

At the core of this phrase is the repetition of E♭. It serves as a constant element as the other musical parameters are varied. The first gesture is a simple leap of an octave, which increases in intensity through the punctuation of a *sforzando* articulation. The response is a rhythmic variation on E♭, which gradually becomes unfocused in articulation. This shape, in which a repeated note is gradually altered in speed, is the most significant rhythmic gesture in the work and is featured prominently throughout the piece. Following the rhythmic shape, E♭ is uttered once more, this time while introducing breath vibrato. The final gesture is a variation of the previous vibrato gesture using *flattement* on a new pitch (B). This gradual alteration in musical parameters is the primary method used to develop sound objects in *TransFantasies*.

After a brief diversionary gesture (F-C♯-A-C), the octave leap and rhythmic acceleration/deceleration motive first seen in the opening gesture return, with variations in tone color, pitch, and rhythmic relationship. This helps to establish it as a significant motivic agent. An unaltered sustained pitch, the first of its kind, follows this gesture. These two objects share a common pitch (G♯), so it comes as a surprise when the G♯ first occurs. However, the following
phrase further emphasizes this tone, establishing a relationship between these opposites in timbre (dark and bright).

Figure 6: Third stave from the opening of TransFantasies

Figure 7 shows a transition phrase that is featured prominently throughout the work. In this example, a four-note collection [A#-E-D#-B] is repeated while varying in speed and intensity. These notes form the set class 4-8\textsuperscript{15} and are the most prominent pitches in the composition.

The gestures discussed above function as points of reference and continuous sources for variation.

Musical Indeterminacy

The modern divide between composer and performer did not exist in the Baroque era; a musician was trained as a composer, improviser, and performer. Through ornamentation and other opportunities, performers shared in the process of composing a work. Music that leaves

\footnote{15 Ibid., 262.}
room for performers’ inventiveness benefits from their contributions and grows through successive performances and performers. This requires a degree of indeterminacy: the final result of the music is not entirely under the composer’s control. In TransFantasies, both the traverso player and the dancer make active contributions to the material of the work and its unfolding.

The traverso part leaves a number of elements up to the performer to determine during the performance. This allows her to be at her most expressive in shaping the material based on how she feels in the moment. The musical parameters that are most often notated with liberties for the performer include duration, speed, and dynamics. For the most part, duration is notated without tempo. Relative note duration is indicated by the distance between note heads on the page and the types of note heads used. Solid notes appear in small (grace-note sized) and medium; whole notes appear with and without additional duration information (such as trill lines or flattement curves). Whole notes that are to be held longer than an expected length are shown with solid extension lines leading from the note head. Figures 8 shows an example of durational indications from TransFantasies.

![Example of durational notation in TransFantasies](image)

Figure 8: Example of durational notation in TransFantasies

Notating duration in this manner conveys the shape of the phrase while allowing liberties in the overall speed of and the actual duration of the individual notes.

Other indeterminate elements involving duration and speed appear in the “Ostinato and Petals” section, where a time signature and standardized rhythmic notation are used in conjunction with directions for the player to vary the speed, volume, and overall intensity over
time in order to match elements of the dance and computer component. An example of this is shown in figure 9.

Figure 9: “Ostinato and Petals” section from TransFantasies

A critical component of this section is the fact that the performer periodically interrupts the ostinato pattern in order to play gestures from the given collection. After the ostinato has been played approximately five times, the computer will have created a dense texture with several variations of the ostinato. The player then selects a single interruption, while the computer musician responds to this by recording and instantaneously playing back the altered result. The dancer reacts to these interruptions by throwing flower petals from a bag, the one prop used in this dance. The computer in turn responds to the dancer, triggering sound files based on the size of her gesture. Thus, the indeterminacy of the traverso player’s part allows her to shape the progress of this section through her decisions concerning the timing of each gesture. A cascade of decisions and responses in shapes the musical accompaniment as she continues the ostinato. She is free to alter elements of the interruptions after completing a cycle of the collection.

Another element of freedom given to the traverse player during the “Ostinato and Petals” section is the shaping of dynamics. The performer is directed simply to respond to the dancer
and the computer music part in her dynamics. This allows the performers collaboratively to shape the section in response to each other’s decisions.

As in music from the Baroque era, ornamentation and articulation are critical components of musical indeterminacy in *TransFantasies*. The primary types used are trills, *flattement*, pitch bend, and breath vibrato. An intended shape is given in the notation; following this shape, the performer is free to interpret the details. For example, Figure 10 documents a shape used to indicate trill intensity.

![Figure 10: Trill speed with indeterminate shaping](image)

Here the performer will shape the intonation and speed of the trill, in combination with dynamic and tone. Pitch bend, *flattement*, and breath vibrato are indicated with similar liberties, as shown in Figures 11 and 12.

![Figure 11: Pitch bend with an indeterminate length](image)

![Figure 12: Flattement shape with indeterminate shaping](image)

Textural Material

Texture as a function of form is particularly important in the central sections of the
composition (“Ostinato and Petals” and “Aggressive, Disconnected”). In these sections, the focal activity is a mass of sound rather than individual events with apparent hierarchical roles (e.g. foreground, middleground, and background). Sound mass compositions by György Ligeti such as *Atmosphères* and *Lux Aeterna*, as well as the stochastic music by Iannis Xenakis (*Pithoprakta* and *Metastasis*) influenced my conception of these sections. In all of these works, a multitude of voices with subtle differences in their behavior create thick, cloud-like textures. In this manner, the overall semblance of homogeneity overshadows individual voices. In the case of *Atmosphères*, many of the textures are comprised of pitches and rhythms that vary only slightly. Both *Pithoprakta* and *Metastasis* are dominated by multiple examples of the same gesture, with slight alterations in timing and pitch. The process of creating textures in this manner was a major influence on the development of *TransFantasies*.

Toru Takemitsu also wrote music highly influenced by sound mass techniques, but in his music, varying degrees of significance are clearly differentiated within the mass. His interest in creating musical textures that emulated traditional Japanese gardens was of particular importance in his music written from 1957-1975. A conversation between the composer and Paula Dietz will further clarify his process and intentions in creating musical shapes:

Takemitsu described a musical excursion, beginning with a stone, a stable element. As he continued, he would see a tree that might, when he looked back obstruct the stone. Then there would be another tree in the distance, and the space between the two, like silence, became important. Finally, appeared the most ephemeral element of all: blossoms, like the cherry blossoms that blanket Kyoto in the spring. “In the end each element does not exist individually but achieves anonymity in a harmonious whole…”

In this vein, each instrument or “element” of a piece has a varying degree of importance. Examples like *Dorian Horizon* and *Landscape I* illustrate these concepts through idiomatic orchestration and a careful balance of dynamics among the instruments.

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22
In the “Ostinato and Petals” section, the *traverso* player repeats a single phrase with brief interruptions over the course of several minutes. As she is doing this, the computer layers several recorded and processed versions of this phrase in real-time. Eventually, a texture with varying degrees of activity has been created. As this section progresses, the *traverso* continues to play but the focus of musical activity is no longer on the performer’s part. It is merely one of the many lines in the mass. This collective mass features peaks and dips in intensity, and as this occurs, the audience is shown different sides of the *traverso* as it appears in and out of the texture. This is not unlike Takemistu’s concept of varying perspective in his garden analogy.

The “Aggressive, Disconnected” section (rehearsal letter G) features an active texture with varying degrees of magnitude. As the section begins, much of the material remains from the “Ostinato and Petals” section (delays, distorted granulation, fixed media). At first, the processed material appears to be more dominant than the *traverso* part, as in the earlier section. As this section progresses, however, individual events can be perceived more clearly through changes in texture and varying degrees of intensity. Most noticeable are the swells of harmony and timbre provided by frequency modulation synthesis (FM), bit crunching and distortion that degrade the signal, and delay-based processing of *traverso* gestures. The presence of the live *traverso* varies in focus until the conclusion of this section, during which it again becomes the dominant force in the musical texture.

Formal Structure

*TransFantasies* contains a separate structure for the musical and dance components of the piece. The sections mostly maintain a level of synchrony with each other, yet each explores distinctive relationships. A sectional breakdown of the music and the dance with estimated durations is shown below.
### Music
1. A Duet for *Traverso* and Computer (~4 mins)
2. Dance Entrance (~2 mins)
3. Ostinato in Petals (~3 mins)
4. Aggressive, Disconnected (~2 mins)
5. An Aftermath (~3 mins)

### Dance
- Off Stage
- Circling, Swinging, Discovery
- Throwing Petals
- Big Movements, Stopping
- Line Up Petals
- Balancing

A driving element of the composite form is the interaction apparent between the participating forces. The piece begins with a duet for *traverso* and computer. Here, the *traverso* is the leading force, while the computer-mediated environment and computer musician influence the live processing. As the dancer enters, her movement influences secondary elements of the texture. Specifically, her position controls the duration of fragments of sound in the computer’s granular processing of the flute, and influences the intensity of swoops and bends of pitch, in combination with an automated predefined shape. During the “Ostinato and Petals” section, the level of interaction is at its height. The *traverso* player’s energy and interruptions influence the computer, dancer, and computer musician, while the decisions made by the computer musician (cue advancement) influence the dancer and *traverso* player. This relationship is reduced in the “Aggressive, Disconnected” section as the level of influence varies amongst the performers. The final section is mostly driven by decisions made by the computer musician, with the dancer responding to the sound. An active and responsive relationship is maintained among the performance forces throughout the work, changing in each section.

While sections are not repeated in full in *TransFantasies*, musical gestures and processing algorithms return and refer back to earlier sections throughout the piece. The intention is for the audience to be able to perceive a meaningful progression through the character alteration of influential gestural motives. An example of this can be seen in Figure 13 below, where the transformation occurs to the transitional gesture previously shown in Figure 7.
Here, in rehearsal letter F, an earlier motive is combined with a processing technique used previously in a different section. The result is the combination of sound that is both referential and progressive.

This brings attention to another focal point of formal development: the use of sound modification. The piece begins with closely related signal processing; processing that does not radically transform the instrument’s timbre. During the transition shown above, the signal of the traverso is transformed into a distorted and compressed tone, resembling the sound of an electric guitar. While this development was foreshadowed in the “Ostinato and Petals” section, it is here that the most extreme transformation occurs. The processing techniques featured previously had been slowly introducing more transformation, but this change in character is categorically more intense. The “Aftermath” section slowly strips away these radical transformative textural elements one by one until only the sound of the traverso remains. In this manner, the form is cyclic as it refers to the opening state during its final moments.

Dance Elements

Choreography and Musical Responses

The dance component of TransFantasies is a study of character, intimacy, and
deconstruction. The performance space is designed so as to increase the potential for the dancer to interact with the *traverso* player and the audience. The intended performance space has concentric circles of chairs with the *traverso* player and dancer performing in the center of the ring as the audience is to sitting in the outer circles (see Figure 1).

During the opening section of the piece, the dancer is offstage. The audience is unaware of her presence until she breaks into the center circle following the duet for *traverso* and computer (rehearsal letter C). As this happens, the *traverso* player is shaping a trill, while anticipating a point of attack as cued by the dancer. At the peak intensity of the trill, the dancer performs an initiating pose that triggers a sound file. This initiating motion establishes connection between the Xbox Kinect controller and the software. Once the connection has been established, a sound file hit is generated and a series of fixed media sound structures follow.

![Image of Xbox Kinect motion tracking recognition pose](image)

Figure 14: Xbox Kinect motion tracking recognition pose

Throughout the “Dance Entrance” section (rehearsal letter D), the dancer explores the space while pacing around in a circle, spinning, and swinging. Occasionally she will invade the personal space of the *traverso* player and the audience members in the inner ring. Her distance from the Kinect controller influences the pitch bend factor of the processed *traverso* material.
She also directly controls the total duration of grains based on her left-right position in relation to the camera. Thus, her motion exhibits both direct control and a level of influence on the processed material during this portion of the piece. These interactions between dance and sound are subtle at this point; the dancer is also highly influenced by the pacing and intensity of the music. Thus, an integration of forces and an interactive loop are quietly established from the moment the dance begins.

After exploring her surroundings, the dancer begins to swing a large bag. She follows this by placing the bag on the ground. She then proceeds to look inside the bag, and back at the audience and the performer (in a theatrical manner). The audience is left to wonder about the contents of this mysterious bag. After receiving a cue from the traverso player (interruption no. 1- high G#), she throws blue rose petals from the bag. They fly everywhere—all over the floor, on the musicians, and on the audience. This should come as an unexpected surprise to the audience. After an initial burst, she continues to throw the remaining petals throughout the performance space. In doing this, she varies her speed, intensity, and gesture size. This movement is used to trigger sound files, as well as to initiate change in the delays and the panning position of the several streams of sound.

After all the petals have been thrown, the dancer drops to the floor and rolls around in her creation. Her initial descent triggers a distortion effect, which transforms the traverso’s sound into its most distant timbre. Once this sound is heard, the traverso player begins the transition phrase (Figure 13). As this new section begins, the dancer starts a frantic spinning dance that is interrupted periodically as she attempts to align the pedals. Her purpose is to divide the space into two halves. From here on, she is no longer able to move around the space freely as her movement has been constricted. In the final section, her dance is further restricted to linear
phrases comprised of awkward balancing patterns as she moves toward the musician. As her left foot moves up and down, the panning and pitch-shifting factor of the computer’s sounds are controlled by this movement. The piece ends with the dancer nearly falling from her balancing patterns, while invading the physical space occupied by the *traverso* player.

**Software Design**

Overview

The software component of *TransFantasies* consists of a series of patches written using Cycling74’s Max software. Max is a graphical programming environment for real-time audio, MIDI, and visual media. Users connect objects with virtual patch cords in order to make programs or “patches.” These patches are capable of performing a variety of functions from signal processing to scheduling events. Max was first developed as a patch editor at Institut de Recherche et Coordination Acoustique/Musique (IRCAM) in Paris by Miller Puckette in 1984 and has developed into a number of environments that collectively represent the most commonly used means of creating interactive computer music and multimedia performance works.

The software used in *TransFantasies* is broken into four main components: a cue system to schedule events, patches that track input data from the *traverso* player, tools for processing sound, and a series of tools to handle motion tracking. Hardware requirements include two computers with at least a 2.5 GHz processor and 4 GB of RAM with wired LAN network running Max/MSP.
Cue System and the Virtual Quartet

A cueing system allows a user to distribute commands, initiate parameter changes over time, and make changes to the behavior of the modules. A computer musician triggers the cues throughout the course of the piece. Performance instructions are included in the software and in the score so that other users can perform the piece. The cues are advanced by clicking the spacebar. Each cue is notated in the score with a number enclosed in a diamond shape as shown below.

Figure 16: Notation of cues

The computer musician inhabits a significant role in this piece as he must listen and respond to the performers accordingly, as well as to the automated computer response. There are instances in which the players are waiting for cues, and others in which the musician is waiting for the performers to complete an idea before advancing. This creates a virtual quartet: the
computer musician may not have musical material to play, but his timing and triggering of cues influences the final outcome of the work decisively.

Sensing and Automated Interaction

While the cueing system initiates a majority of the change and commands in the piece, input tracking is used on the *traverso* throughout the composition. Most notably, pitch, amplitude, and durational data are used to trigger events. For example, in the opening duet for *traverso* and computer, several pitches of the primary collection are frozen using a Fast-Fourier Transfer (FFT) algorithm. This process records the input data and creates a continuously looped repetition of that particular sound within a defined window of time. This is used to create a chord cluster of notable pitches that are then used as a background drone. To facilitate this control, a patch has been created to listen for certain pitches. When the result is positive, an initiating bang is sent to start the freeze component. The input sensing patch is shown below in Figure 17.

![Input Sensing Patch](image)

Figure 17: Input sensing patch
Other examples of sensing include using pitch and durational data to trigger sound files, which is featured in the opening as the *traverso* first plays a high E♭. An excerpt from this moment is shown in Figure 18 below.

![Figure 18: Sound file triggered based on pitch](image)

As mentioned previously, the motion of the dancer is also used to influence and trigger computer music elements—this will be described in greater detail below.

Beyond using input data to affect change over time, a number of predesigned behaviors are automated and triggered with cues. Examples of these include changes over time in sound parameters, changes in motion tracking and flute sensing control, and initial settings for given sections. Figures 19a and 19b pair the commands from the cue list with a gesture in the score.

![Figure 19a: Notation for cue 15](image)
Figure 19b: Cue list information for cue 15

The above cue loads initial settings but also initiates change over time though the automation of a line shape. Several of the cues in the piece contain similar types of procedures.

Sonic Archetypes and Relationships

The sound modifiers used to shape this piece are as follows: granulation, freeze, pitch shifting, timbre shifting through ring modulation and distortion, filtering, FM synthesis, delays, and fixed media playback.

According to Curtis Roads, “granular synthesis is a technique that builds up acoustic events from thousands of sound grains. A sound grain lasts a brief moment which approaches the minimum perceivable event time for duration, frequency and amplitude, discrimination.”

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Granulation is a useful tool in designing cloud-like textures as one can define the amount of grains and the duration of each in a given texture. This works particularly well in designing sound mass-based music. Other grain parameters can include but are not limited to pitch, windowing, panning, and randomization factors. In *TransFantasies*, live granulation is used extensively. In this case, a buffer length and windowing function are predefined. The signal is read into a buffer in real-time. The sound is subsequently broken into small grains instantaneously. The user can then sculpt the resultant texture based on the parameters defined above.

Granulation is most often used as a natural extension of the sonic identity of the *traverso* in this work. For example, granulation is employed to extend the frequency content while establishing a new rhythmic foundation. In this case, granulation responds to the live component. Later in the work, granulation becomes a motivic agent by repeating and developing influential material. This is most notable during the “Ostinato and Petals” section, in which long grains are used to create variations of the ostinato pattern.

Freezing is a technique whereby the end of a sound gesture is recorded and then played back continuously. The length of a buffer with a windowed function is specified in advance. One can then trigger the content of a live signal to populate the buffer, after which the window of time is repeated continuously. The result is that the sound appears to be frozen in time. This proves to be a useful effect in extending the frequency component of a single note of the *traverso*. It is quite powerful as it creates an immediate awareness that a sound has been recorded and brought into the computer realm. Freezing is used extensively in the opening duet and during the “Ostinato and Petals” section. In the opening, freezing is used to overlay several influential pitches into a single buffer through the aid of the Input Sensing patch. A chord cluster is then built from these pitches and used as a recurring background texture.
Pitch shifting is of paramount importance in this work. As mentioned above, there are several instances of pitch bend and flattement as notated in the traverso part. Pitch shifting through digital signal processing is to be seen as an extension of this action. This is performed in a number of ways, such as through slight or radical modification of the live signal or fixed media component, or through altering the playback of a granular or frozen texture. A notable example of pitch shifting that involves the live signal occurs in the first interaction between the dancer and the traverso player. At this moment, the dancer has just entered the performance space; her distance from the camera influences the bend factor of the traverso.

Timbre shifting occurs throughout the piece in the form of ring modulation and distortion. In the opening duet, tone color modulation is hinted at but always abandoned quickly in favor of a blend of dry traverso signal with reverberation. As the piece processes, however, it becomes increasingly clear that the signal will undergo a significant transformation. This is fully realized during the transition into the “Aggressive, Disconnected” section (as shown in Figure 13), as the soft timbre of the traverso is abandoned in favor of a distorted, more abrasive tone.

John Chowning explains frequency modulation synthesis (FM):

In FM, the instantaneous frequency of a carrier wave is varied according to a modulating wave, such that the rate at which the carrier varies is the frequency of the modulating wave, or modulating frequency. The amount the carrier varies around its average, or peak frequency deviation, is proportional to the amplitude of the modulating wave.\(^\text{18}\)

The resultant waveform also contains sideband frequencies at sum and difference frequencies of the two originating waves. FM technology was a leading method of designing complex waveforms and emulating instruments in many synthesizers during the 1980s and 1990s. In TransFantasies, FM synthesis is used either to emulate or to reference sound objects produced by the traverso or to provide a character harmonization in a given texture. An example of the

latter can be found in the distorted FM with a high feedback component found in the “Aggressive, Disconnected” section. Figure 20 shows the FM patch used in *TransFantasies*.

![FM synthesis unit designed for TransFantasies](image)

While this piece contains a large amount of live processing, several of the textures and individual sound gestures were designed in advance and are played back in full during the course of the piece. All of the fixed media featured in this piece were designed using sound from the *traverso*. Fixed media playback is used in two ways: straight and modified. In the modified example, the computer musician and dancer induce subtle changes into the playback through pitch shifting, filtering, and volume alteration.

In several cases, the above-mentioned digital signal processes are feed into each other to create meta-modifiers. A good example of this can be found during the “Ostinato and Petals” section, in which a layer of sound is created through a granulated version of the live input that is
routed through a distortion unit. Other examples include those in which delays of the live signal are sent to the pitch shifter and distortion unit.

Motion Tracking

The hardware used for motion tracking in this piece is the Xbox Kinect controller created by Microsoft™. The Kinect controller is an inexpensive option with a fairly accurate response. The Kinect is able to sense the X, Y, and Z position data of ten different joints: head, torso, right and left elbow, right and left hand, right and left foot, and right and left knee. To accurately track a moving body, the Kinect creates a skeleton based on the relation of these joints to one another.

The data output from the Kinect controller is converted into Open Sound Control (OSC) on a separate machine running Synapse, a software program developed by Ryan Challinor.

Open Sound Control (OSC) is a protocol for communication among computers, sound synthesizers, and other multimedia devices that is optimized for modern networking technology. Bringing the benefits of modern networking technology to the world of electronic musical instruments, OSC's advantages include interoperability, accuracy, flexibility, and enhanced organization and documentation. Synapse provides three different evaluations of each stream of X, Y, and Z data received from the Kinect. They are the joint position relative to the torso (measured in millimeters), the joint position in world space (measured in millimeters), and the joint position in screen (measured in pixels). This results in 87 different values that can be tracked simultaneously (3 values are not given as the torso values cannot be measured in relation to themselves). Once the data is converted into OSC, it is then scaled into ranges from -1 to 1. This has been done so that all the values can be put into similar ranges. The data is then measured over time and used to influence

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aspects of sound control. Figure 21 documents a single patch for one joint of scaled motion tracking data.

![Figure 21: Scaled motion tracking data](image)

The scaled data for each of the 87 tracked values is sent to an additional user-influenced patch for further processing. It is here that the specific movements are analyzed, and decisions are made based on frequently used patterns.

Motion tracking is used in conjunction with sound in two ways: to influence pre-existing shapes and to exert direct control over sound processing agents. Examples of direct control include triggering events such as in the initial entrance of the dance and the transition phrase that leads to the “Aggressive, Disconnected” section. More involved examples include those in which the behaviors of certain joints are measured and averaged over time. In this case, a response is then triggered after meeting a series of conditions. An example of this can be found in the “Ostinato and Petals” section as the dancer is throwing the petals throughout the space. A threshold for speed for the Y position of the right hand is set, and when that threshold has been crossed, a trigger is sent to a table. The table selects a number from 0-9 with weighted probability. The resulting numbers are sent to one of three different sound file playback units and a sound file is triggered. This patch is shown in Figure 22.
Examples of direct control are those in which the data from a given joint has been scaled and directly mapped to control aspects of the texture. This is frequently used throughout the piece to alter parameters such as the panning position of individual and global sound streams, granular patterns, and pitch bend factors.

Motion tracking data is also used in tandem with predesigned computer shapes. An example of this can be found in the “Ostinato and Petals” section as the X position of the head is used to influence the jitter factor of a self-generated Gaussian shape.
Conclusion

This work represents several new directions for me as a music technologist and composer. It provided the opportunity to further my research in interactive computer music and intermedia and to develop custom software to facilitate an interactive environment. Through the development of the software for this piece, various design strategies involving input tracking and analysis, motion tracking, sound processing, and cue control were explored. My research in these areas will extend beyond the scope of this composition, as this software will be used in future creative projects. Furthermore, I have been developing additional tools for pattern detection that will be featured in upcoming collaborative works involving real-time sound and video manipulation.

Collaborating with dance led me to discoveries that could not have been made through working with music alone. In particular, movement-influenced data served as an influential source in generating musical material. Using motion-tracking data in tandem with computer-mediated structures provided the necessary amount of balance between human decisions and predesigned data structures. In fact, I have decided to create further pieces incorporating this method.

While the ensemble featured in TransFantasies may be uncommon, interactive media featuring musicians and dancers is a growing artistic field. To this effect, this piece is a continuation of a long line of intermedia works beginning with the early collaborations between John Cage and Merce Cunningham. I am inspired by the developments and discoveries that took shape in this piece and I look forward to future collaborative works that feature technology in engaging manners.
Bibliography


PART II

MUSICAL SCORE
TransFantasies

for

flauto traverso, computer music, and dance

Jason Fick
(2012)
TransFantasies is an interdisciplinary work for Baroque flute (*flauto traverso*), dancer, and computer music. The piece requires two computers with at least a 2.5 GHz processor and 4 GB of RAM. A wired LAN must be established and connected with a hub or crossover cable. Both computers must have MAX/MSP 5.1 or later.

An Xbox Kinect controller is used to detect the motion of the dancer. The secondary computer will handle the motion tracking using Synapse (http://synapsekinect.tumblr.com/). The Synapse program detects the values received from the Kinect controller and converts them into OSC. A custom patch designed in Max/MSP receives the OSC data, scales the values, and sends them to the main computer for processing.

A microphone must be used to amplify the signal from the player. A lavalier omnidirectional is preferred (a DPA 4060 Omnidirectional mic was used during the premiere of the piece). Attach the microphone to the clothing slightly below the left shoulder of the player.

The main computer is to run a custom software patch designed to handle audio and motion input tracking, sound processing, and the scheduling of events. The patch requires a computer musician to advance cues throughout the performance. The specific timing of each cue is notated in the score with a number enclosed inside of a diamond shape as shown.

The preferred stage set-up for this work is one where the chairs are placed in concentric circles. The *traverso* player and dancer are to perform in the center circle. A diagram of the intended performance space is shown below:
Performance Note

This piece was written for a traverso tuned at A-415 and must be performed with this flute type as the intervallic material, timbre relationships, and computer music component has been crafted specifically to this tuning.

A great deal of liberty is given to the performer in terms of interpreting duration. For the most part, duration is indicated without a regard for tempo. Note length is indicated by the distance of notes to each other and through differentiating the types of note heads. Solid notes appear in small and medium varieties and whole notes appear with and without extended duration information. Whole notes that are to be held longer than an expected length are shown with solid lines connected to the next gesture.

Flattement, trills, vibrato, and pitch bend are indicated with a suggested shaped upon which the performer is given the freedom to interpret the specifics in term of speed, intensity, and duration.

There are several digital modifiers used in this piece to alter the signal of the traverso in real-time. When necessary, indications are notated in the score as follows:
During the *Ostinato and Petals* section (Rehearsal Letter E), the player is instructed to repeat the given ostinato pattern continuously while varying the speed, dynamics, and overall intensity as she feels fit, while allowing opportunities to be influenced by the actions of the computer music and dancer. After sufficient time repeating the ostinato (30-45 seconds), the musician is to stop the playing the ostinato and to select one of the given interruptions. After playing the interruption, the player is to continue on with the pattern as left off. This pattern of alteration between ostinato and interruptions is to continue for the remainder of the section. After completing a complete cycle of all interruption, the player is free to alter the characteristics of the interruptions (pitch, dynamic). The section is shown below for further clarification.

**E Ostinato and Petals** see performance note for instruction on this section

30 – 44 advance cues every 10-15 seconds in an effort to articulate flutist's and dancer's actions with new cues

<table>
<thead>
<tr>
<th>Interruptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>tr.</td>
</tr>
<tr>
<td>cpu</td>
</tr>
</tbody>
</table>

There are also points in the piece in which the *traverso* player is to wait for a cue from the dancer in order to continue to the next section. When necessary, these relationships are notated in the score. An example can be seen below:

21 gradually increase intensity until soundfile hit as cued by dancer

tr. | mm |

Initiating Cue from Dancer
TransFantasies
for traverso, computer music, and dance

Jason Fick
(2012)

Score

Reposed, with erratic outbursts

1. traverso
   \( \text{unfocused tone} \)
   \( \text{Breath Vib} \)
   \( \text{flattening} \)

2. computer
   \( \text{Pitch Shift} \)
   \( \text{Granulation} \)

3. \( \text{did}' \text{ll} \)
   \( \text{freeze} \)

4. tr.
   \( \text{mp} \)
   \( \text{sfz} \)

5. cpu
   \( \text{n.} \)

6. \( \text{Grain Disperse} \)
   \( \text{sound file playback} \)

7. TransFantasies
   Jason Fick
(2012)

Score for traverso, computer music, and dance

47
TransFantasies

```
tr. 

```

```
cpu 

```

```
cpu 

```

```
cpu 

```

```
```
TransFantasies

---

**C**

Granular Transposition

- Begin slowly
- Accel.
- Molto rit.

- Granular Transposition

---

**D**

Dance Entrance: Spacious and Exploratory

- Respond and anticipate influential pitches in the computer part

- Wait for metal chattering

---

**Fixed Media Playback**

- Pitch bend on live input
- Only pronounced pitches are indicated

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49
TransFantasies

**E Ostinato and Petals** see performance note for instruction on this section

- advance cues every 10-15 seconds in an effort to articulate flutist's and dancer's actions with new cues

**INTERRUPTIONS**

- Play this when dancer falls to floor

traverso, dancer, and computer music influence behavior
TransFantasies

accel. -- -- -- -- -- -- molto rit.
flutter

Dance and Computer only
Freeze and FM fade out
Granulation pitch factor varied

Calming Aftermath

Delay Fade
TransFantasties

Degrade Fade

Adagio

Slower

Granulation Fade