

## **Expanding a Taxonomy of Instrumental Grouping Effects to Align with Contemporary Musical Practices**

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### **Abstract**

Concurrent instrumental grouping phenomena as explained through the established body of empirical research into the perception of orchestration can be at times challenging to map onto the diverse musical experiences heard across contemporary Western art music. McAdams, Goodchild, and Soden (2022) presented a Taxonomy of Orchestral Grouping Effects. I present a revision and expansion of this taxonomy that I found useful when considering recurring approaches to instrumental grouping I observed in contemporary music. The taxonomic expansion I am suggesting is based on interviews with, and analysis of the music of, current composers and performers, including students, faculty, and staff at several academic institutions and at international new music workshops. The goal of this expansion is to promote the application of theories across different musical practices, identify gaps in knowledge, and reveal opportunities for further empirical research.

### **Background**

Early studies into instrumental grouping have primarily focused on performance of discrete pitch dyads and melodic lines being played in parallel (Kendall & Carterrete, 1993; Sandell, 1995). In a lecture addressing timbre and orchestration at Darmstadt, Adorno (1966/2021) says of the music of his contemporaries: "...these tendencies can be found in the most recent music: the growing importance of timbre—precisely because it is no longer subordinated to motivic-thematic events, which no longer exist in the sense that they once did"—pointing out a paradigmatic shift from pitch-centered organization to timbre-based compositional practice. Post-tonal music's rise to prominence starting in the 20th century means that studies which assume the centrality of melodic lines and discrete pitch structures are limited in their applicability to contemporary musical practice. Although the perceptual and acoustic features uncovered in these studies are all still valid, the context within which they appear in contemporary music is at times vastly different. An example of the importance of such context already present in McAdams et al.'s (2022) taxonomy (which I will abbreviate as the TOGE from now on) is sound mass music as an instance of concurrent grouping. In the context of a sound mass, as opposed to performing a dyad or parallel melodic line, musicians can achieve grouping without maintaining synchronicity between the constituent instruments (Noble, 2018). The TOGE also affords for evolving timbres that would otherwise not trigger a discrete event formation by further splitting formed events into "stable" and "transforming" (and "punctuated"). These transforming events are not a part of sequential grouping, but concurrent grouping, in the TOGE. I will show why I found that this taxonomy, though already incredibly useful, is not always a good fit for contemporary music.

### **Methodology**

To support the taxonomic expansion I propose here later, I will first present a few brief case studies that exemplify considerations missing from the TOGE or instances where the existing taxonomy does not align well with a conception of certain music. The case studies I will present are drawn from my work investigating approaches to instrumental grouping in contemporary musical practice as part of my dissertation work at McGill University. The data I build upon is inherently limited in scope by my own

experience and positionality. The point of departure is still institutionally supported Eurocentric art music, even if it is more contemporary than the traditional Western classical canon. The data I collected which inform this paper include: unstructured interviews with faculty composers of the Analysis Creation and Teaching of Orchestration (ACTOR) partnership; 3 Composer-performer Orchestration Research Ensemble seminars held at McGill University (Quebec) and at UC San Diego (California) over the past 4 years, including session and discussion recordings, score analyses, and structured interviews with the composers and performers; and semi-structured interviews with advanced students at IMPULS academy (Austria), Darmstadt Ferienkurs (Germany), and UC San Diego about their music and practices with relation to instrumental grouping.

### **Case Studies**

The varied musical contexts present in contemporary music at times require consideration of additional features of the perceived sensory scene not yet systematically investigated within the field of orchestration research, and at other times suggest a shift in categorical boundaries. I point out where friction arises between the TOGE and the music I encountered in my research using a small selection of example cases, presented below. Following this section I will propose an expansion of the TOGE based on the problems identified through these examples.

In the short text score *Sonic Meditations XVI*, Oliveros (1974) instructs the performers to start singing at the same time with each choosing their own pitch, presumably resulting in a cluster of randomly selected pitches. Then, as each performer takes a breath, they are told to restart singing with a pitch they deem as approaching the average of the rest of the singers. Once unison is achieved, the performers are to reverse the process, returning to a diffuse set of pitches like in the beginning. In a possible performance we can imagine an initial sound mass of sung pitches slowly converging into a fused drone of one pitch, then slowly expanding back out to a diffuse sound mass. In such a performance, listeners are likely to notice the categorical shifts in musical texture—from diffuse sound mass to fused unison and back to sound mass—and be able to discuss formal segmentation such as an ABA structure, albeit with somewhat fuzzy borders. Given a sufficient number of singers, listeners might not be able to detect any individual singer stopping to breathe and beginning a new pitch, thus maintaining a perceived continuity. Following the TOGE model, this entire performance could be heard as a single concurrent event. Though the TOGE allows for concurrent groupings to transform over time, there seems to be an uncomfortable mismatch when the entire work, with its ABA structure, can be categorized as a single auditory event; while these continuously evolving events are described in the TOGE as possibly lasting as long as a musical phrase, the implication in the perceptual process flowchart (provided in the TOGE article as Example 2) is that these events are mere building blocks that feed into the perception of larger temporal structures of music.

Further examples of a sustained continuity that transforms over time can be seen in Czernowin's *String Quartet* (1995). In mm. 38-40 the string quartet is sustaining a dense chord: without vibrato in mm. 38, then in mm. 39 they continue with a rhythmicized vibrato that is synchronized between Vn.1 and Va., and between Vn.2 and Vc., but not between the two pairs of instruments, and finally at mm. 40 the instruction for all is to "keep vib. in rhythmic unison". All three measures are one event, with a strong onset at the beginning of mm. 38, but the overall timbre, and potentially the perceived groupings, are changing from measure to measure without being tied to separate discrete events, instead based on processes such as comodulation or common fate. In the TOGE this could potentially be categorized as a sequential grouping that is transforming between segregation and integration, though this description isn't strictly in the taxonomy. The above string quartet example, utilizing notated rhythms for the strings' vibrato, also raises another feature of contemporary music that is understudied in empirical research—extended instrumental techniques. Contemporary musical practice features a growing number of extended instrumental techniques that afford detailed musical parameter control, as seen above, allowing for complex behaviors that do not align with the presumption of discrete pitched events as universal building blocks.

In Takasugi's *Sideshow*, a 2016 piece for instrumental octet and electronics, an added layer of the visual and physical presence of the performers is used in the orchestration itself. For instance, instrumentalists are instructed to mime actions played in the electronics, creating a ventriloquist's illusion of the instruments producing the sounds that are actually coming from the loudspeakers. Takasugi then slowly decouples the two, traversing a confusing liminal space, until the illusion is undone. Power (2016) reports of the premier "Most of the musicians' actual playing is difficult to distinguish from their miming." and "sometimes a player mimes music being performed elsewhere in the ensemble; sometimes a player mimes electronic music they could never, quite, have played." The electronics are carefully produced to support these illusions—taking into account the acoustics of the room, speaker placement, etc. to make sure the overall timbre of recorded and live sound can each be confused for the other for as long as the illusions need to be maintained. The illusions described above, and their undoing, are strongly tied to the notion of sound source identification that lies at the heart of auditory scene analysis and the TOGE, yet currently visual and theatrical matters are left outside of the scope of orchestration research.

One last example for a phenomena underserved by the research underlying the TOGE is gestural integration. This concept is not well defined in the orchestration research community, yet it comes up repeatedly in discussions with musicians about their practice and approach to instrumental grouping. One example can be seen in Diba's *Reaching for the Unreachable Point of Desire* (2020) composed for the Composer-performer Orchestration Research Ensemble seminar held at McGill University. The opening two measures exhibit a shared gesture of rising energy that the composer indicated in seminar discussions as the main thematic seed in this work. In the second measure of the gesture, each instrument exhibits contradictory behavior in pitch: two rising at different rates from each other, a third staying fixed, and one descending. There is no common fate being observed in the strict sense (aside from the rising dynamics), but a shared gesture is perceived nonetheless. The instruments are not fused but still perceived as grouped. Gestural integration is a topic in orchestration research I suggest is in great need of further study.

### **Proposed Expansion**

First, I suggest expanding the underlying theoretical basis of auditory scene analysis to audio-visual scene analysis. Though the focus in most musical studies understandably revolves around the sonic experience, in order to properly engage with current practices we need to expand our understanding of the perception of sound sources and actions beyond the purely sonic, so that we better match the expanded notion of musicking in contemporary aesthetic experiences. This expansion promotes considering the effects a performing body being present on stage, or visuals in a multimedia composition, can have on the perception of the music being heard. Though, at its core, musical scene analysis revolves around the formation of auditory streams or objects in our perception that represent physical, illusory, or abstract sound sources, there is no reason to ignore the visual cues that might affect the perception of sound sources. Within audio-visual musical scene analysis, I suggest we can observe two types of sound source formation—object definition and action identification—each with its own subset of strongly linked perceptual features. Figure 1 shows my proposed taxonomic categories.

Object definition—the mental formation of a source object to associate incoming sounds with—would include acoustic features and perceptual processes such as harmonicity, timbre-space overlap, and complexity-collapse. Harmonicity and timbre-space overlap cues can suggest a shared oscillating/resonating body, similar materiality, and/or a shared enclosing space. I suggest instrumental blend and fusion are instances of object definition. In contrast, rather than focusing on cues that line up to support the definition of a unified source object in our mind, complexity-collapse is the process by which the individual differences that remain are too numerous to process among the only-partially-similar grouped sounds, leading to a sense of multiplicity within the perceived combined source object. The potential for visual cues to strongly bias the overall definition of an object in a sensory scene—like an act of instrumental ventriloquism—can be accounted for in this taxonomy, as objects can have other attributes beyond the purely sonic. While strongly tied to concurrent grouping and the mechanisms of event

formation in McAdams et al.'s model, this category also affords for object permanence over time, allowing to associate separated events, segments, and long auditory streams with evolving sonic parameters to the same source object.

Action identification is the process by which concurrently sounding objects appear to be unified by their response to an underlying force acting on the objects as a group. This includes the sounds exhibiting common fate in their behavior, such as parallel envelopes in pitch, spectra, or loudness. Two more phenomena I place in this category are that of gestural integration and similarity of activity. In gestural integration multiple sounding objects exhibit changes in musical parameters that can be different—orthogonal in parameter space or even similar in parameters and opposite in direction—but that exhibit enough synchrony and similarity in the rate of change of said parameters that they sound as if they are caused by a shared underlying force acting upon them at the same time. When considering audio-visual scene analysis, this grouping process could also be reinforced by seeing an appropriate action being performed. For example, showing a performer actually causing multiple instruments to sound out with one physical gesture, or a choreography reinforcing an abstract mental image associating physically decoupled sounds with a seen gesture. Next, similarity of activity can promote the formation of layers based on a shared rhythmic pattern or other group activity that suggests their association. Action identification does not necessarily result in the inability to hear the grouped instruments apart, but it does promote their collapse into a single layer of music if multiple layers are present. In the TOGE, an event with evolving timbre is part of a concurrent grouping, while a melody of discrete pitches is a sequential grouping. I would categorize both as instances of an identified action causing change in the musical parameters of a defined object.

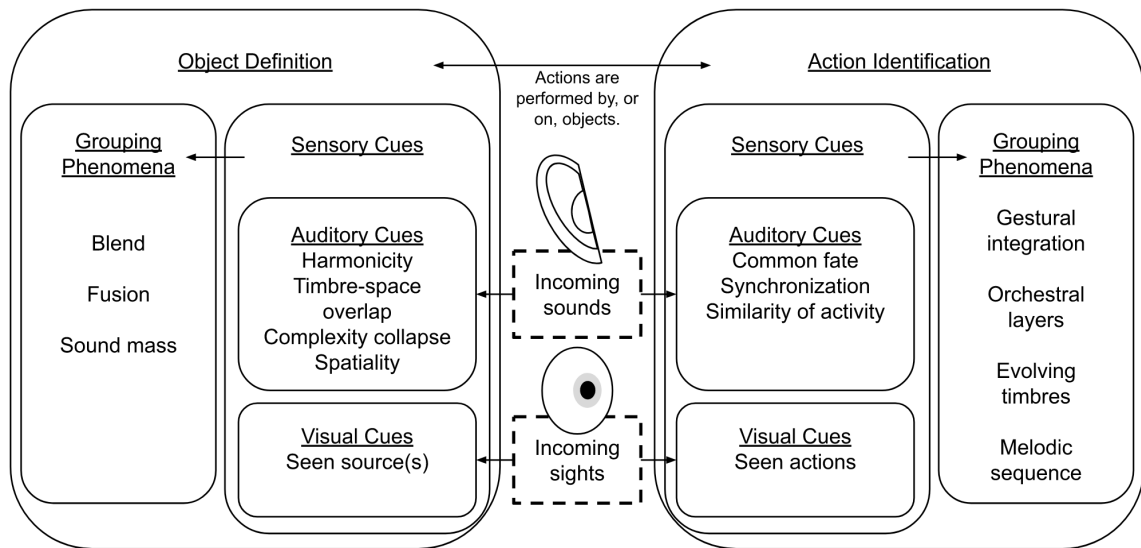


Figure 1: a diagram of the proposed taxonomic categories showing perceptual cues and concurrent instrumental grouping effects associated with each category.

### Further Discussion

One topic I have not covered in this article is the notion of embodiment in music. I believe this notion is better supported with the object-action categories I propose. I do not yet feel sufficiently informed on how different musicians use the term, but it has come up in conversations with practitioners and seems to be a central lens for thinking about music for many contemporary artists. Similarly to gestural integration, embodiment seems like an area not currently investigated enough within orchestration research.

The intention behind the work in this paper isn't to replace the TOGE, but to build upon it, and do so in a way that better maps contemporary musical practice onto perceptual phenomena. Also, by attempting to

make a taxonomy that is more applicable to current practitioners, I hope I can help orchestration pedagogy and research become less reliant on examples drawn from the notoriously exclusionary traditional Western canon. The categories I propose here are not yet supported by empirical psychoacoustic research, but on qualitative data primarily revolving around how musicians conceptualize and talk about their approaches to instrumental grouping. I believe the difference between the taxonomies mainly arises from the TOGE being formulated based on empirically tested bottom-up perceptual processes in pitch-centric music, while my taxonomy came about through my attempts to map the top-down sense-making of contemporary musicians onto the phenomena described in the TOGE. My taxonomy emerged as a consequence of my ongoing research, and will certainly evolve further as my work continues. Moreover, within the scope of this paper, I could not cover every approach I came across while working on instrumental grouping in contemporary music, nor have I exhaustively discussed all aspects of the TOGE in relation to my proposed taxonomy. I invite the readers' questions, suggestions, and challenges so that this work can continue to grow and be refined into a more useful conceptual tool for researchers and musicians alike.

## **Conclusion**

In summary, theories initially formed while focusing on the common practice Western orchestra are not always well suited to investigating contemporary music. Although the empirical studies behind McAdams et al.'s TOGE narrowed their scope due to practical necessity, now that a theoretical basis is formed, we need an expansion of scope in order to increase relevance to contemporary artists. In this paper I proposed taxonomic categories based on observed contemporary musical approaches to instrumental grouping that overlay on top of the TOGE and that are better aligned with the practices of current practitioners. I also identified understudied phenomena, and pointed towards potential areas of future study.

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