Waveguide Model II

for any number of performers
and any instrumentation

A sibling to Waveguide Model I, which was
commissioned by PRISM Quartet, Inc.
with support from
The Pew Center for Arts & Heritage

Dan Trueman
2019
Preamble

*Waveguide Model II* is a new variation on *Waveguide Model I*, a collective decision-making piece created for the PRISM Quartet, inspired by emergent phenomena like flocking and schooling as well as pieces like Riley’s *In C*, Andriessen’s *Workers Union*, many of Cornelius Cardew’s works (*The Great Learning*), and my own *Clapping Machine Music Variations* and *There Might Be Others*, all of which are participatory pieces in some fashion (see the postamble for more of a pre-history and rationale). The first "model" (for PRISM, and made in collaboration with director and video artist Mark DeChiazza) was composed with the broader aim that meaningful interaction and feedback between the players and other elements, visuals in particular, might be possible, and while this new model doesn’t explicitly address that possibility, it can be explored and incorporated in any particular performance as desired by those involved.

A waveguide, as its name implies, is something that guides the movement of waves; a canal is one example, fibre optic cable is another. In music, strings are waveguides, as are tubes, which guide waves to oscillate at particular frequencies (the saxophone itself is a kind of complex waveguide!). Flocks and schools are also, in a way, examples of waveguides, where perturbations flow through the flock in specific, controlled ways. Most broadly, a waveguide is a set of constraints for how material or objects might move or flow, shaping but not fully determining what sorts of patterns might emerge.

In this piece, the members of the ensemble are elements within a kind of compositional/musical waveguide, following a set of specific constraints, but making choices that shape the emergent music. As such, there is no conventional “score,” but rather a set of instructions (the “model”) and examples.

— Dan Trueman
Princeton, NJ
February, 2019

© 2019 Many Arrows Music
The Model, and Instrumentation

The primary elements of this piece are the wavelets, which comprise both hinge tones and wave tones, and the waveguide following rules, along with a set of potential initial conditions. I’ll describe each, along with many examples and practice exercises.

Wavelets

The wavelet is the fundamental smallest element in this piece, and at its core is dead simple: a kind of neighbor-tone figure, consisting of a hinge-tone (the first tone) and a wave-tone (the neighbor-tone):

Wavelets are repeated ad infinitum, constrained by various following rules described later. They have a range of modes and features, the most fundamental being the four paired strict features:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Example 1</th>
<th>Example 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rising/Falling</td>
<td><img src="image1" alt="Example Image" /></td>
<td><img src="image2" alt="Example Image" /></td>
</tr>
<tr>
<td>Open/Closed</td>
<td><img src="image3" alt="Example Image" /></td>
<td><img src="image4" alt="Example Image" /></td>
</tr>
<tr>
<td>Soaring/Beating</td>
<td><img src="image5" alt="Example Image" /></td>
<td><img src="image6" alt="Example Image" /></td>
</tr>
<tr>
<td>Big/Small</td>
<td><img src="image7" alt="Example Image" /></td>
<td><img src="image8" alt="Example Image" /></td>
</tr>
</tbody>
</table>

Note that these are all in pairs, reflecting two different states for each feature (a wavelet can be rising OR falling, it can be open OR closed, etc...). This will be important later. Of course, these can all be combined in various ways, so we might have the following:

Small/Rising/Closed/Soaring  Small/Falling/Closed/Beating  Big/Falling/Open/Soaring

Naturally, wavelets can be varied in other ways. I categorize these as relaxed for reasons that will become apparent later. Here are some examples:
Countless others are of course possible. The rhythmic variations are obviously contingent on the prevailing sense of meter, to be addressed shortly. The articulations, ornaments, and dynamics are what might be described as expressive features, and it is crucial that the players be conscious and proactive in shaping the wavelets in thoughtful ways, and in ways that can (at times) create larger phrases and shapes.

Practical factors also play a role; for instance, the need to breathe, or rest the bow arm, or simply a sense that the texture should thin, might encourage a player to stop, leave a gap, make space.

Unlike the strict features, none of these are paired in opposites; rather, these are more open categories, which will have clearer significance when we get to the waveguide following rules.

**Hinge and Wave Tones**

For *Waveguide Model II*, the center pitch for the wavelets, or the hinge-tone, will begin on concert D, in any octave, while the wave-tones can be any chromatic pitch above or below the hinge-tone. At first, this simply means that everyone will begin on some kind of D, and then “wave” from there to essentially any pitch above or below that D.

For continuously pitched instruments, these wave-tones should aspire to be just-tuned relative to the hinge-tone, according to this system:

Above are the frequency ratios for each pitch, relative to D, and below are offsets (in cents) from equal-temperament. If you are familiar with Helmholtz-Ellis just-intonation notation (http://www.marcsabat.com/pdfs/legend.pdf), this may also prove useful:
Note that this is arranged, after Harry Partch, in a symmetrical under/over fashion, where a m7th down (D4-E3-D4) wavelet will result in a differently tuned E than a M2nd up (D4-E4-D4) wavelet:

The key is that the interval (not the scale degree) be just-tuned, whether it is going up or down. And of course these intervals can be compound as well (where, for instance, a keyboard player is playing very low and high notes with opposite hands).

Don’t get hung up on the tuning, however! It is ok for it to be aspirational, or even forgotten at times in the heat of the moment; there can be a lot to think about when playing this piece, and the tuning goals are there to help structure your choices, not paralyze you.

Discretely pitched instruments naturally will ignore this, which might result in tuning clashes with other instruments; if you end up in this situation, either embrace these clashes, leaning into them, or use this as a reason to change your wavelet to avoid the clash. More on this later.

At any point, a player may decide to transform their wave-tone into a new hinge tone. Why and how someone might make such a decision is addressed in a later section (Waveguide Following Rules), but here is an example of how this might work, where the wave-tone (G) becomes the hinge-tone:

The tuning system (for that player) should then move to this new hinge-tone, so wave-tones will be just-tuned above/below this new hinge-tone. Consider the simple example where a player switches to the G hinge-tone and then plays a m7th above that, tuned as a just 7/4 7th over G:
Again, don’t let this sort of tuning become a question of perfectionism; in fact, *discovering the tuning as you play* is fine, even encouraged! In the example above, you may begin playing the F as it comes, and then gradually adjust the tuning as you repeat it.

How do we know whether a particular wavelet is “big” or “small?” That’s really up to the players themselves, and should only really be a question with intervals around the 4th and 5th; again, not something to get hung up on.

Finally, it’s definitely possible to become “unhinged” and stray too far from where you began, or just become disoriented; whenever necessary or desired, just return to a D hinge-note — it is a kind of home pitch, or tonic.

---

**Tempo and Entrainment**

There is no fixed tempo, pulse or meter in *Waveguide Model II*. I am interested in hearing how any performance might converge on a particular pulse or metric structure, and how that might change over the course of piece, vanish completely, re-emerge, and so on; more broadly, this is a question of *entrainment*, or how groups of individual synchronize spontaneously. Rather than plan (or “compose”) how this might happen, I am more interested in setting up a framework where it can happen in ways that are contingent on the performers, their instruments, their preparation, their interests and choices.

That said, I would like to give a bit more to go on than just that, so, just as D is the “tonic” for the pitch world of this piece, 120bpm is the base tempo; before the piece begins, players should have a sense of 120bpm in their ears and bodies, even if they don’t begin playing explicitly at 120bpm. And just as there are over- and under-tones to the wavelets, I would like to favor triplet multiples and divisors of 120bpm: 80bpm (120 * 2/3), 55.5bpm (80 * 2/3), 180bpm (120 * 3/2), and 270bpm (180*3/2):

Individually, these moves are fairly straightforward, playing 3’s against 2’s, or 2’s against 3’s, and so on, but when they are combined, it can become challenging; as the figure above shows, we end up with 9’s against 8’s, or even further afield. The aim is not to try to execute these difficult polyrhythms, or even to stay in a fixed tempo, but to work with simple 3’s against 2’s and see where they take individual players, subsets of players, and the group as a whole; it may totally fall apart, or stratify into separate groups that seem to be going at unrelated tempi, etc….

One of the reasons for this structure is to give consistency to how we think about meter and rhythm in the piece, but also to invite mechanically based instruments like drum-machines, delay-instruments, step-sequencers, and so on to join and be configured so that they share these tendencies; more on this in the next section.

All that said, wavelets can be played at any pace, in any rhythm!
Instrumentation

Any instrument, voice, electronic device, prepared instrument, pitched or unpitched, is welcome!

You may wish to prepare your instrument in such a way that makes it easier or more interesting for you; for instance, string players might want to explore scordatura that emphasize D (ADAD for the violin, for instance); or, a percussionist might cut a set of pipes so that they use a subset of the tuning system here; and so on.

You might also play multiple instruments, switching between them, or singing while playing another instrument.

I would like to issue a special invitation to those who work with electronic instruments to try to configure them so they facilitate both the tuning and tempo structures described above. You might setup a delay line or drum machine with presets at the five tempi, or you might build in tuning that by default uses the D-just system, or is even adaptive so that it moves with the hinge-tones. I have created a set of preparations for bitKlavier (http://bitklavier.com) that does both of these things and suggest that in any performance of this piece at least two people play this instrument; it offers the opportunity to fairly easily imbue the performance with both the tuning and tempo ideas described here.

Once you have bitKlavier setup and working and you’ve put the gallery for this piece in the “galleries” folder, you can open the “Waveguide Model II” gallery; it should look like this:

You can poke through this to learn how it works, but here is a summary:

- The tuning will work as described, always tuning just above/below a given hinge-tone (even as the hinge-tones move far from D); so the examples described earlier, with the two differently tuned E’s, and the 7/4 m7th above G, will both be tuned as expected (you can confirm this by opening the Tuning preparation—the green tuning fork—and monitoring the “note” value).
- Playing ANY D will always reset the hinge-tone tuning back to D; D is home, the tonic
- The five central D's (along with at least one other note) on the instrument will set it to pulse at the tempi as follows:
  - D6 => 270bpm
  - D5 => 180bpm
  - D4 => 120bpm
  - D3 => 80bpm
  - D2 => 55.33 bpm

- Playing a single note will silence the pulse, whereas playing two or more notes will launch the pulse, or restart it if it’s already going.

It’s best just to play with it to discover how it behaves! Again, the aim of having this in the piece is to provide some context for both the tuning and tempi, and also to suggest an approach for how electronic instrument might be configured to work well here. Please feel free to modify these preparations, if you are so inspired, or make a new set of preparations that expands on, or complements, these.
Waveguide Following Rules

How to play all this... *together*? The basic principles are as follows:

- attend to one other player at all times
- endeavor to replicate the wavelet they are playing
- if desired, “flip” one or more of the strict wavelet features
- if desired, change the relaxed wavelet features
- if desired, use the same hinge pitch they are playing... or not.
- take as much time as you need to do the above, perhaps converging on your target wavelet over the course of several repetitions
- if whom you are following is playing something radically different than what you are, perhaps only change one or two things in response to what they are doing, instead of going for total replication
- try to entrain with others, but don’t worry if you don’t
- if you like, change who you attend to occasionally (but not too often!)
- rest as needed
- listen

Imagine a scenario with four players, one following the other, at a fixed tempo; here are some examples of how this might go, if it were handled in a really strict manner, with imaginary SATB instrumentation:

1. No flips.

2. One \textbf{Rise} \leftrightarrow \textbf{Fall} flip.
   
   Note how the flip cascades through the quartet.

3. One \textbf{Soar} \leftrightarrow \textbf{Beat} flip.
   
   This clarifies how “soar” works; you wait until the cycle completes, so four beats in this case. It would be shorter if there were fewer players, or if the time separation between the players was smaller.
Notice that with each of these, a repetitive pattern settles in, so it would be possible to get to know these and play them without doing any following; that misses the point of the exercise and leaves you unprepared to deal with variations that might arise, intentional or otherwise. While there will surely be moments in a performance of *Waveguide Model II* where this sort of stability sets in, it will be important to continue attending to what your leader is doing so you can adjust as needed.

Notice also how it may be difficult to tell in time if and what your leader may have flipped. For instance, in example 6 we have an 8th-note spacing between players, which means that wave cycles around every two beats. This means that the “soar” wavelet (in the soprano, for instance) will last two beats before repeating, and in this case, when it does repeat, it flips to a “beat” wavelet. With this closeness of spacing, it can be difficult (depending on the tempo) to actually know what your leader is doing before you begin; for instance, at what point does the soprano know that the baritone is “beating?” If you can’t tell in time, and do the “wrong” thing, just correct as soon as possible, which will have implications for your follower; so already, with a strict waveguide, we have the potential for some variability, and the importance of listening rather than settling into a pattern is crucial.

In practice, I am imagining a more relaxed approach to following the waveguide rules, where they are useful rather than imprisoning. However, practicing with a strict approach can be useful, as described shortly.

4. Both flips from (2) and (3).

Note here how you have to change more than one feature of what you are doing, even as you are flipping only one of your leader’s features.

5. Three flips.

6. Smaller time distance between voices.
Practice/Rehearsal Approaches and Materials

Individual Wavelet Variation and Waveguide Practice Exercises

The first task is to become comfortable with the strict wavelet features, in combination with the range of hinge tones available on your instrument. There are sixteen wavelet variations if you take into account only the four strict features (a 4-bit system):

1. Rising / Open / Soaring / Big
2. Rising / Open / Soaring / Small
3. Rising / Open / Beating / Big
4. Rising / Open / Beating / Small
5. Rising / Closed / Soaring / Big
6. Rising / Closed / Soaring / Small
7. Rising / Closed / Beating / Big
8. Rising / Closed / Beating / Small
9. Falling / Open / Soaring / Big
10. Falling / Open / Soaring / Small
11. Falling / Open / Beating / Big
12. Falling / Open / Beating / Small
13. Falling / Closed / Soaring / Big
14. Falling / Closed / Soaring / Small
15. Falling / Closed / Beating / Big
16. Falling / Closed / Beating / Small

Two simple exercises:

1. play each variation on various hinge-tone available on your instrument, to get the lay of the land
   - play these:
     - at different dynamic levels
     - with varying articulations
     - with a range of ornaments
     - with any other expressive variations that you can find

2. with a metronome, at varying tempi:
   - loop a variation continuously, and then decide in the moment to flip one feature; repeat
   - loop a variation continuously, and then decide in the moment to flip two features; repeat
   - loop a variation continuously, and then change hinge-tone; repeat
   - loop a variation continuously, and then decide in the moment to change to an entirely different variation; repeat
   - actively integrate “relaxed” features

A waveguide following exercise:

• record yourself playing wavelets with occasional flips, and with various “relaxed” features
• imagine your recording as your waveguide “leader” and play along with it (at varying time spacings), assigning yourself specific flips to apply to what you hear
• repeat
GroupWaveguide Practice Exercises

**Duo practice exercises:**

Take the individual waveguide following exercise above, but replace the recording of yourself with another player, as follows:

1. assign one player to be the leader, the other the follower
   - leader repeats wavelets with occasional flips, follower copies
   - leader repeats wavelets with occasional flips, follower copies, but with an assigned flip of his own (for instance, if your leader plays a rising wavelet, you play a falling wavelet)
   - similar, with two assigned flips for the follower (i.e. Rise <=> Fall and Beat <=> Soar)
2. try to follow one another
   - either can introduce occasional flip, the other copies

With this, following should happen as soon as possible, and you should experiment with varying tempi and time spacings between you, while introducing dynamics, ornaments, and other relaxed features as you become more comfortable. You might also just want to take it out of tempo, even talking briefly between repetitions to think through various approaches. Also, try with different hinge-tone relationships; unisons to registrally distant.

**Group practice exercises:**

Sit/stand in a circle and follow the person to your left; the group should now be a closed loop that wavelets can flow through.

To start, attempt a strict waveguide by having one player start with a simple wavelet (say, a whole-step neighbor-tone figure) and allowing it to propagate through the group.

At first don’t change anything, but then gradually allow single flips of strict features (rising becomes falling, open becomes closed, etc…). Things can get hairy pretty quickly so try to keep it from falling apart; stop and restart as needed, trying different initial wavelets.

Focus on particular kinds of strict changes. Perhaps assign one person to always to a particular kind of flip.

Instead of flipping strict features, explore changing the character of the wavelets through the various relaxed features described earlier. Explore dynamic ranges, making space, changing the textures, etc…

Don’t worry about staying together in a pulsed manner, but if a pulse emerges, embrace it, or transform by playing 3-against-2, or 2-against-3, as described earlier.

Reverse the listening direction, following the person to your right, repeat the above.

Allow players to change who they are listening to mid-stream.

Experiment with varying the strictness of the following, sometimes trying to be super strict, other times more relaxed and free.

Stop often, talking about what works, what doesn’t, what’s hard, what to try next. The idea is to get used to a range of possible scenarios and to get comfortable responding and provoking.
Initial Conditions

I imagine a performance of this piece as a kind of snapshot of something that has been going on before we arrive and would continue after we leave, without clear beginning or end, much as our experiences usually are when we encounter flocks and schools. But, we do have to start somewhere, and to that end we have a catalog of initial conditions, short moments that could very well happen in an actual performance.

To begin a performance of Waveguide Model II, choose one of these initial conditions beforehand, perhaps only seconds beforehand, or invent one of your own. This choice can be by chance or intentional, but if it is intentional, avoid choices that you made just recently; it will likely be a mistake to try to reproduce a recent performance in any way! You may want to establish a following order beforehand as well, or let people decide on the fly whom they will follow.

These initial conditions are all in four parts, under the assumption that there will be at least 4+ players involved; players should just double parts as needed, or you may decide to fragment one of these, having only a couple of the parts active to start. These are sketches, not prescriptive beginnings.

Initial conditions are useful in other ways than simply starting as well. For instance, it’s possible that a waveguide could fall apart during performance, or nearly so, and a player could on-the-spot choose one to get things started again, perhaps playing their line repeatedly so that the others recognize and join in. It may also be that, due to external forces (cues from visuals, for instance), we choose to allow jump-cuts during the performance, moments where the texture changes suddenly, as if the waveguide has ruptured and mended in a new form instantaneously.

Practice these examples, both to be familiar with them, and to get an idea of just a few of the ways the textures might develop.

Closing Strategies

How to finish a performance of such an open-ended piece? I think an enormous range of possibilities could work well. Players could leave the waveguide individually, even leaving the stage, one by one. The group could reach a climatic static point, repeating continuously, and then one player could conduct a cut-off. The lights could go dark, perhaps with a warning via projections, triggering a sudden cut-off or slow fade. A simple unison waveguide, like the Initial Condition #1, might arise and sustain itself quietly until a conducted cutoff or staggered exit. A decision can be made ahead of time about what sort of exit to go for, if that is most comfortable, or it can be played by ear, so to speak.
Catalog of Initial Conditions
\[ \text{Simplicity of notation:} \]

- **B**
  - mf
  - \( \text{slap} \)
  - \( \sum \)

- **T**
  - \( \Omega \)
  - \( \Omega \)

- **A**
  - \( \text{tr} \)

- **S**
  - \( \text{f} \)
  - \( \text{mp} \)
Interaction and Feedback: Visuals, Staging, Electronics

This waveguide binds the players together in a number of ways, but even the tightness of the binding is variable; imagine a hypothetical Strictness Knob that might be “turned” to adjust how strictly the players attempt to play the waveguide. There are many other “knobs” we could imagine, ones that “conduct” tempo, dynamics, register, ornamentation, etc…, but those are direct and controlling, whereas strictness is more of a systemic, behavioral kind of knob. Rather than create an array of many knobs that might micromanage how the musicians play, I suggest three qualitative knobs that leave room for interpretation amongst the players, but provide an opportunity for interaction with external elements, with visuals in mind in particular.

KNOBS

<table>
<thead>
<tr>
<th></th>
<th>strict</th>
<th>&lt;=&gt;</th>
<th>relaxed</th>
</tr>
</thead>
<tbody>
<tr>
<td>resistive</td>
<td>&lt;=&gt;</td>
<td></td>
<td>changeable</td>
</tr>
<tr>
<td>repulsed</td>
<td>&lt;=&gt;</td>
<td></td>
<td>attracted</td>
</tr>
</tbody>
</table>

I say “suggest” because until we try these we just won’t know what works and what doesn’t; there are surely other types of knobs that we’ll think of, and these may not work well at all.

I’ve described what I mean by strict<=>relaxed. The other two (which surely overlap with strict<=>relaxed and with each other) are meant to suggest somewhat different tendencies to go for. The resistive<=>changeable knob suggest two extremes, one where we are resistant to change, embracing the situation as it is now, and attempting to continue similarly, the other where we are unsatisfied with how things are and want to actively disrupt the status quo. How we do either of these, and what in particular we focus on, is entirely up to the players. The same applies to the repulsed<=>attracted knob, where become repulsed by, or attracted to, something (or someone, or somewhere!) in particular and adjust our playing accordingly; this could even manifest itself as physically moving to a different location on stage.

How might these knobs be turned? In Waveguide Model I, Mark DeChiazza created an interactive video system which the players then interpreted in various ways, sometimes as “turning” one of these knobs. And the knobs themselves were meant to be strict or relaxed, meaning: how closely we follow them varied. In Model II, with its open instrumentation and much less specified context, everyone will have to decide if and how these knobs should be turned, if at all; should there be hand signals, or does someone want to create some kind of video system, or flash card system, that turns them? Or are these just parameters that we keep in mind as we shape our performance?

Note, finally, that of course the players themselves can move, perhaps to be able to hear someone better, and that in itself might suggest to other players that a knob should be turned one way or another.

I also propose a series of “buttons,” messages that might be more-or-less explicit and suggest singular actions for the players. This initial list is potentially just a beginning—it’s not hard to imagine others—and I should also mention that ignoring direction is always an option (but that’s different than not having direction at all).
Again, what these might mean specifically is left to the players.

Finally, it could be useful to simply have some information to work with. While I can imagine a long list of Displays (local weather, stock market averages, Twitter feeds, etc...), and perhaps we should have such a list, I’m going to start simply with **time**: it would be terrifically useful to the players simply to know how much time has elapsed since the beginning of the piece, and having that conveyed (continuously or periodically) via visuals or some other means would be a natural.
Postamble

The Waveguide Model pieces are inspired by a wide range of systems and phenomena, and are intended to both explore and invite interactivity and feedback in music performance, as well as provide opportunities for that process to interact further with “non-musical” elements. Some questions, with regards to visuals in particular:

- how do the musicians respond to what they see (and hear) in musically meaningful ways?
- how in turn do the visuals (whether they be projections or staging/movement choices) respond to the musicians?

Before worrying about whether technology plays a role in mediating between visuals and music, I wanted to create musical materials that afforded the musicians opportunities to make decisions, which seems fundamental to the broader notions and questions we are wrestling with. Of course, these opportunities could be fairly straightforward and applied to a traditional, fully determined and notated score—play faster or louder when you see X, change your articulations when you see Y, etc...—but I was interested in exploring ideas of collective decision making and emergent behaviors, largely inspired by collaborative work I have been doing with scientists Naomi Leonard and Kayhan Ozcimder and choreographers Rebecca Lazier and Susan Marshall (Naomi and Susan’s project Flock Logic, and also my piece with Rebecca, There Might Be Others, in particular).

The approach here actually began with a movement-following idea of Kayhan’s and Naomi’s. Four people arranged in a line, each following one person and in turn being followed, in a closed loop (so, #2 follows #1, #3 follows #2, #4 follows #3, and #1 follows #4, etc…). They either move their arms (which are extended outwards) up or down, in response to what their leader is doing; given an initial condition (say, person #1 moves their arms up), then that movement will simply cycle around the circle of people, like a wave. However, introduce a “phase inversion,” or “flip”—where one person is instructed (or decides) to flip the direction, moving their arms, say, down when their leader moves them up, and the system begins to take on some different properties.

This is illustrated below (image courtesy of Naomi), with the movements of players 1–4 changing over time, measured in musical beats. So, on beat 1, player 1’s arms are directly outwards, and then on beat 2 her arms move up, and beats 3/4 her arms come back to horizontal and stay. Player 2 follows. Player three “flips” the phase, moving his arms down, which then player 4 follows, leading player 1 (on beat 9) to move his arms down. The following and flipping continues.

![Diagram of arm movements](image)
Some interesting things: this can actually be hard! And the difficulty is dependent on the tempo, physical arrangement, and so on, and how the group responds to “mistakes” is also of consequence.

With an eye towards this new piece, I worked up an analogous scheme to try with singers, where instead of moving the arms up or down, the singers would sing ascending or descending whole steps; we get the “rising” and “falling” wavelets:

So, musically the movement exercise translates into this:

This scheme was extended to include some variations on this simple motive. In addition to “closing” the interval, I introduced “open” motives:

And the notion of “flipping” was extended from switching between up and down to switching between “open” and “closed” motives: so, if you were assigned the role of flipping open/closed (or if you spontaneously decided to flip open/closed, perhaps based on some visual stimulus), and your leader was playing, say, a closed pattern, you would follow with an open pattern, that in turn your follower would have contend with:
Finally, with the singers, I also introduced “soaring” vs “beating” motives. So far, we have been looking at “beating” motives that beat continuously, like wings, until receiving different following instructions from a leader. “Soaring” motives simply sustain their final note until changes their behavior:

So our previous example might change as follows:

I use all of these types of motives and flips in this piece, and also introduce another, switching between duple and triple rhythms:

To illustrate this, let’s create some more space between the voices, having them a full quarter-note apart rather than an eighth note:

One of the characteristics of collective decision-making and emergence (as illustrated by flocking and schooling) is complex behavior resulting from simple principles, something we can see here. While performing within this system can be challenging, it affords opportunities for intervention, where outside forces (like visuals!) can impact the choices or rules, and if we embrace the challenge and accept “mistakes” as possibilities and just keep going, then the “mistakes” become absorbed into the system and ripple through.