

Composer's Note

Communion: An Attempt at “Sonic Gardening” with the Smartphone Chorus

Jean-Marc Pelletier
Nagoya Zokei University

Abstract

In this presentation I will describe an attempt to explore the boundary between fixed media and free improvisation. Algorithmic music theoretically enables the perpetual generation of music, and devices like wind chimes, aeolian harps, and suikinkutsu generate soundscapes autonomously once initiated, without human intervention. In *Communion*, a series of related musical projects, Jean-Marc Pelletier explores a related but distinct concept: “Sonic Gardening.” Like generative soundscapes, a “Sonic Garden” has no beginning and no end. Yet, it does not possess complete autonomy; rather, it is sustained by the constant tending (creation, editing, and performance) of the composer acting as a “gardener.”

Communion utilizes the “Smartphone Chorus,” a performance system Pelletier has been developing since 2023. The Smartphone Chorus is a mechanism that synchronizes and individually controls connected devices in real time, generating soundscapes as participants access a dedicated web page on their personal smartphones. In the latest iteration of *Communion*, the composer records electric guitar improvisations on a daily basis, accumulating up to 100 loops per session. Each session produces a “stack” of up to 100 loops, which is stored in a growing database. When a listener accesses the project’s web page, a stack is chosen based on the time of day, and a random loop from the stack is assigned to the listener’s smartphone. Since individual loops are often simple, the piece only takes shape when the number of listeners present in the same space starts to grow. During live performances, the composer further improvises over the sound of the audience’s smartphones playing their assigned loops.

The presentation begins with a broad overview of the technical dimensions of the Smartphone Chorus as well as the specific Max/MSP tools developed for the realisation of *Communion*. This technical discussion will serve as a starting point for an investigation of the historical context and aesthetic dimensions of *Communion* as an example of “sonic gardening.”

本発表では、固定メディアと自由即興の境界を探索の試みについて述べる。アルゴリズム音楽は、理論上、音楽の永遠な生成を可能にする。また、風鈴やエオリアン・ハープ、水琴窟のようなデバイスは、ひとたび起動すれば人の介入なく、自動で音風景を生成し続け

る。ペルティエ・ジャン＝マルクによる一連の音楽プロジェクトである「Communion」では、こうした生成的な音風景とは少し異なる「音の造園」という概念が探求されている。生成的な音風景と同様に「音の庭」にも始まりも終わりもないが、それは完全な自律性を有するものではなく、「庭師」となる作曲家による絶え間ない手入れ（制作・編集・演奏）によって成り立つ。

「Communion」は、ペルティエが2023年から開発を続けている演奏システム「スマートフォン合唱」を用いている。「スマートフォン合唱」とは、体験者が手持ちのスマートフォンで専用 Web ページにアクセスすることで、接続された端末群をリアルタイムに同期・個別制御し、音風景を生成する仕組みである。最新作の「Communion」では、作曲家が毎日エレクトリックギターを即興演奏し、一度のセッションで最大 100 本のループ素材を蓄積する。各セッションで生成された最大 100 本のループからなる「スタック」が、成長していくデータベースに保存される。体験者がプロジェクトの Web ページにアクセスすると、時刻に応じて一つスタックが選択され、そのスタックからランダムに一つのループが体験者のスマートフォンに割り当てられる。個々のループは単純であるため、同じ空間に集う体験者の数が増えてはじめて、作品の輪郭が立ち現れる。ライブ公演時には、作曲家が体験者のスマートフォンから再生される割り当てられたループの上にさらに即興演奏を重ねる。

本発表ではまず、「スマートフォン合唱」の技術的な側面、および「Communion」の実現のために開発された Max/MSP のツールについて概説する。この技術的な説明は、「Communion」を「音の造園」の一例として、その歴史的環境と美学的次元を考察するための出発点となる。

1. Introduction

1.1. The Smartphone Chorus

The Smartphone Chorus is a musical performance system that uses audience members’ personal smartphones as individual sound sources. Participants connect to the system via dedicated web pages on their devices. Once connected, the system allows for precisely synchronized playback of audio samples, effectively acting as a distributed sampler. Playback control can be achieved either through algorithmic means or by direct interaction from a performer. As such, the Smartphone Chorus can be used

in concert settings, as well as in sound installations.

The Smartphone Chorus was first used in a performance held on December 3, 2023 at Nagoya Zokei University. For the piece *Polyphonie pour piano*, the author triggered sampled piano sounds from the Smartphone Chorus, while four additional virtual pianos played from speakers located at each corner of the performance hall. Compositionally, the piece functioned as a piano quintet, with chords and melodic lines broken up and distributed among the audience. A second performance using the Smartphone Chorus took place on February 24, 2025, also at Nagoya Zokei University. This was the first piece titled *Communion*. It used vocal samples and unlike the previous piece, all the sounds originated from the audience's smartphones.

1.2. Related Work

Distributed music is a category of musical performance that makes use of the audience's electronic devices (Taylor 2017). These devices can be treated as a single instrument or as an ensemble. A seminal piece in this genre is *Dialtones: A Telesymphony*, created by Levin, Shakar, and Gibbons in 2001 (Levin 2005). However, the origins of distributed music can be traced further back, at least as far as Jose Maceda's *Ugnayan* (1974), a performance that used portable radios tuned to multi-station radio broadcasts. For an overview of the history of distributed music up to 2016, see (Taylor 2017).

Distributed music performances can be organized according to the role played by audience members. Baldo and Masu (2026) identify *participatory* and *non-participatory* systems (Baldo and Masu 2026). An example of a participatory system would be the Stanford Mobile Phone Orchestra (Oh and Wang 2011), in which audience members actively interact with their devices. By contrast, in *Fields* by Shaw, Piquemal and Bowers (2015), the audience members' smartphones are treated as individual speakers in a large multi-channel array (Shaw, Piquemal, and Bowers 2015).

The Smartphone Chorus falls in the non-participatory category of distributed music system. It retains some of the spatialization characteristics of pieces like *Fields* but no effort is made to determine the location of devices in the space. It should be noted that the *non-participatory* label only applies narrowly to the system. Audience members do actively interact by moving about and in some instances exchanging devices with their neighbours. This form of participation is largely emergent and is not the result of instructions by the performer.

2. Communion

2.1. Overview

The title of *Communion*, which can refer to a shared spiritual or emotional experience, was chosen to reflect the

fact that a Smartphone Chorus performance can only exist when a sufficiently large number of people come together. Thus, for the first two performances, there was an emphasis on the coming together: the entire audience playing as a single "piano" or forming a virtual choir.

For the latest iteration of the *Communion* series, I have opted for an approach that further emphasises the necessity for physical communion. Unlike earlier pieces, which were performances with clear beginnings and ends, the latest version exists in an intermediate state between permanent generative artwork and constrained performance. The piece's web page can be accessed at any time before or after performances. Sound playback does not depend on actions of a performer. The performance relies mostly on the audience gathering and accessing the same web page at the same time.

For this version of *Communion*, sounds consist of looped electric guitar phrases, with each audience member being assigned a different loop at random. During live performances, the performer uses the sound of these layered loops as an accompaniment for guitar improvisation.

2.2. Compositional Process

Apart from the live improvisation, the piece consists entirely of a large number of looping fragments. Loops are organized in *stacks*. A "stack" is a collection of up to 100 loops that are intended to be played in unison. The piece is composed by adding loops stack by stack. Every stack is assigned a time position on the 24-hour clock, which will be used to select stacks when listeners access the web page.

The compositional process is largely improvisational. Stacks are created by a looping recorder that captures the composer's improvisations on the guitar. Loops are typically around 20 seconds long; recording a single stack of 100 loops takes between 30 and 60 minutes — the length of a regular practice session.

3. Tools and Technology

3.1. Architecture of the Smartphone Chorus

The Smartphone Chorus is implemented as a serverless application using Cloudflare Workers. It can be accessed from anywhere, at any time, does not require a dedicated WiFi network, and works well on cellular connections. Audio files and the associated stack metadata is stored in persistent cloud storage. There are three categories of users: players, conductors and administrators. Players and conductors access the system via WebSockets, while administrators have access to a REST API for managing the storage and database.

"Players" are users who access the system via the publicly-facing web interface. In a performance context, audience members act as players. Other than pressing a button to start playing audio, players are entirely passive.

Behind the scenes, the web application obtains global UTC timestamps at regular intervals from the Worker to synchronize audio playback across all devices. In typical operation millisecond-level synchronization between players is achieved. The Worker sends messages to each player to instruct them to pre-load new audio files. The UTC timestamp for the start of the next loop is communicated in advance at the start of each loop cycle, to ensure that players maintain synchronization. Loop playback is performed using a dedicated Web Assembly instrument created with RNBO (Cycling'74 2026).

While players are connected to the Worker, the current UTC timestamp is compared to the stacks' identifiers. The stack whose identifier is closest to the current time is considered as the active stack. Each player is assigned a loop at random from this active stack. As time passes, the active stack may change, in which case players are assigned a new loop at random.

“Conductors,” like players, connect to the Worker using WebSockets. Conductors, however, do not play audio themselves. They have access to an extended API that allows them to monitor the status of every connected player. Conductors may also send commands to adjust an offset applied to the global UTC timestamp. This allows a conductor to effectively “fast-forward” to a new stack regardless of the current time. In a live performance setting, the conductor is usually the performer.

During daily maintenance of the piece, the administrator uploads new files to the storage bucket and updates the database to register new stacks.

3.2. Max/MSP Tools

Two Max 9 projects were developed for this version of *Communion*. The first project's function is the recording of loops, and the second is a performance interface for ‘conductors’. Part of the recording system is implemented in RNBO and is exported to serve as the on-client playback engine.

The loop recorder allows importing a pre-recorded backing track. This track is not exported and its only function is to aid the performer. A click track may be used here, but as the project evolves, stacks recorded in the past may be mixed down and used as backing tracks for new stacks. The interface easily allows the user to select which stack the loops will be recorded to. New stacks are created simply by adding new folders to the output directory, where the individual loop files will be stored.

Loop recording is done using two different modes: *manual* and *continuous*, which are toggled using the “auto-save” switch. Loops are recorded automatically into “pending” buffers, labeled “Buffer A” and “Buffer B” in the user interface. In manual mode, once a loop has completed, the user must explicitly save the contents of the pending buffer either through the GUI or by using a MIDI footswitch. In “auto-save” mode, the pending

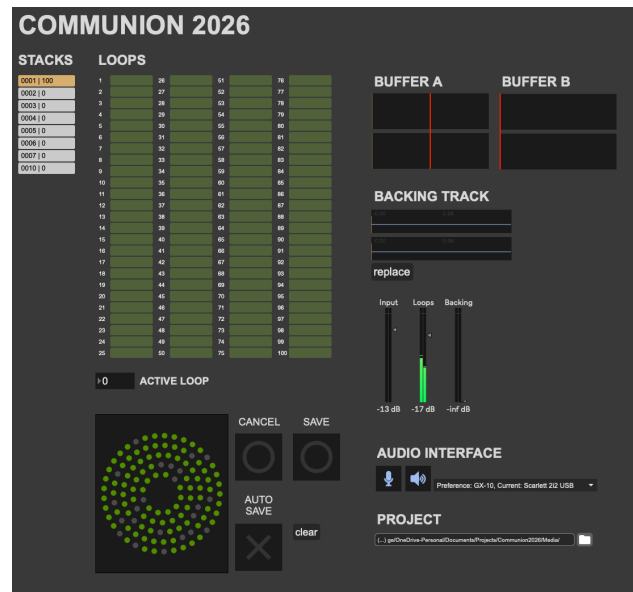


Figure 1. Loop recording interface in Max/MSP.

buffer is automatically saved once the next loop cycle is almost finished. In this case, the MIDI footswitch triggers the “cancel” action, which allows the user to discard the contents of the pending buffer. In normal operation, “auto-save” mode is preferred as it allows the performer to focus on improvisation and only interact with the system when a mistake has been made.

In order for the performer to have a better idea of the global effect of the loops being played in a space, once a loop is saved, it is assigned to one of 100 playback tracks. Each of these tracks passes the audio through a biquad filter tuned to simulate smartphone speakers. This filtered signal is then sent to a binaural spatialization patch created using Spat. Each track is assigned a random position within a virtual space surrounding the listener, simulating the effect of listening to the Smartphone Chorus in a performance space.

4. Sonic Gardening

4.1. Historical Context

The latest version of *Communion* is an attempt to explore the boundary between fixed media and free improvisation. Algorithmic music, powered by computers, theoretically enables the perpetual generation of music. In the program notes to her 1977 piece, *Kepler's Harmony of the Worlds*, Laurie Spiegel writes about the piece and the early computer music system GROOVE: “This piece is a straight-forward realization of Johannes Kepler’s idea based on astronomical data. The mapping of planetary data to frequency in this excerpt (as the piece is potentially infinite in duration), shows the continuous time function model fundamental to GROOVE’s design very clearly.” (Spiegel 2012)

While Spiegel only pointed to the *potential* infinite nature of algorithmic composition, later composers experimented with infinite generative music. One example is Brian Eno's *Generative Music 1*, realised in 1996 using SSEYO's Koan software. Parameters affecting melody, rhythm or harmony are specified as rules that allow the system to generate changing sounds indefinitely (Loydell and Marshall 2017).

Outside of strictly musical contexts, we can also point to devices such as wind chimes, aeolian harps, and *suikinkutsu*. These are designed to produce sounds in response to environmental stimuli like wind or flowing water. Conceptually, they are sonic processes unconstrained in time.

4.2. What is Sonic Gardening?

Of course, neither wind chimes nor the Koan software are truly infinite processes. Eventually, the wind chime or the computer will break down and the sound will stop. "Sonic Gardening" refers to the idea of a sonic process that, while indefinite in *nature*, still depends on regular maintenance to function. Here, by "maintenance" I mean not only tending to the physical integrity and conservation of the piece, but also to its regular artistic modification. Just as new annual flowers are planted every year, a "sonic garden" is a musical piece that is continually modified. Some elements may be added, others removed; the work exists in a state of flux while (hopefully) retaining its identity.

4.3. Composition as an Ongoing Process

Sonic Gardening seeks to position composition as an ongoing process. To continue the analogy: a garden is never finished, it is by nature a perpetual work in progress. It is this never-ending toil that distinguishes a garden from a natural landscape.

There is a parallel to be drawn with the act of instrumental practice. Just like a garden, proficiency on an instrument is the result of regular practice, in other words, maintenance. The same can be said of any skill, including composition. However, fixed media, from musical notation to audio files, *fix* the product of the compositional process to a static form. While there is undeniable "gardening" involved in perfecting a composer's skills, a score or a piece of recorded music is more akin to a *painting* or *photograph* of a garden than it is to the experience of a real garden.

However, this does not mean that the *realised* music has unchanging forms. This is especially evident with improvised music, but can be said of any musical performance that incorporates any degree of interpretation from a performer. Looking at improvisation or instrumental performance through the lens of sonic gardening means paying attention to how forms are shaped by regular, ongoing creative processes.

To create a piece of music as a "sonic garden" means to partially eschew fixed compositional elements to better focus on an approach that embraces the ongoing nature of creation. A sonic garden may be abandoned but it is never finished; it never exists in a definitive state.

4.4. Performance as a Shared Esthetic Experience

John Dewey makes a distinction between "experience" — something that occurs continuously as a result of an animal interacting with its environment and singular "experiences" — when "the material experienced runs its course to fulfillment." (Dewey 1932, p.36) Dewey conceives esthetic experiences as *whole* and *structured*: "Thus the non-esthetic lies within two limits. At one pole is the loose succession that does not begin at any particular place and that ends—in the sense of ceasing—at no particular place. At the other pole is arrest, constriction, proceeding from parts having only a mechanical connection with one another." (Dewey 1932, p.41)

Smartphones can be used to transmit esthetic objects (music, photographs, films) but are also often distractions impeding esthetic experiences. Likewise, smartphones are both instruments for and hindrances to human communication. For this reason, the title of *Communion* carries some sense of irony as a true communion is inherently human and esthetic (in the sense that Dewey intends).

Despite the intended irony, genuine communion is an aspiration in this piece. Can a system like the Smartphone Chorus evoke in participants a sense of unity in the same way singing in a choir does? Do the smartphones hinder audience members' connection with the music, with the performer and with each other? The goal of this project is not to seek a definitive answer to either of those questions but rather to offer an opportunity to ask ourselves these questions.

4.5. Future Directions

Distributed music, while not particularly widespread, has been gaining more attention since the spread of smartphones. Technological barriers have been significantly reduced in recent years and the spread of generative AI coding should further accelerate this trend. One of the biggest outstanding issues is surprisingly simple: even hundreds of smartphone speakers in the same space produce relatively little acoustic power. Systems like the Smartphone Chorus, for the foreseeable future, are to be constrained to relatively quiet and intimate musical settings.

Thus, in future work, the emphasis should shift significantly away from technological considerations towards esthetics. Are distributed musical systems that depend on electronic devices capable of acting as instruments of esthetic experiences? If so, what forms and practices are most suitable for this musical paradigm? These are the questions that I wish to investigate through my continuing creative practice.

Is “sonic gardening” a useful metaphor? By this I mean: is it a mindset that fosters creative practice? Is it a way of talking about a category of artworks that invites deeper understanding? Here again, in future work I hope to explore these questions not to seek definitive answers but as a motivation to further my skills as a creator and educator. In other words, to “tend my garden.”

collaborations, as well as cross-modal interactions, especially between vision, sound and action.



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6. Author’s Profile

Jean-Marc PELLETIER

Associate Professor, Representation Design Area, Nagoya Zokei University. My creative and research interests span interactive media, digital art, sound art and musical performance. I am particularly interested in cross-disciplinary