Scenes of Computational Transcoding – or How Technology Listens to a Fish Farm

Developing a Creative Media Installation for a Museum through the Computational Reinterpretation of Audio Data from a Periphery in South China

Marcel Zaes Sagesser

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In South China's Greater Bay Area, an idiosyncratic low-tech sound emanates, primarily from mechanical impeller aerators – air propellers used in local fish farms. The author's creative approach integrates audio recording, soundscape mapping, computational analysis and translation across media with performative reinterpretation by singers, resulting in a museum gallery installation. This method, presented as computational transcoding, utilises technology to listen with a difference. An interdisciplinary theoretical framework is applied to demonstrate that computational and vocal transcoding of audio from a fish pond offers new perspectives yet also renders the transcoding process itself audible. The methodological scenes blend an artistic narrative with audio-visual media to offer an original perspective on urban soundscapes. This approach emphasises human vocalists' role in contrasting computational limitations and algorithmic artefacts in interpreting these environments. Presented in scenes, the piece guides the audience through the outskirts of South China, with a video backdrop available to the reader to provide the soundtrack.

#listening through technology

#south china's greater bay area

#computational transcoding

#technosonic spaces

#urban soundscapes

Prologue: Scenes, Computation and Creative Research

In this piece, in the role of author and artist, I detail a creative, mixed computational and human approach to interpreting audio recordings from the technology-informed fish ponds at the outskirts of South China's largest metropolitan area (see Figure 1) and translating them into a creative media installation for a museum to foster access points, in computational sound and listening, to the close co-existence of local inhabitants, urban development and sound-producing technologies. Organised in 10 scenes, I describe, discuss, theorise and interpret a found environmental soundscape and the process of translating it through computational transcoding. Computation, here, helps shed light on an otherwise deeply personal, embodied experience of walking and listening. I hope to establish this framework, made of scenes that include computation, as a creative research method.

The technologies found in South China's hinterland produce noise, sometimes in abundant amounts – even, or particularly, when sound production is not their intended goal. Technological sounds feature prominently in Guangzhou's and Shenzhen's hinterlands. The sound is embedded here in a landscape and, as such, has been theorised as a 'soundscape' (see e.g. Sterne 2013). Yet, it is a soundscape that all too easily becomes lost due to its place on the periphery, outside the centres of attention. This research hopes to bring the sonic periphery to our attention.

The original motivation for this research was a commission by curators Jian Xiao (肖 剑) and Dong Chen (陈东), who, in 2022, set out to invite a diverse group of artists to contribute positions to their exhibition 'The Taste of Fluidity: The Domestication of Ponds and Sucrose' (流变之味：驯化中的塘与糖) at the Shunde Food Museum (顺德美食博物馆) in Foshan City in South China. I accepted, and shortly after, artist Lei Xi (奚雷) took me on a first field trip to the Shunde fish ponds. This site visit has inspired and informed my extensive work in that area to date. The exhibition opened in December 2022, and among the five installations on view was my original contribution: the artwork 'In Idle Mode (Noise).' Much later, in 2024, the Chronus Art Center (CAC) Shanghai (CAC 新时线媒体艺术中心) invited me to contribute the artwork to its curated subsection of the Wuhan Biennale 2024 under the grand topic of 'Urban Fluidity' (城市流体：2024 武汉双年展). The CAC's subsection brought together creative positions using digital media and computational processes that looked into urban fluids and their geopolitics in some form. 'In Idle Mode (Noise)' was on display from October 2024 until May 2025, and it is this reworked iteration that lies at the very core of this piece of writing.

The creative media installation is characterised by a deeply practice-based modality of enquiry – nowadays, a common form of enquiry often discussed as 'artistic research' (see e.g. Baers 2011). I am adding a mixed computational and embodied–experiential approach to this framework. This setup helps render audible – and thus accessible – small sonic fragments from the periphery that would otherwise get lost. Theorising this practice-based enquiry offers context to broaden its relevance with diverse perspectives. Critical theory and critical perspectives from computer science and urban and sound studies help situate the computationally transcoded fish pond scenes that emerge through ears, microphones and algorithms. A 'scene' can refer to many things, as shown, for example, by the *Cambridge Dictionary*[1]. A scene can encompass something partial, a fragment in media, a unit of time, a reference to a geographic location, a happening, an emotion or something imagined. In technical and cognitive realms, an 'auditory scene' often refers to simply the fact that multiple layers of information are happening at once; in research, this is often referred to as one of the 'most difficult' challenges – namely, 'dealing with mixtures of sound' (Bregman 1993).

However, Hartman (1997) famously used the concept in 'Scenes of Subjection' in the context of repressed and enslaved Black women in 19th century America to capture a certain 'performative' (of torture, misconduct, resilience) that her writing rendered accessible. While my position and context are vastly dissimilar from those of Bregman and Hartman, the term nonetheless helps me render – aided by media and computation, with writing and embodiment – something as particular and ambiguous as walking along South China's peripheral fish ponds and creating an imaginary for an audience. Note that additional theoretical standpoints are interwoven with the observational notes across the 10 scenes that follow. That said, we are now prepared to set off for the fish ponds. Before we continue, the reader is invited to pull up and play in the background the audiovisual accompaniment of this article. Turn up the volume as the soundtrack gradually transitions from the original fish pond recordings to the sound emitted by the creative media installation in the exhibition gallery (https://bit.ly/cubic2025886).

Video 1: Audiovisual accompaniment of this article. *Source: author*

Scene 1: Listening on the Urban Periphery

The scene: scattered trees, roadside bushes, distant factories, residential buildings, narrow streets, wooden and metal shacks, highways, high speed rail bridges and electric wires – all interspersed into what seems an older, larger structure of soil-made levees that embrace small water bodies, organised between river branches and larger waterways for transportation (see Figure 1). Mosquitoes, a few residents and strong November heat hit the dry asphalt under my feet. As I walk, I find myself wondering: Am I hallucinating this high-pitched hum that hovers monotonically over the landscape? The peripheral area in China's Greater Bay Area – specifically the Pearl River's Delta, here in Huanglian Village (黄连村) in Shunde District, Foshan City, close to the Shunde Waterway (顺德水道), far outside the large metropolitan centres of Guangzhou and Shenzhen and yet so deeply intersected with them – reveals a sonic experience that is unique, as I believe. A single, pervasive 'voice' – a soft, pitched hum – hovers above the landscape and blends with distant traffic and foreground activity. What it stems from is a medium-sized device made of a rotation motor with propellers of plastic shovels that push oxygen from the air under the water's surface to support breeding fish in the ponds. The mechanical device's noise, a blend between the engine proper and the shovels hitting the water in fast succession, is unique not only in that I had not heard anything similar before but also in that this sound to me seemed to simultaneously constitute unwanted noise and a somewhat pleasing, almost musical, dreamlike experience. What I am referring to are the fish ponds of Shunde (see also Liang and Chen 2020) and, more specifically, the device sometimes described, in a translation from Ding's (2009) work, as an 'impeller aerator' (叶轮增氧机) (90). How does the fish farm's impeller aerator, a roughly 40-year old (Ding 2009, 95) low-tech air propeller, mediate the human experience in Huanglian?

Scene 2: A Lo-Fi Techno-Sonic Space

When inquiring about the idiosyncratic soundscape on Guangzhou's and Shenzhen's peripheries by the fish farms in the Pearl River Delta, it is a question that needs a larger lens than solely asking about the sonic properties themselves. This vast area, integrating agricultural, industrial,

residential and urban spaces, is populated by no fewer than 86 million people (People's Government of Guangdong Province 2024). The administrative region of Shunde District, famous for its 'dike-pond agriculture' and tourism (Zhou et al. 2022, 173) alone had 9.55 million inhabitants in 2022 (The Guangdong-Hong Kong-Macao Greater Bay Area Development Office 2024). The people here coexist with the technological infrastructure. Sound is contextual, and when situated in the landscape, it acts at once as 'a physical environment and a way of perceiving that environment' (Sterne 2013, 183); as such, it can shed additional knowledge on how humans interact with their environments. Sound is culture, argues Sterne (Sterne 2013, 183). Sound is the product of human's activity as much as it informs their acting. What struck me during my repeated visits to the fish farms over three years was how the human-to-sound relationship in these villages around Huanglian was specifically framed through the technology of the impeller aerator (see Figure 2). The result is a techno-sonic space characterised by its uniqueness amid a humongous area of settlement that has produced, according to Chung et al. (2001, 20), a 'completely new urban substance', defined by notions of plasticity, improvisation and an 'unprecedented intensity of production.' This space holds a peripheral existence; it is absolutely speaking not as loud as the encompassing industrial cities; it is outside the focus of attention and yet informs the everyday of a large number of local inhabitants and workers.

Scene 3: An Archive of Recorded Ephemeral Spaces

Sonic spaces are ephemeral. They are hard to pin down, are hard to visualise and often escape policy discussions and, traditionally, many other parts of human discourse. Sonic spaces leak (Stanyek and Piekut 2010, 19). Sound, as a physical wave, is a fleeting force. It can be measured, for instance, to enforce a noise pollution policy, at least in terms of its volume in decibels. However, this alone reveals little, since sound acts on a larger scale and includes its social, cognitive, cultural and urban dimensions (see also Lacey 2022, IX). Sound thus exists in a complex relationship with the environment (see Figure 3). Voegelin (2018, 46), therefore, called for a 'volume' of sound beyond scientific measurement, one that includes 'the environment's material and temporal expansion.' I follow her attempt to find new methods and vocabularies to attune to the sheer complexity of sound's dynamic, intangible, invisible and ever-so-ephemeral physics. This ephemeral physics of sound was captured as early as the year 1300; the first maps provide evidence of sonic landmarks (McMurray 2018, 115). Contemporary sound or noise maps follow the same idea; they reduce the dimensionality of complex systems into something more easily graspable, and by so doing, they point to the always dynamic relationship not only of the connection between maps and sound but also of the inherently unstable nature of both environments and sounds (McMurray 2018, 120). Yet, in turn, environments also produce expectations, in the sense of what a listener expects the soundscape to be when viewing a given environment (Jian et al. 2012, 31), such as the one depicted in Figure 3. Thus, the relationship between an environment and its sounds is inherently complex. My attempt to understand the particularities of the ephemeral space on the urban periphery is thus grounded in recording large amounts of data from over three visits in three years at 10 sampling locations near Huanglian. Over the course of this period, I built a site-specific dataset. This archive, in itself, forms a scene that we can revisit (see Figure 4).

Scene 4: Computational Listening

The process of conducting field recordings involves the transduction of energy from soundwaves to a

digital file (Roberts-Breslin and Breslin 2022, 148). Sampled sound measurements are rendered as approximated binary data points that can then be digitally stored and processed. Specialised software visualises audio data on a two-dimensional plane as waveforms or spectrograms. The depiction in Figure 4 clearly reveals to the eye what my ear had experienced; quite independent of how far the microphone is standing away from any impeller aerator or what type of microphone is used, a continuous stream of noise is primarily visible, intercepted with short, local impulses stemming from foreground activity close to the microphones. While the foreground action varies in regard to the recording location, the noisy backdrop does not – or at least not crucially. Computation thus extends the embodied experience. Chun (2005, 20) defines computing as the 'enabling [of] connections through rendering the invisible visible', and she goes on that software, in particular, 'seems about making the invisible visible' in the sense that processed binary data points are rendered perceptible for a user. Visual listening aided by computational visualisation of the audio data, in this scene, sheds light on the Delta's soundscape in a way that ephemeral listening cannot – not only by rendering it visually accessible but also by fixing an ephemeral experience on a piece of storage medium. The latter is the essence of what shapes computational processes.

Scene 5: Qualitative Mapping of the Sonic Entwinement

This scene is one of recreating connections between geographic entwinement, collected audio data and panoramic photographs shot at the recording locations (see Figure 5). It emerges as a visual collage with map and photographic elements; it is on purpose kept non-scientific, interpretative and incomplete so as to leave room for the viewer to imagine potential scenes that may have been. The collage is incomplete, as I prioritised a few qualitative recording locations over the systematic coverage of the entire territory. Figures 4 and 5, once read together, produce an imaginary of the density of pitched noise present closely among buildings. This intricate entwinement stems from an old tradition of human–nature collaboration in South China in which water-based and land-based forms of agriculture co-existed, theorised as 'land-water interaction' (Zhong 1980). Over the centuries, humans have lived in symbiosis with the ecological and aquaculture environments that surround them. Technologies were key in domesticating the environment; they helped render it 'suitable to grow for human use.'[2] This form of domestication is, again, a function of the technologies available to the inhabitants – the impeller aerator being one of them.

Scene 6: Listening through Computation

Further computational analysis of audio data, using specialised tools by the IRCAM music research centre, divides individual recordings into distinct segments of different frequency and density and then maps them out according to the proximity of standard Western musical instruments on which IRCAM trained this model. This tool is intended to support composers when they orchestrate musical structures; it is not necessarily intended to orchestrate fish pond noise recordings. Yet, the use of such a specialised approach proved meaningful in my work, since I was interested in better understanding the Delta's soundscape in its ambiguous position between noise pollution and a potentially musicalised listening experience. The scatterplot in Figure 6 shows data segments from the audio that are higher-frequency and noisy (top left) towards more muffled and pitched noises (bottom right). The software, while analysing the spectral makeup, uses colour to suggest recommended orchestral mappings, such as the fish pond's noise on the bottom right, which might be best approximated by

cellos playing softly. This software, at the end, spits out a raw musical score full of artefacts and computational 'dirt' and is hard-to-read for a human (see Figure 7). It is this process of computational work that I call 'transcoding', following Chun and Manovich's theorisation. Chun and Manovich present 'transcoding' as a mode of 'translat[ing] files from one format to another' in which 'cultural and computer layers' are brought into a relationship (Chun 2005, 20; Manovich 2001, 48 via Chun, 2005). The computational transcoding of the fleeting fish pond soundscape across manifold formats provides us with an additional perspective to look at these precarious spaces on the outskirts but also makes visible their cultural, technological, social and political layers.

Scene 7: Human Vocalists Extend Computation

In the first run, the computational transcoding rendered a musical score for seven singers based on the analysis of the fish farms' soundscape. However, the tool was not advanced enough to attend to the subtleties of a human voice or to the subtleties of the air propellers because it understands noise and pitch as two separate entities. Therefore, it assigned them as an either/or to some singers but not others. The ambiguous output of a noise that contained pitch in the way that I had heard it in Huanglian was not foreseen as an option by the programmers. However, a human voice, especially a trained singer, can produce more subtle in-between states. In my role as a user, it was not my position to override the algorithm that I had prompted to support my work. I accepted the results to understand more about not only the original soundscape but also the mediating technology that started to lie between myself and the soundscape.

Scene 8: The Chorus

The computational output of the IRCAM algorithm was handed on sheets of paper to trained singers, with a chorus of seven young opera singing students from the Chinese University of Hong Kong in Shenzhen paid to interpret the musical score (see Figure 8). In a learning endeavour to decipher the digital 'inhumane'-looking notational style of the algorithm, I went through quite a psychological process of coaching singers to empathise with a machine so that they had less trouble dealing with great vocal jumps, unnatural speeds and an unfamiliar-sounding aesthetic agenda. The singers recorded 15 voices, some of which, according to the IRCAM algorithm, contained pitched 'music', while others produced noise from air flowing through their teeth. An individual microphone captured each singer's voice so that they could all be placed in distinct loudspeakers for playback. The chorus transformed the data written as musical score into sound – that is, it gave voice to the fish pond.

Scene 9: Low-Hanging Horn Loudspeakers

For playback, yet another outdated sound technology is employed – one that is similarly connected to the hinterlands of urban centres: the horn loudspeaker, which is related in shape and style to the megaphone yet predominantly used for village-style broadcasts and other kinds of public addresses. Fifteen low-hanging horns, carefully hovering above the ground, carry the 15 recorded voices (see Figure 9). A noisescape emerges from the horns that hover in the air above the ground, as if above the fish ponds. For visitors, the scene in the

museum reproduces the noisescape of the fishing village in the Greater Bay Area, yet it does so with a change. Rather than letting the audience listen to the recorded audio data, a process of computational as much as human transcoding has taken place to blur the layers of landscape and computation and of culture and technology. Audio data has been transcoded through and with sound. What becomes audible are the technologies of mediation and transcoding themselves. Ultimately, this piece of technology might not be crucially different from the sonic technologies at the fish pond – namely, the impeller aerator that frames the residents' everyday lives. In the late Middle Ages, angels carried symbolic 'divine megaphones' as indicators of sound making or listening, as recorded on the 'Hereford Mappa Mundi' (McMurray 2018, 115). They used these horns as extensions of their bodies to signify a sonic form of history writing. In the exhibition gallery, horns become visual markers that have no obvious connection to the fish pond; rather, they create a completely different experience – one in which physical horns coincide with a transcoded soundscape. The interest lies in the mechanics of lo-fi noise as a mediator of the human experience of place. Now that Huanglian's soundscape has been transcoded into a gallery soundscape that is at once more human and more technological than the original, it has given rise to what is specifically *not* an accurate map or scientific sonification but rather a qualitative space that renders salient the social-technological issue of noise pollution in one of the largest centres of human settlement.

Scene 10: Of Sonic Ambiguities

Is it the sound of a chorus? Is it the noise of a fish farm? Is it a technological device? Is it the techno-sonic space of the delta? Or the sum of individual singers sounding simultaneously, yet out of synchrony with one another? What is it that I hear when I stand in the exhibition gallery at Wuhan Biennale, amid 15 hanging horn speakers (see Figure 9)? The audio data that lie on the ground of this creative transcoding stem from one of the most significant, dominant – yet probably forgotten – sound sources: the air propeller of the Pearl River Delta's fish farms. Its sound is ambiguous in that it might signify an unwanted noise for some, but for others, it might stand in as an identifier, a soundtrack, a sign that provides them with a sense of place or even an acoustic home. The emerging installation in the gallery connects to the original recording location by the Pearl River (see Figure 10) in that they both remain ambiguous and exhibit an abundant number of sound layers that happen at once.

Afterword: A Fleeting Volume from Huanglian

As 15 voices of young singers in an art gallery vocalise noises of a fish farm out of horn speakers, this 'home' is shifted to something new. Sound, as an ever-so-'fleeting and uneven volume' (Voegelin 2018, 66), escapes us over and over. Voegelin's work is crucial in this project, as she points to the nature of sound as 'fleeting' and always more than just sound waves – as a 'political' force in the sense of a 'possibility' that can help us understand the world around us (Voegelin 2018, 17ff). I follow her aim of 'pluralising a current hegemonic knowledge system' by creating alternative, mixed practice-based, interdisciplinary approaches that help us understand the political, environmental and social issues of our time 'from the entanglement of "direct" sound and with a leaky vision that sees the in-between' (Voegelin 2024, 12). In a system that this creative research produces, we end up listening to distorted horns playing the voices of singers who struggle to interpret a musical score written by a computational orchestrator fed with digitalised noise captured around the fish farms. The constitutional elements of what we hear are as much technological as they are human, yet the exact makeup is hard to determine, given the manifold layers of transcoding, blending 'culture' and

'computer layers' (Chun 2005, 20). What ends up emerging as a poetic space I understand also as a poetic concept that sheds light on the fact that, in a large urban settlement, technological and human forces intersect and co-exist in complex ways, to which the local soundscape bears witness. If we follow Sterne, we understand that a soundscape always carries in itself an invitation to listen to it (Sterne 2013, 190). Computational transcoding, as a creative technology, has become a metaphorical device through which analogous translation can be achieved, which in turn triggers human imagination regarding how to reconsider the original data fed into it. In this sense, the artistic intervention 'In Idle Mode (Noise)' acts as a techno-sonic device that conserves a specific sonic present and past, collects a specific sense of place and shows how deeply a human experience is linked to technology. The blurred sound between water and land, between noise *and* pitch – aquaculture in the Pearl River Delta is made audible through an idiosyncratic computational transcoding designed for and by Huanglian village.

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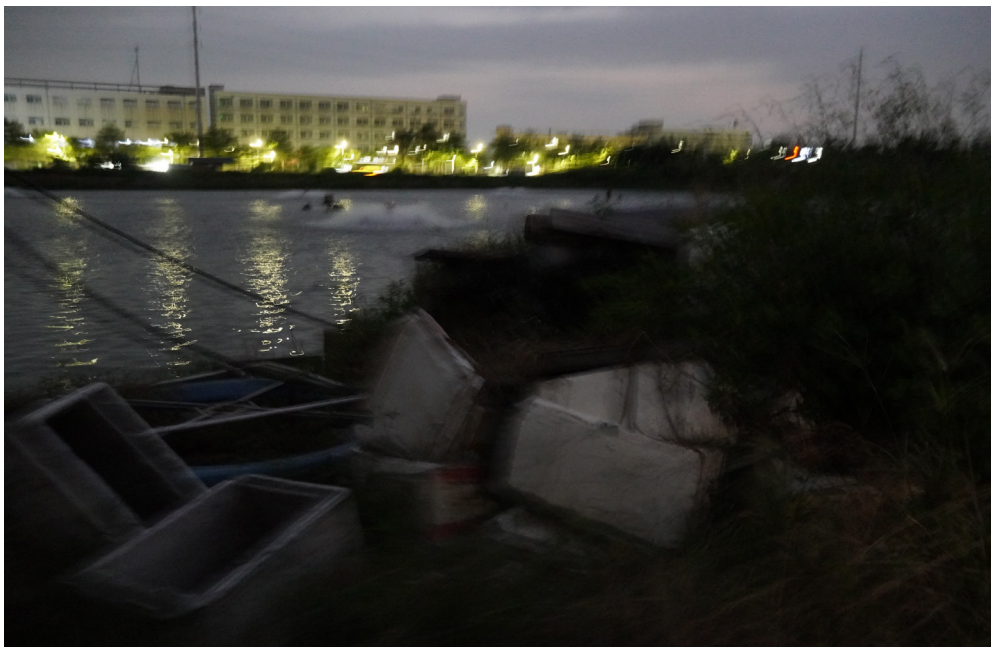

Figure 1 (top). A blurred photograph of a fish pond in Huanglian, on the periphery of China's Greater Bay Area, at twilight, showing the interwovenness of industrial, residential and agricultural uses of space. *Source: Author.*

Figure 2 (bottom). The fish pond's impeller aerator, a low-fi air propeller that pushes oxygen under the water surface. Photograph by the author in Huanglian Village (2024). *Source: Author.*

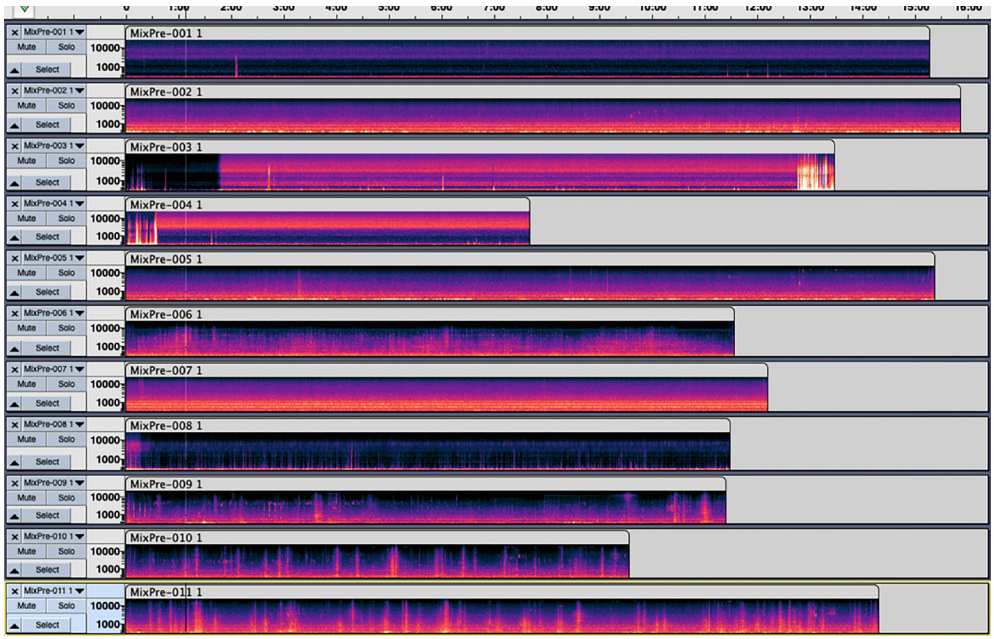

Figure 3 (top). On the road, as depicted from a taxi in the Pearl River Delta close to Huanglian Village, showing the mixed use of the environment. Photograph by the author (2024). *Source: Author.*

Figure 4 (bottom). Spectrogram representation of recorded fish pond audio. The 11 samples show a mix of different recording locations (see Figure 5), microphone types and recording years. Visualisation by Qiuya Xiang, Binghuang Xu and the author using Sonic Visualiser (2024). *Source: Author.*

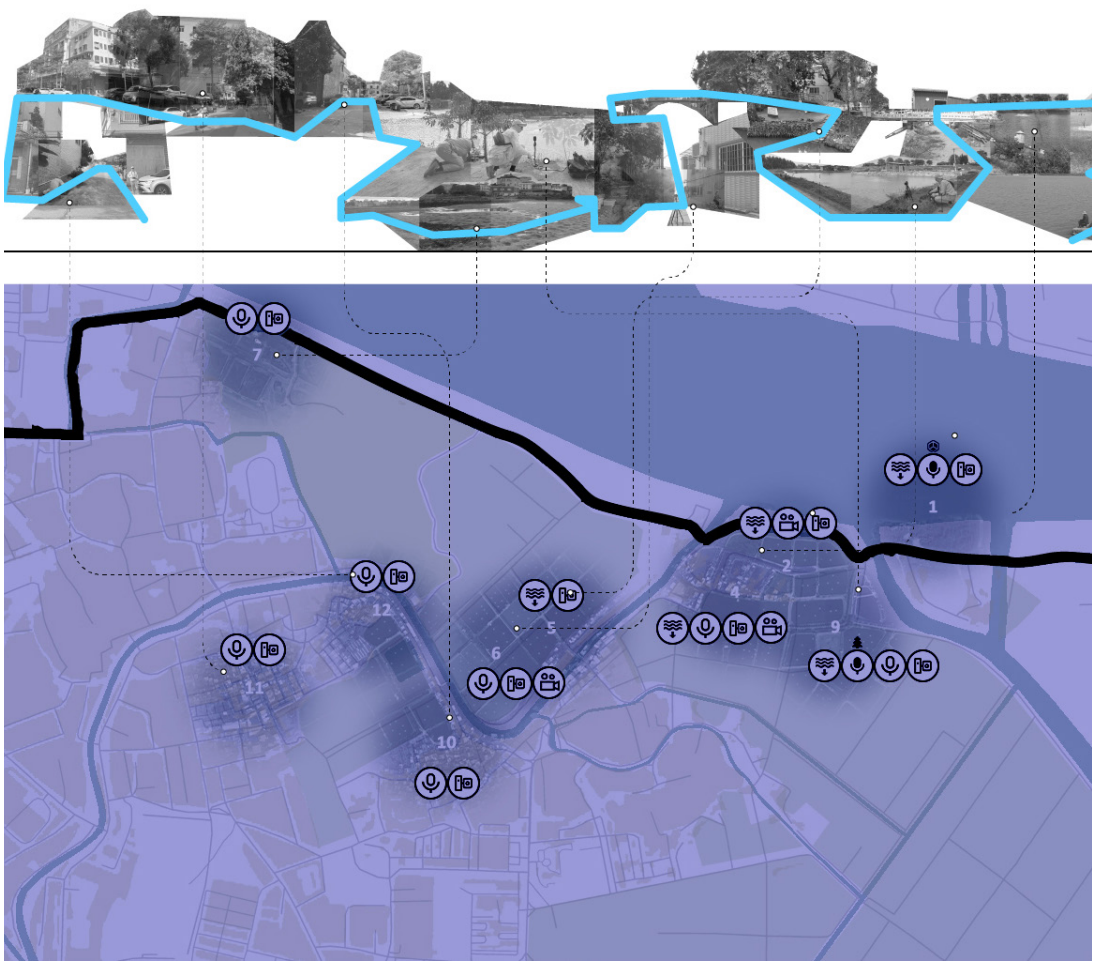

Figure 5. Qualitative collage of Huanglian Village. The lower part shows an abstracted geographic map; dark blue areas represent water bodies (Pear River is the largest, and small rectangles are fish ponds interspersed with buildings); grey lines and the thick black line are small and major streets; icons represent what recording equipment has been used at the 10 locations; the upper part is a temporal-spatial fold of the walkway between the recording locations with a collage of panoramic photographs; and the light blue line renders approximate shapes of the geographic micro area around the microphones (these are qualitative and do not represent any actual shape). Made by Qiuya Xiang, Binghuang Xu and the author (2024). *Source: Author.*

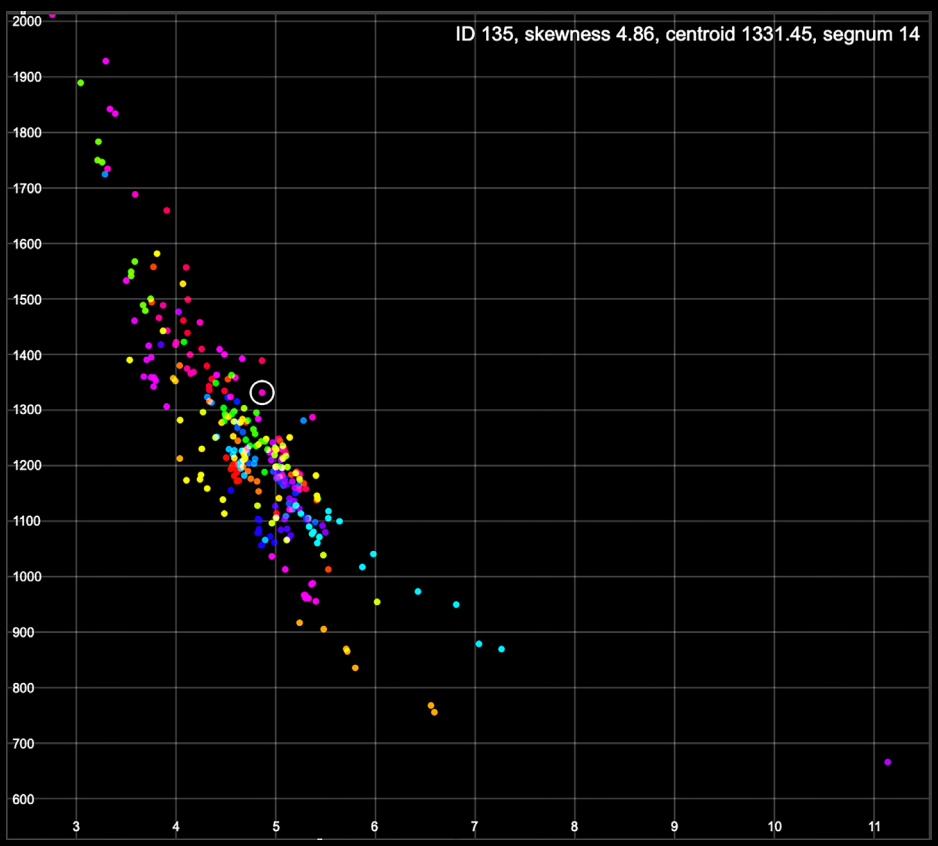

Figure 6. Two-dimensional scatterplot of a fish pond field recording made using IRCAM's Orchidea. Screenshot by Yixuan Jin and the author (2024). *Source: Author.*

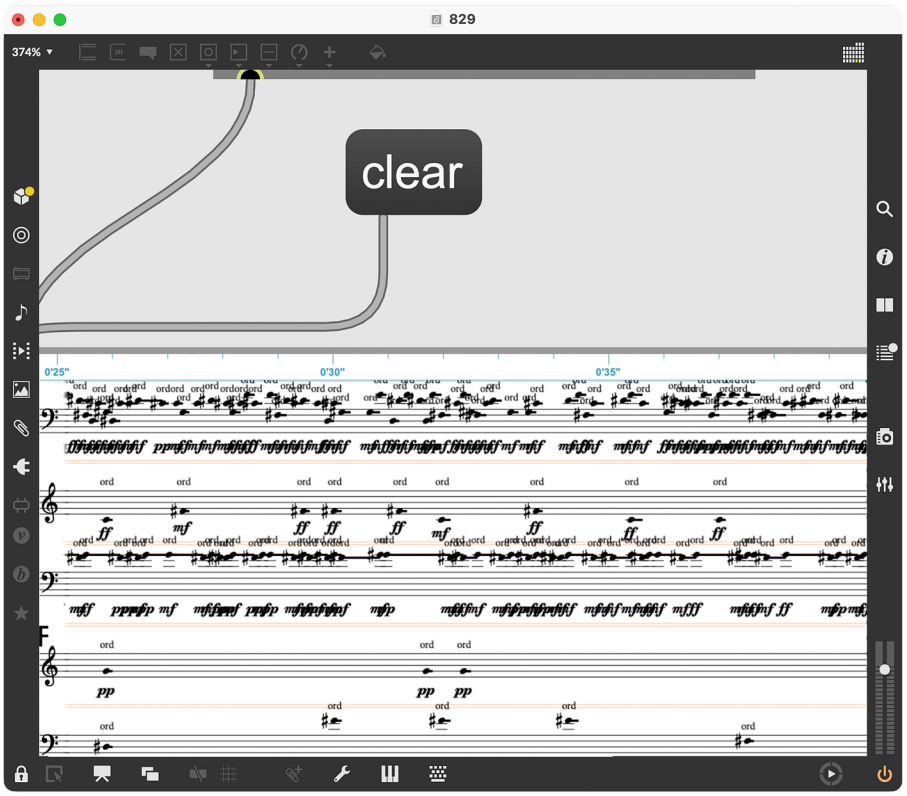

Figure 7. The output of IRCAM's Orchidea: A musical score approximating the fish pond's noisy soundscape, derived through machine learning. Screenshot by Yixuan Jin and the author (2024). *Source: Author.*

Figure 8. Seven singers from the Chinese University of Hong Kong in Shenzhen's School of Music interpreting the computational score of the fish pond. *From left to right: Han Zhang* (张瀚), *Yujie Zhang* (张雨洁), *Mingrui Hou* (侯明睿), *Yuxuan Xu* (徐宇轩), *Jiajun Xie* (谢佳峻), *Waner Zhang* (张婉儿) *and Caiying Chen* (陈彩滢). Photographed by the author in a recording studio in Shenzhen (2022). *Source: Author.*

Figure 9. Exhibition view of the creative media installation 'In Idle Mode (Noise)' at the Wuhan Biennale 2024, with 15 low-hanging horn loudspeakers emitting sound and four LED screens in the background displaying computationally processed panoramas of the Pearl River Delta. Photograph by Zhaorui Liu (2024). *Source: Author.*

Figure 10 (top). The Pearl River at the outskirts of the city, with a highway bridge crossing. Seen from Huanglian Village. Photograph by the author (2024). *Source: Author.*

Figure 11 (bottom). The Pearl River outside Guangzhou. Photograph by the author (2022). *Source: Author.*

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Endnotes

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Bio

Marcel Zaes Sagesser (he/him) is an artist and researcher investigating how humans are increasingly intertwined with their technologies. Focusing on the material qualities of sonic media, his work reimagines environments that let us listen to human-technological relations. Mixed practice-based and academic methods enrich this critical practice. The ongoing series, High & Low Tech Sonic Materialities, renders multiple strata of 'tech' audible to rethink how they shape human experience in dense urban spaces.

Marcel's work has appeared internationally at Fridman Gallery New York, ZKM Center for Art and Media, Center for New Music San Francisco, Gray Area San Francisco, Hong Kong Arts Center, HEK House of Electronic Arts Basel, Wuhan Biennial and Shanghai Cadillac Concert Hall, but also at research-based venues such as at Columbia University, Standford University, CHIME Fest at University of Chicago, Designing Intearctive Systems at Carnegie Mellon University, ISEA at City University of Hong Kong, or ICMC at New York University Shanghai. His work has been awarded with prestigious grants such as the Fulbright Fellowship or Zhejiang Conservatory's Keylab Grant for Digital Music. Publications include venues such as the Journal of Media Art Study and Theory, or Norient Sampling Politics.

Marcel received his PhD in Music+Multimedia Composition from Brown University. From 2022-2025, he served as an Assistant Professor of Media Arts & Technology at the Southern University of Science and Technology, Shenzhen, China. Starting in 2025, he is Professor of Applied Sciences and Academic Director of Audio and Visual Media at the St. Pölten University of Applied Sciences, Austria.

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