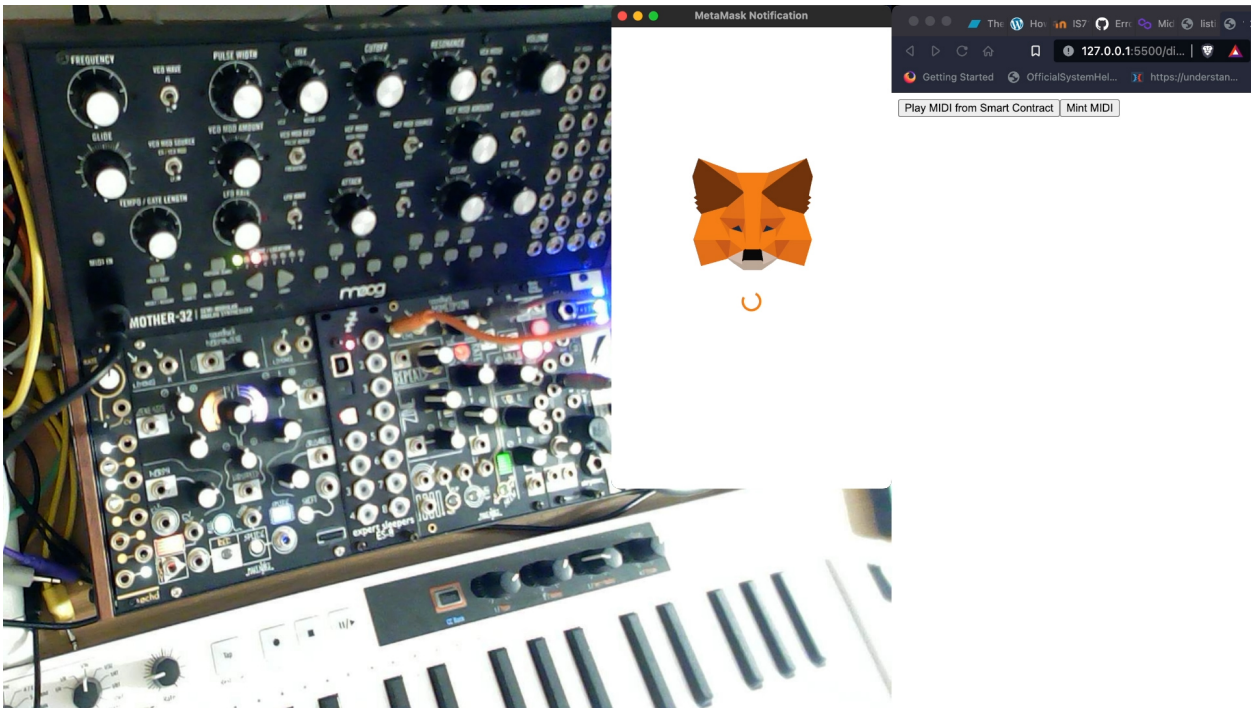

Permanent Music: Appropriating Blockchain Technology for Music Archiving

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Conceptual Background

Within capitalist society, social, cultural, and political lives are more often controlled by market forces. A person's value is determined by how much they can financially contribute to society and therefore how much labor they can expend to perpetuate the capitalist hegemony. Emerging technologies, like blockchains and music streaming, more often become a system of financial incentives and self-interest gameplay, even if those mechanisms weren't in the original design. In a 2018 interview, artist and independent researcher Gerald Nestler describes the 21st century condition:

> "We are often confused, even numb and blind vis-à-vis developments that undermine democratic accountability in favor of the evaluation regimes of market and security apparatuses. 'Securityzation' (as a power triangle of security, austerity, and asset investments) is decoupling and blacking out general assumptions on civil and political rights (and human rights too, which are rewritten around a credit system in which inalienable rights do not exist), reducing participation in political and economic affairs and decision-making" (Nestler, 2018, p.130)

He uses the metaphor of the financial derivative to describe the contemporary human condition. The financial derivative, thought of as bets upon a future price, provides a worthy model of describing the implicit forces on everyday social life (Nestler, 2018). Modern infrastructure, from health care to social media, is organized around profitability, and those in power position themselves with the most to gain through financial investments. The future of

infrastructure is therefore a matter of financial speculation than that of social concern or planning.

At first glance, blockchain infrastructure appears to be the latest manifestation of what Nestler describes. The conversations around blockchain technology “rely heavily on markets and mechanism design—a variant of game theory—as their preferred instrument of social organization on a large scale” (Groos, p.165). Those in finance use financial instruments to further control how society operates. Those with wealth, and therefore power, are positioned to increase their wealth if they’re in control of the rules of the game.

Blockchain technology gamifies and commodifies social functions by abstracting all interactions between people as monetary transactions. Where as most record keeping belongs to individuals, organizations, and companies, these technologies “move towards a configuration of social reality that is strictly representational”, cementing our monetary system as a larger force in every life (Reijers, 2018, p.122). When currency is the basis for all interactions, a system of self-executing code “eventually configures the narrative structures that mediate our social world” (2018). Notwithstanding the effects of speculation on transforming non-financial interactions to financial ones, blockchain technology further disrupts the way the people interact with each other.

Nevertheless, crypto and the new web 3.0, as it’s commonly referred as, is an infrastructure that affords unusual configurations despite its anarcho-capitalist origins. Certain narratives, like the centering of markets as government, that were used as a reason to build the blockchain could be rewritten as the technology gains mass adoption. Communities of activists, scholars, and artists have found ways to forge new narratives around this nascent and malleable structure (Whitaker, 2019). Amy Whitaker notes that “blockchain enables a variety of new models for community support for the arts” that could address systemic issues from a new angle (2019, p.37). Unlike the tribulation of modifying current financial structures, which are rigid

and oligarchic, building a kind of system is more approachable. It creates opportunities for both creating replacement infrastructure, and infrastructure that doesn't exist to handle some of the more contemporary issues facing society.

Firstly, the mechanisms through which contracts are created and stored have consensus mechanisms for verification. Vitalik Buterin, the founder of Ethereum, describes it as "'multifactorial consensus' in which different mechanisms and groups produce a multiplicity of signals, and the ultimate decision depends on the collective result of the various inputs" (Groos, p.164). The movement from centralized power in the form of banks and credit reserves to collectively-owned mutual funds offers an opportunity for democracy in financial decision-making.

Subsequently, alternative governance structures have emerged in the crypto space to manage the free-market flow of alternative currency. Decentralized Autonomous Organizations are a form of governance within blockchain technology that offer organization that feels more like a worker's cooperative than a corporation. "[In DAO's] people envisage that the organizations' management and operational rules could be also encoded on blockchain in the form of smart contracts, so that the organization will operate autonomously according to predefined business logic without third-party intervention" (Wang et al., 2019, p.871). Where historically the use of automation is to increase profit margins, in this instance it provides tooling for individuals to manage a complex and dynamic organization. Automation, which previously alienated workers for the benefit of the management class (Stabile, 2008), has the potential to hand democratic control back to people outside of large institutions.

Finally, the emergence of blockchain technology allows for a relatively permanent archive that persists beyond the capabilities of traditional institutions. Groos points out that "… any application built on top of Ethereum would be distributed throughout the whole network and run on what Ethereum's developers call a 'world computer'. Hence a programme run on the

Ethereum blockchain could not be turned off by simply shutting down a single computer" (p.153). This kind of archive may be retrofitted to suit the needs of any kind of record-keeping. "The advent of blockchain and distributed ledger technologies is but one new chapter in a long and complex history of record keeping, archiving practices and institutionalized trust that goes back to the origin of writing itself" (Bordeleau, 2021). While the invention of a persistent, permissionless archive was originally for storing financial information, that doesn't necessarily limit it to the world of finance.

Blockchains are an example of an "ambivalent" technology, where narrative and design plays a role, but at the same time can be transformed into something different (Feenberg, 2002). The malleability of blockchain for general purpose use makes it a worthy target for artists, developers, and practitioners to enact change. Through processes of consensus, appropriation, and collective organizing, an originally financial invention has the potential for artistic liberation.

Methods

The aim of this research is to apply critical making towards the technology of blockchain and cryptocurrency. 'Critical making' is the practice of using material engagements with technologies to open up and extend critical social reflection (Ratto & Hockema, 2009). In practice, it could be seen as the process of (1) identifying paradigms of making within a technological ecosystem, then (2) subverting those paradigms with inversions that bring forward marginalized perspectives and alternative methodologies (Bogers & Chiappini, 2019). Critical making is a method that facilities paradigm shifts, making a path visible for designers, engineers, and business leaders to implement radical ideas. Through creative practice, a

meaningful relationship can begin between the motivations for social change and the realities of technical systems. The goal of critical making is to create a “sociotechnical system” which includes liberation as founding principle. Ideas around social justice are therefore seen, heard, and experienced in ways that are no longer abstract (2019).

Through the process of critical making, this research hypothesizes that:

- Musical scores can be used as a model of infrastructure.
- Musical information in the form of MIDI provides a low-cost method of storing information on a shared ledger.
- From this public, permanent, and interactive piece of data, a paradigm for redesigning digital infrastructure is created.

This research will use the MIDI protocol (Musical Instrument Digital Interface) to store bytes of musical information on a smart contract. In contemporary music, MIDI is a decades-old standard in converting musical information into digital signals. Independent of blockchains, MIDI provides a plethora of benefits to artists, from music creation to music distribution (Airy & Parr 2001). On the blockchain however, MIDI can provide a low-cost and efficient way to storing melodies, rhythms, and metadata into a permanent archive.

Permanent Music aims to reconfigure the purpose of cryptocurrency technology from financial speculation to culture building and music archival. As noted by blockchain scholars, “the individual act of transacting an amount of cryptocurrency depends on the collective intentionality that amounts to the validity of this act” (Reijers, 2018, p.108). While this premise usually amounts to the automated, market-driven procedure of validating code, this foundational component of blockchains can prove useful in the way that music is shared, created, and distributed. The natural consensus mechanisms in music, from songwriting to the development of music protocols, can serve as a model for future infrastructure.

The music community offers an alternative model for building infrastructure, as their consensus mechanisms predate that of financial speculation. Though music has been heavily commodified by pressures of capitalism, music and music communities persist and co-exist with an exploitative industry. One example is the “locational clustering” of music making in an era of globalization. Clustering remains relevant even as the music industry takes advantage of networks, suppliers, and markets, referring to this as a “location paradox" (Florida et al, 2010). When a cultural artifact, such as music, becomes a gathering point, a different model for interpersonal interactions and organization can emerge independent of capitalist hegemony.

An archive of musical data provides the seed from which alternative systems of infrastructure can grow. Ultimately, the success of *Permanent Music* depends on whether it meets the aims set by the paradigm of critical making. That’s to say success is apparent if and only if musicians, developers, and audiences find this technology liberational, apart from its financial incentives. Data oriented around culture itself suggests a different narrative than a culture that’s been disrupted by digital infrastructure.

Artifact

The accompanying artifact for *Permanent Music* is a smart contract, with the ability to mint ERC721 (non-fungible) tokens. These tokens have stored musical information that can be played back through a website or software application. The contract itself is deployed on a low-carbon, layer-2 side chain called Polygon, which reduces the ecological impact of Ethereum significantly (Digiconomist, 2022). It cost £2.16 to deploy, and I set the cost of minting to less than £0.01.

This contract is easiest to access through the artifact's Github repository, which uses web 3.0 infrastructure to interact with blockchains. Coupled with the integration of Web MIDI API, now a native technology in all modern web browsers, anyone can play back the MIDI data from a token to the MIDI device of their choosing. In this context, a financial paradigm of trading and speculating becomes a musical playground, wherein musicians, developers, and other enthusiasts can make use of royalty-free data to create new works.

By creating a smart contract and deploying it with MIDI-engraving capabilities, music information is positioned as a permanent and public resource, with the potential to be reinterpreted or reimagined into new forms of art. It puts MIDI data as the central point of configuration. It allows sharing sharing and collaboration, much like the ways of early internet peer-to-peer torrents (Field, 2001). And as MIDI is just a specification on how to interpret raw data, the permanent data also can be extended to other artistic forms. MIDI can be mapped to many kinds of artistic mediums, from visual art to human movement (Breve et al, 2022). While most music-related non-fungible tokens are individual song recordings, an abstract set of data allows the artist to apply any rhythm, any bassline, or any accompaniment to that source. *Permanent Music* points to the ubiquity of data and how common standards can be used for different applications.

This model of infrastructure takes influence from The Sphere, a "research-creation project" that reimagines arts funding and business practices (Bordeleau, 2021). "[The Sphere] allows for artists, cultural workers, audiences and organizations of different kinds—that is, a wide range of sympathizers and other potential stakeholders—to initiate creative collaborations and implement new funding strategies" (2021). *Permanent Music* provides greater specificity to these concepts by providing a tangible seed from which artistic exploration can follow. The use of MIDI situates the smart contract in the context of music composition, arrangement, and instrumentation. The premiere artifact implements the idea of an 'anarchive', which moves

beyond documentation to production methods that adapt to developments in technology. With music, and potentially other disciplines of art, the priority of technology isn't what we can extract from the world, but what we can share, create, and perform for other people.

Because the data is organized through the MIDI protocol, the contract ascribes a particular way the data will be used. Music-centered blockchain usage aims to produce 'cultural and economic equity with new forms of contractual and non-contractual bonds', a goal outlined by Gerald Nestler (2018, p.142). Orienting infrastructure around arts, culture, and community relationships could shift the way that assets, artifacts, and symbols are valued. By subverting the process of commodifying music with the musicking of finances, new relationships emerge between the art created and the people who create it.

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