Live Coding as Critical Media: Asian Assemblages of Algorave

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Abstract

In this paper, we situate the practice of live coding as an articulation of critical media. This critical practice involves the real-time use of programming languages to address a range of creative challenges and communicative strategies through tactical improvisation. Despite its roots in the early 2000s, we observe that live coding remains a marginal creative practice. The literature on alternative media presents various modes of digital critical practice, including hacktivism, culture jamming, and others, yet live coding has received very little attention within this field. As a performance-based musical practice, algorave is a social movement centred on the performance of electronic music that re-centres human agency within an assemblage of sociotechnical relations. This critical practice challenges the logic of automation and generative AI by demanding human creativity and competence towards the creation of soundscapes. The nature of live coding decenters the use of programming away from its common institutionalized associations, particularly with neoliberal, STEM-based careers and education. Instead, live coding functions as a participatory practice to empower, subvert, resist, and transcend sociotechnical constraints. We see live coding providing experimental, experiential and pragmatic possibilities for marginalized and Global South contexts through a radical reframing of creative technologies which originate from the Global North. Our work highlights cases of live coding through algorave across Asian contexts.

Key words: live coding, critical media, algorave, alternative media, global south

Introduction

Live coding can be defined as a real-time, interactive practice involving the immediate authoring, modification, and execution of computer code as the principal methodology for generating dynamic, creative or pedagogical artefacts (Selvaraj et al., 2021; Zmölnig & Eckel, 2007). It is characterized by the use of programming languages to produce in real-time sonic, visual, or conceptual outputs. It is a versatile technique employed across diverse domains for artistic expression, performative demonstration, and educational exploration. We examine live coding as a critical media practice, highlighting its experimental, experiential, and pragmatic possibilities, particularly in the Global South and marginalized contexts. While live coding has its roots in the early 2000s and before, it remains a niche creative practice that has received little attention in the field of alternative media.

We specifically focus on live coding through the lens of algorave practice, spotlighting Asian contexts within the Global South. Algorave is a social movement modeled on raves in which algorithmically generated electronic music recenters human agency within sociotechnical relationships (Armitage & Thornham, 2021), challenging the deterministic logic of automation and generative AI by emphasizing human creativity in soundscape creation. The grassroots nature of live coding detaches programming from its institutionalized and neoliberal agendas, including STEM-based careers and education. Instead, it acts to empower, subvert,

resist, and transcend sociotechnical constraints. Below, we further define key terms before discussing the criticality of live coding and algorave. The penultimate section of our work juxtaposes experiential knowledge of algorave with relevant literature. We conclude with reflective remarks concerning the significance of live coding as an expression of human agency.

Defining Live Coding

The history of live coding as a distinct creative practice can be traced back to a 1985 musical performance and technical talk by Ronald Kuivila (Roads, 1986). By the year 2000, more musicians, visual artists, and choreographers began exploring real-time programming in performance (Zmölnig & Eckel, 2007). This led to the formation of communities such as TOPLAP (Temporary Organisation for the Promotion of Live Algorithm Programming) in 2004, which played a significant role in formalizing the practice and fostering its growth (McLean et al., 2005; Lara Mendoza et al., 2023). The emergence of the algorave scene, where music and visuals are generated from algorithms, often through live coding, further popularized the art form within both academic and underground music circles (Williams, 2023).

In artistic domains like music and performance art, live coding is deeply intertwined with improvisation, performance, and the public visibility of the coding process (McLean et al., 2010; Parkinson and Bell, 2015). The field of computing views live coding through the lens of real-time interaction and a critical perspective on traditional software development (Rein et al., 2018). In computer science pedagogy, the focus shifts to live coding as a teaching methodology aimed at demystifying programming and promoting active learning (Selvaraj et al., 2021). Academic study of live coding as a teaching technique largely began around the turn of the millennium. We now explicate the concept of critical media to then demonstrate how the employment of live coding across domains constitutes this form.

Defining Critical Media

Atton's (2001) work on alternative media identifies them as outcomes that constitute non-standard or disruptive approaches to the economics of production and cultural formations of media use. Other scholars have identified interchangeable terms for alternative media, such as grassroots media, independent media, participatory media, autonomous media, tactical media, and critical media, as examples, with each term prioritising a core feature, function, or context (Pajnik & Downing, 2008; Sandoval & Fuchs, 2010). These practices transform the content, form, distribution, reception, relations, and reproduction of mediated communication and creative practice.

Critical media are counter-hegemonic as they challenge "institutional and professional media power" and offer a way of opposing "conventions and representations of the mainstream" (Atton, 2008, p. 31). Later, Atton (2015) noted that the study of critical media considers "different ways of generating, structuring and presenting" representations through process and outcome. Considering these understandings, Fuchs (2010) offers a useful elucidation of critical media worth echoing:

Critical media product content shows suppressed possibilities of existence, describes antagonisms of reality and potentials for change, questions domination, expresses the standpoints of oppressed and dominated groups and individuals, and argues for the advancement of a co-operative society. Critical media product form aims at advancing imagination, it is dialectical because it involves dynamics, non-identity, rupture, and the unexpected (p. 189).

As such, critical media can be understood in terms of a two-fold conception of form and content that is transgressive, creative, and emancipatory. Critical media are media forms, content, and practices that actively question and challenge dominant power structures, ideologies, and representations prevalent in mainstream media. This field often examines the influence of media on social, cultural, and political realities, with a particular focus on issues of inequality, marginalization, and social justice (Bailey et al., 2008). Scholarship in critical media aims to understand how media content is produced, distributed, and received, revealing underlying and overt biases while advocating for more equitable and counter-hegemonic media landscapes (Pajnik & Downing, 2008).

Live Coding and Algorave as Critical Media

Live coding inherently possesses a critical dimension largely absent in traditional programming due to its focus on process, performance, and the public exposure of code. The critical aspect of live coding has been noted by its practitioners from the viewpoints of both Latin America and feminism, and the references here are not an exhaustive list (Ledesma, 2015; Mendoza et al., 2023; Armitage, 2018; Armitage & Thornham, 2021, Champlin et al., 2023; Chicau & Bell, 2022). This improvisational practice, where code is written and executed spontaneously, leads to dynamic development and often unexpected results. As such, it contrasts starkly with coding as a static practice and structured instrumentality of computer science (Popat & Starkey, 2019). This emphasis on the 'how' of digital creation aligns with critical media's interest in deconstructing media production practices and the ideologies which constitute such (Atton, 2015).

The practice of live coding stands adjacent to similar forms of critical media production, such as hacktivism and culture jamming, which also use digital technologies, including various forms of programming (Bailey et al., 2008). Hacktivism involves the use of computer-based technologies to disestablish structures of power, "enacted through computer code that exposes information, destroys data, or disrupts operations" (George & Leidner, 2019, p. 10). Consider the original definition from the hacker collective The Cult of the Dead Cow in 1994: "... a policy of hacking, phreaking or creating technology to achieve a political or social goal" (Thomas, 2001, p. 1). Similarly, culture jamming concerns a reappropriation of meaning and practice through the remixing of existing forms and content, sometimes through the "tactical use of digital media," which can be "process rather than result-oriented" (Lekakis, 2017, p. 318).

Hacktivism and culture jamming have roots in the critical practices of the Situationists, a European intellectual collective which emerged during the late 1950s (Bailey et al., 2008). The Situationists were characterised by their signature practice of détournement, which concerned how they 'hijacked' and recontextualized the meanings of texts in an attempt to subvert, invert and deconstruct through creative synthesis (Pajnik & Downing, 2008). This was exemplified in the ways Situationists detached still and moving images from their original contexts through which new meanings were juxtaposed with or referenced original meanings (Coyer et al., 2011). We see live coding as a critical practice that is methodically consistent with the intellectual tradition of the Situationists as a détournement of programming languages.

In contrast to both hacktivism and culture jamming, a defining characteristic of live coding is the transparency of its process: the constructed code is typically displayed to the audience, allowing them to witness the creation of the artwork line by line. This practice extends across domains, including music, visuals, dance, poetry, and notably, pedagogy. The focus in live coding shifts the final output to the creative process itself, making the act of coding a public and performative event (Zmölnig & Eckel, 2007; Bell, 2013; Lee, 2019). This differs from programming within industry contexts such as finance and healthcare (Liu et al., 2020).

The practice of algorave functions as a complex détournement of music, which unsettles common notions of instrumentation, composition, arrangement, and musicianship.
Live coding's focus on process and improvisation also contrasts with the polished, finished nature of mainstream digital media, pushing back against the illusion of seamless technology and highlighting the human labor, decisions, and potential errors involved (Ledesma, 2015). This perspective aligns with critical media's goal of deconstructing media production and revealing often-hidden labor and power dynamics. Experiments in collaborative music making over the network, often carried out through live coding, can examine and challenge ideas around political structure (Knotts, 2015).

The focus on real-time interaction and liveness in live coding provides a valuable model for contrast with other real-time digital practices and their effects on audience engagement and power dynamics (Tanimoto, 2013; Parkinson & Bell, 2015; Rein et al., 2018). Furthermore, the implicit critique of traditional software development within the computing aspects of live coding can inform broader critical analyses of software design and its embedded ideologies. The interdisciplinary theoretical foundations of live coding, drawing from performance studies, human-computer interaction, and pedagogy (Rein et al., 2018), provide critical media scholars with diverse lenses to examine the complex relationships between users, code, and digital systems.

The contemporary media landscape is characterized by increasing algorithmic mediation, blurring lines between media production and consumption, the pervasive influence of digital platforms, and concerns regarding media and data ownership. Live coding emerges as a distinctive intervention, offering a critical perspective and alternative practices that directly engage with these dystopian features of the contemporary situation. The act of making the usually hidden process of coding public can be interpreted as a critical intervention, challenging the idea of software as a black box and inviting scrutiny of its underlying mechanisms (Ledesma, 2015).

The ever-increasing online archive of screen recordings of these live coding performances from algoraves or other events as seen on YouTube and elsewhere serve to further disseminate these critical perspectives to not only local audiences but the general international audience online. These characteristics strongly connect live coding to the objectives of critical media. Crucially, it underscores the necessity of a consistently critical approach that unites theory and practice. This viewpoint, unlike approaches that isolate "alternative" or "community" media, sees cultural practice broadly as essential to human life and action, echoing the ideas of Williams (1975) as cited by Hamilton (2015). From these points, we contend that live coding can accurately be categorized as critical media. We further explore this understanding through the musical practice of algorave, as we discuss in the next section.

Live Coding and the Assemblage of Algorave

Rather than being a music genre, algorave is better understood as an 'event' or even a social movement. Sociologically, algorave is best understood as an alternative social movement as it is anti-establishment, shunning hierarchy and identity-blind to its practitioners as part of its inclusive ethos (DeFronzo & Gill, 2020; McLean, 2025). Practitioners present media generated through algorithms, most often through live coding, that fits a rave context. Similar to traditional raves, this can include music genres like techno, house, electro, drum and bass, and ambient (Collins & McLean, 2014). The algorave movement challenges music genre constraints and social structures around the use of programming languages and the production of electronic music, and practitioners have developed a set of progressive guidelines for running one (McLean, 2025). However, the algorithmic tools involved allow performers to produce music that does not belong to standard genres, instead sometimes forming alternative,

unnamed genres in the 'event' of their creation. Even though algorithmic systems also imply at least a certain level of automation, the performance context tends to highlight the human operator of the system. This is often done in part through live coders' practice of sharing their screens with the audience by projecting it (McLean et al., 2005; McLean et al., 2010; Lee, 2019).

Algorave questions the way live music is understood in its in situ execution by musicians and the experience of audiences. The use of various technologies such as digital audio workstations (DAW), laptops, microphones, audio interfaces and programming languages forms a musical assemblage of sociotechnical relations. That intertwines with musicians, audiences, and the contexts which inform and constrain the use of live coding. Théberge (2017) notes that musical assemblages construct how we conceptualise and operationalise the relationality of humans, contexts, instruments and technologies. Similarly, Waters (2021) raises the notion of "performance ecosystems", referring to situated configurations of elements concerning temporal, historical, social, physical, aural, visual and individual interplays (p. 135). This idea is expanded further by Wilson (2024), who sees "compositional and improvisation frameworks" which encompass a range of human, non-human, and more-than-human actors which "participate on their own terms and carry with them the acoustic assemblages in which they are already entangled" (p. 240). Other scholars identify the interface between humans, music and digital technology as posthuman encounters where "the reconfiguring and redistribution of human agency and cognition in conjunction with intelligent machines" is acknowledged in the case of live music production (Dyer & Kanga, 2023, p. 283). As such, the idea of a musical assemblage suggests that skilful manipulation of sound produces more than just the output heard by listeners. Bell (2013) explicates some factors in this assemblage and relates those factors to the aesthetic dimensions of live coding.

Live coding in algorave has programming languages as a core aspect of its performance, notation, and phenomenology (Blackwell & Collins, 2005). This encourages collaboration and enables networked performances where participants can contribute remotely (Kirkbride, 2020). In these settings, programming languages serve not just as tools but as expressive media for sculpting sound, image, and movement. The continuous feedback loop among the coder, the code, and the resulting output, where each influences the others in a dynamic, iterative cycle, plays a crucial role. Algoraves and live coding creatively destabilise the static conceptions of the ways programming languages are typically understood to be used. It is also common in algoraves for audiences to experience varying kinds of visualizations projected alongside the music generation, such as a display of the programming language in a web browser or specialized application, or a second performer operating live visuals alongside the main algorave musician (McLean et al., 2010).

Collins & McLean (2014) remark that the experimental nature of algorave embraces failure, uncertainty and error as a critical part of the practice. Armitage (2018) further comments that algorave offers the opportunity for constructive non-achievement, as "failure has been an expected and at times thrilling outcome of live coding performances". Debugging and responding to unexpected outcomes are considered integral and revealing parts of algorave performance, not flaws. This inherent transparency in the usually opaque process of programming fosters direct and critical engagement with the underlying technological systems that produce digital media. This openness augments the musical assemblage of algorave, giving a certain emphasis to human agency not present in other forms of electronic music. While technologically driven, this musical assemblage is human-centered, positioning human input as central to electronic live music experiences. In contrast to other contemporary algorithmic production techniques like mostly-autonomous neural networks, live coding in algorave is a critical practice that defies the deterministic logic characterizing 21st-century technological discourse.

Live Coding and Algorave in the Global South

Having established live coding through algorave as a critical media, we examine Global South contexts in which it has occurred. In this section, we draw heavily on anecdotal evidence drawn from algorave practitioner experience, corroborating this experiential knowledge with scholarship in related fields. In the Asia-Pacific region, early algorave events include a 2013 event in Sydney, followed by the first Algorave in Tokyo, subsequent events in Tokyo, a Japan tour, and an algorave in Hong Kong as part of ISEA. While Japan and Hong Kong are Global North contexts, algoraves differ there despite those countries having financial structures in common with the rest of the Global North. Algoraves and live coding practices have a longer presence in the Global South within Latin America and India, and more recent developments have taken place in Indonesia and Thailand.

Mendoza et al. (2023) analyzed Latin American live coding practices, contrasting them with Global North developments, proposing that live coding goes beyond technical sound experimentation to critique cultural and technological systems. This positions it as a medial musical practice whose artifacts function as critical media. Mendoza et al. (2023) highlight live coding's engagement with different types of time and various relations with the performer's body, noting differences stemming from fundamentally distinct constitutive logics, not just auditory cultures. Western focus on music tonality, exemplified by Sonic Pi presets, is treated differently in Latin America, (Mendoza et al. 2023). By rejecting Western hegemonies and using indigenous rhythms or culturally resonant sonorities, live coding can serve as a powerful tool for political contestation against extractivist and colonial forces, empowering practitioners to decolonize sonic practices, challenge power structures, and articulate their own cultural narratives. Latin American performers must work around these assumptions to perform authentically. Mendoza et al. (2023) note the algorumba of Colombian live coders, also described as such by Venezuelan live coder Julio D'Escrivan, with rumba deriving from Yoruba culture. This synthesis shows how Global South cultural practices can find voice through live coding, implying its vital critical media practice, sometimes similar to DJs but extending into broader cultural, symbolic, and technological systems.

Khoparzi (2022) describes that the development of algoraves brought together algorithmic music makers and gave them a different context to present work that had previously been eclipsed by Global North practitioners in Indian art galleries. Further, it allowed these cultural practices to reach audiences beyond technology and Western-influenced art crowds. Cardenas (2018) documents the growth of live coding in India from 2014. Later, algoraves and live coding events were held in many cities in India, such as Bangalore and Dehli (Khoparzi, 2022). Live coders around the world describe using the practice to reconsider the assignment of meaning, and in South Asia, that has also involved the incorporation of elements of classical music such as ragas; Delhi hosted the first all-women algorave in the country. The practitioners in these events in India come from diverse backgrounds including sound, design, and film (Mitra, 2021).

Hartono and Sutanto (2023) explore the development of algorave music practices in Indonesia, particularly Yogyakarta, where activities began in 2021. They note that Indonesian art institutions do not provide formal education in electronic music or live coding tools. The group "Paguyuban Algorave" arose as a platform for teaching and sharing live coding, electronic music, and algorave practices. Hartono and Sutanto (2023) examine algorave music in Indonesia, focusing on "Paguyuban Algorave" and how the international algorave movement uniquely amalgamated with local Indonesian culture, resulting in a distinctive musical approach. Hartono and Sutanto (2023) also investigate why this approach gained widespread acceptance compared to other computer-aided music forms and explore algorave's trajectory in Indonesia by considering historical Indonesian antecedents. They also investigate the influence of cultural factors on community interactions, communication, and knowledge

sharing, leading to ways distinct from the Global North, and they mention the complex relationship between culture and gender.

Thailand has also seen growth in live coding practice, with public performances dating at least back to 2012 with Kijjasak Triyanond live coding in the ChucK system (personal correspondence, June 2025). Synap Home Lab has been a center of recent activity, both showcasing local performers and hosting international ones (SYNAP BKK, 2023). Algoraves have also taken place in Thailand (Somno, 2024). Given this background, the potential of live coding and algorave to act as critical media in other Asian Global South contexts is apparent. However, it is necessary to acknowledge potential challenges related to access and infrastructure in the Global South.

Unequal access to reliable technology, including computers and stable internet connectivity, can limit participation in live coding activities for some communities (Ledesma, 2015). Addressing infrastructure gaps and ensuring equitable access are vital for realizing live coding's full potential. Additionally, there is a recognized need for culturally responsive pedagogy and content in live coding education to ensure its relevance and effectiveness in diverse cultural contexts, as simply transplanting teaching methods from the Global North may not be effective or appropriate. Finally, it is essential to be critically aware of and actively work against any potential colonial assumptions unintentionally embedded in live coding practices originating from the Global North. Decolonizing approaches that prioritize local knowledge, perspectives, and creative practices increase the possibility that live coding serves as a tool for empowerment and cultural expression in the Global South.

The potential of live coding as a critical media practice is particularly significant in Asia and the Global South, where issues of access, representation, and cultural sovereignty in the digital age are acutely felt. Live coding offers accessible methods for digital art creation and expression that can empower marginalized communities and challenge the dominance of Western-centric media narratives and technologies. Carpentier et al. (2015) offer insights into how critical or community media democratizes technology by making it accessible and fostering participation. The emphasis within live coding on open-source tools, visible processes, and collaborative learning aligns directly with their community approach. This focus on shared access and active participation enables individuals to move beyond being mere consumers to becoming active creators and critical users. Access begins with the low economic barrier to entry, especially through free and open-source software.

Carpentier et al. (2015) also highlight use of technology for alternative purposes and diverse discourses, which resonates with live coding's potential to challenge mainstream media production norms and provide a platform for marginalized perspectives. This demonstrates that live coding empowers individuals and communities to engage with technology in ways that challenge established power structures and promote media democracy. Live coding can facilitate the creation of culturally relevant digital media that actively challenges dominant Western aesthetics and narratives in the global media landscape. It provides tools and techniques for artists to develop unique sonic and visual expressions reflecting local cultural aesthetics, traditions, and histories, allowing communities in the Global South to assert their identities, share their stories, and contribute to a more diverse and representative global media ecosystem. This critical practice can be seen as a form of digital decolonization, providing means to create content that is not only produced locally but also reflects local perspectives and values, pushing back against homogenizing global media flows (Ledesma, 2015).

Conclusion

Live coding is an evolving and significant form of critical media, uniquely positioned to interrogate and challenge the dynamics of our increasingly digital and algorithmically mediated world. It operates critically through its inherent transparency, capacity for direct intervention, and power to foster participatory engagement. This act of revealing the "how" of digital creation directly aligns with critical media's aim to expose constructed realities and embedded power structures within media forms. Furthermore, live coding provides a dynamic platform for critical commentary, intervention, and increased agency. It fosters agency by demonstrating that code is a malleable medium, empowering individuals as creators and modifiers of digital technology, not just passive consumers. This is crucial in an age where understanding code is increasingly vital for informed societal participation.

The accessibility of open-source tools and supportive live coding communities further facilitates this shift, enabling experimentation and challenging existing technological paradigms. This move from passive consumption to active creation and critique is a central goal of critical media practice. Furthermore, the strong emphasis on open-source tools and the sharing of code and techniques offers a direct critique of the proprietary nature characterizing much traditional software development. The dominance of a few large digital platforms concentrates power over content distribution, user interaction, and data collection, often operating with proprietary software and algorithms. Live coding offers a compelling counterpoint to this centralized model (Ledesma, 2015). The collaborative nature of many live coding communities encourages shared knowledge and decentralized networks of practice, presenting an alternative to the top-down structures of dominant platforms.

The transparency of live coding performances also encourages critical thinking about software and algorithms. Observing live coding can reveal programmer choices that lead to certain outcomes or favor particular perspectives, stimulating discussions about fairness, accountability, and the ethical implications of algorithmic decision-making. It reveals the technological processes that shape our digital experiences as constructed systems with specific logics and potential biases. Audiences and practitioners gain a more concrete understanding of how digital media is produced, moving beyond passive consumption to a more informed and critical engagement. This visual and experiential learning empowers audiences to ask critical questions about commonplace digital technologies.

The significance of live coding as critical media is particularly evident in contexts like the Global South, where it offers accessible avenues for digital art creation and cultural expression. By providing tools and platforms for creating culturally relevant digital media, live coding can empower marginalized communities, challenge Western-centric narratives, and contribute to a more diverse and representative global media ecosystem. Recognizing live coding as a vital form of critical media is essential. Its unique ability to bridge technical practice and creative expression offers a powerful lens for understanding and critiquing the digital world that increasingly shapes our lives. As technology and media landscapes continue to evolve, live coding may play a larger role in shaping the future of digital culture and critical engagement. With the persistence and care of its practitioners, this may happen not only in the Global North, but also within the Asian Global South.

Examining live coding alongside established forms of critical media highlights both commonalities and distinct differences, underscoring its unique position. Compared to documentary film, for instance, both can expose hidden realities and challenge dominant narratives. However, while documentary film achieves this through narrative, visual evidence, and editing, live coding does so through the direct manipulation of code and the revelation of underlying computational processes. Similarly, both live coding and activist art aim to provoke critical reflection and inspire social change. Yet, live coding's primary medium is software and

its performance, offering a unique avenue to engage with technology as a site for political and cultural intervention, distinct from the broader range of mediums employed by activist artists.

Conversely, critical media theories can significantly deepen the understanding of live coding. By focusing on power structures and ideologies, critical media can illuminate inherent biases and design choices within live coding tools and languages. Applying critical frameworks allows researchers to analyze how these tools might favor certain forms of expression or interaction while potentially marginalizing others. Furthermore, critical media's emphasis on audience reception and the social/political contexts of media consumption offers valuable insights into how live coding performances and educational applications are interpreted and engaged with by different communities. Understanding the power dynamics in the creation and consumption of live-coded media can lead to more critically informed design and application of these practices across all domains, promoting greater inclusivity and critical engagement with technology. An exchange between the study of live coding and critical media holds significant promise for advancing our understanding of the intricate relationship between code, culture, and power in the digital age.

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