

Real-Time Game Mechanics in Theatre

by Remy Siu (蕭逸南)

“On time”

8 August 2018 // Gold Saucer Studios

I’m editing a film.

I’ve just been given a quick tutorial on Adobe Premiere by my friend and close collaborator Daniel O’Shea (*A Wake of Vultures*). I’ve been using Final Cut Pro X and Digital Audio Workstations (DAWs) for years, so it clicks for me. There’s a timeline and a playhead. Time is represented on the x-axis. Clips are arranged linearly; they play one after the other. When I press the spacebar, the playhead begins to move, showing me the ‘present.’ Every time I stop the playhead and replay the same section, I reliably see and hear the exact same thing.

I realize that for the first time in three years, I’m working in a fixed format.

1 February 2018 // Foxconn Frequency

(no.3) talk-back session, performance works

“You say that the work is variable length, how long could it be?”

David Pay (Music on Main performance series) asks.

“Theoretically forever,” I say.

“How do you deal with that dramaturgically?”

30 January 2018 // Foxconn Frequency

(no.3) rehearsal, performance works

The show premieres tomorrow.

I’m freaking out because Maiko Yamamoto (*Theatre Replacement*) and June Fukumura (*Popcorn Galaxies*) just watched a three-hour run of *Foxconn Frequency (no.3)*. The longest end-to-end run we’ve ever done.



Foxconn Frequency (no.3) at PuSh International Performing Arts Festival 2018.

Photo by Remy Siu

My performers, Natalie Tin Yin Gan (Hong Kong Exile), Vicky Chow (Bang on a Can All-Stars), and Andrei Koo (a 12-year-old boy), look exhausted. Each of them represents a different skill level of piano playing. Natalie is an amateur, Vicky is a god, and Andrei is a child.

Paul Paroczai, my close collaborator and co-programmer, asks, “How long was that?”

The piece allows a theoretically infinite duration, but let’s be honest, I was aiming for something between fifty and eighty minutes. It says as much in the PuSh program. Three hours is *too damn long*.

Mahaila Patterson-O’Brien (Farouche), my partner, is also there. She has a list of good notes about what to do: This section could be shorter; this section could be longer; this section is completely unneeded.

I write these notes down and go sit at the computer. This computer runs everything in the show: the lighting, the keyboards, the projectors, the monitors, the sound, the 3-D printers, the structure, and the game-mechanics system. All the devices being used in the work have long cables running across the theatre to this computer. There is no stage manager.

I look at the TouchDesigner patch and the nested tables that contain the structure for the show. These nested tables contain all the permutations of the modes utilized in the work, along with all the ‘settings’ in the modes. The last two and a half weeks have been about ‘tuning’ these modes to a place of proper difficulty for the performers so they are adequately challenged.

“It’s too hard,” I think. “But that’s part of the drama,” I think. “But three hours is too long.”

There is a mode where the performers need to execute a piano passage in complete unison (pressing the right keys together within a twenty-millisecond window per key). It is difficult for Natalie

and Vicky, but especially difficult for Andrei as a young pianist who is not used to playing with others.

“He can’t keep count with the others,” I think.

We understand the minimum length of a section, but not the maximum length. As with many of these modes, if the players cannot achieve the proper success conditions, they must repeat the passage until they can. These unison sections are usually five minutes or so, but this time, one lasted twenty minutes. I can make these sections easier to make them shorter, or I can leave them be, hoping that Andrei will perform better for the premiere. I also consider that this unison mode exhibits a core part of the work’s theme. The performers are given few constraints on how to achieve their goal, but more often than not—even in the competitive sections—they work together under this oppressive system.

“I should leave it be,” I think.

But if these sections last longer than ten minutes, it will upset the balance and flow of the work, as the next section is on average longer and requires that length to settle.

“Shit.”

I adjust their window of time to thirty-five milliseconds.

Thirty minutes later

“It’s too easy.”

The struggle of it is gone, the success conditions too quickly reached. It does nothing now. No one needs to work together to achieve it, and those extra fifteen milliseconds create a visible gap between key presses that renders the whole section pointless.

The performers seem happy, though. Andrei is more confident now. Natalie is relieved.

I adjust the window back to twenty milliseconds without telling them and cross my fingers. We test the unison section again. They complete it faster than they ever have before.



A section from *Foxconn Frequency (no.3)* that displays the 3-D printed yellow cubes.

Photo by Remy Siu

“On real time”

Sometime in December 2017 // Gold Saucer Studios

The 3-D printer has jammed again.

I take it apart, unfold a paper clip, warm the nozzle to 100 degrees Celsius, and begin to push the paper clip through the top side of the nozzle where the filament has melted and clogged the entry of new filament.

My hope is to make these 3-D printers print a yellow cube during the performance of *Foxconn Frequency (no.3)* based on the performers' accuracy. Time will be represented on the *y*-axis: the start of the show, the first layer of the object, and the end of the show, the last layer. The layers will be offset by the players' performance. If they do well, there will be no offset; if they do badly, there will be a large offset.

I am excited that the performance will produce a unique physical object. Maybe one day, Vicky will play so well that she will produce a perfect cube. At least, I think, people will have another hint that the show happens in real time.

1 February 2018 // *Foxconn Frequency (no.3)* after the show, performance works

An audience member approaches me to ask questions about the work. They ask about what the pianists get to see.

I tell them that the pianists see traditional Western notation, as that is still the most effective way to communicate these passages. They receive these passages on computer monitors. They are different every performance in an attempt to subvert their ability to prepare and practise.

“It happens in real time,” I say.

“Real time?” they say. “What is *that*?”

22 April 2017 // *The Westin Bayshore Hotel, Vancouver*

I'm at the Centre A Fundraiser with Howie Tsui, a visual artist, and a colleague of ours comes to speak with us. The colleague asks us about our work *Retainers of Anarchy*, a 28-metre-long digital projection with algorithmically controlled virtual cameras and animations.

We immediately begin to speak about the technical difficulties of the project, trying to power five 1080p projectors with 20+ 4K videos running simultaneously, while moving the camera, and keeping everything at fifty frames per second—

... without direct user/audience interactivity, something running in real time is perceptually similar to something running 'offline.'

“Wait wait,” our colleague says, “You are running it real time?”

“Yes,” I say.

Our colleague laughs, “You don't have to run it in real time!”

If you Google search for the definition of 'real time,' you'll get something like this:

“Real-Time: relating to a system in which input data is processed within milliseconds so that it is available virtually immediately as feedback.”

Almost none of my work so far has audience interactivity. I've been steering away from interactivity, because I don't know what to do with it yet, and I like watching others engage with real-time systems, and based on the popularity of *Twitch* and *YouTube* gaming, so do many others. But without direct user/audience interactivity, something running in real time is perceptually similar to something running 'offline.'

I think about this. Is my obsession with systems and performances running in real time some display of macho programming prowess? Yes, probably some of it. Video games run in real time. Your smartphone applications (mostly) run in real time. Videos do not run in real time—they are 'baked,' and play back in the same way every time. With 'baked' sequences, you can pretty much do whatever you want in the image—you could make a Pixar movie, for example. It sits strangely with me, as I like constraints in process.

So our colleague is asking us, indirectly, why didn't we bake our sequences? Why doesn't *Retainers of Anarchy* loop?

Sometime in January 2017 // Gold Saucer Studios

I press “start.”

Howie and I sit back to watch the first running prototype of *Retainers of Anarchy*.

The virtual camera moves in unexpected and new directions. It feels alive and restless, with a life of its own. As it interpolates from one angle to another, the camera takes a different path to its Wuxia-inspired subjects each time.

Howie began this project as a response to a Chinese state-sponsored work, *River of Wisdom*, originally shown at Expo 2010 in Shanghai. This digital projection work brings an ancient scroll to life with breathtaking detail and animation. It was clear to us, early on, that we could not achieve something so intensely dense, even if we 'baked' the work as they did. We just didn't have the people power for it.

However, in that moment, seeing the camera move in a chaotic and lively fashion, the conceptual and dramaturgical reason for a real-time system becomes clear.

Retainers of Anarchy is a response to the clean, orderly life presented by this other digital scrollwork. It is meant to resist that depiction of Chinese life, by using Wuxia—a genre of fiction that features martial artists in ancient China—as a narrative tool of dissidence and resistance. All of a sudden, we had a formal analogue—a dialectic between the stiff immutable order of a 'baked' linear playback and the fluidity of a real-time system with large possibility spaces.

I *felt* it. It made a difference, even if I—as an audience member—didn't have to input anything.

11 December 2017 // *Nero Cafe on Seymour Street, Vancouver*

“I think it's all about presence,” Lee Su-Feh (Battery Opera) says.

Yes, I think. 100 per cent.

We are talking about my performance systems. I realize that my interest in performers making decisions onstage, in the



Working on *Retainers of Anarchy* at the Gold Saucer Studios.
Photo by Rémi Thériault, remitheriault.com

moment, is *all* about presence. It also helps me unpack my feelings of discomfort with musical performativity, the style one would get taught in music school as a pianist or a violinist. Those actions are fake. Unnecessary; for show. Often, I hear people talk about that kind of music performance being ‘theatrical,’ and I’ve just come to see it as bad theatre.

I’ve seen new-media performing artists strike a switch with enough force to rip it from its surface as part of their theatrical shtick, and not just because they were having a good time performing. These actions are confusing to me. If they wanted to move the switch with such force, why not make a switch—or whatever interface—that *requires* that force? I want to trust that the audience can tell the difference.

Lee Su-Feh’s *Dance Machine* comes to mind, a kinetic sculpture that transforms with bodies moving within it. Every time I see this work, I think about what Su-Feh has repeatedly told us during Hong Kong Exile rehearsals for *NINEEIGHT* and *Room 2048* as our dramaturge.

“What are the stakes?” she says. “Be present. Be honest.”

1 February 2013 // SFU Woodward’s, PuSh Festival

I am watching *Winners and Losers*, where Marcus Youssef (Newworld Theatre) and James Long (Theatre Replacement) play a game they made up. They are playing this game before my very eyes, in the moment, receiving live input from the audience and from each other.

I am in the last year of my undergrad at Simon Fraser University (SFU) Contemporary Arts. I realize they are playing a game onstage. After five years of music composition training, writing string quartets and orchestra pieces, I realize that, as much as games (of all kinds) have been a part of my life and my reason for getting into the arts in the first place, they have little place in my practice.

I think about how video games kept me company as I grew up sheltered by immigrant fear. My grandparents don’t speak English, so I was never allowed to leave the house or have friends over.

I feel in that moment that I have betrayed myself.

James rings the bell, “Loser!”

“On agency”

8 June 2017 // Gold Saucer Studios

Paul Paroczai and I are showing our new work, *new eyes*—for [single] player, to our Vancouver peers before its premiere at Contemporary Musiking Hong Kong.

We’ve been working for months to get this project ready, and we both agree it’s the most difficult thing we’ve done, both technically and conceptually. *new eyes* for three projectors, two loudspeakers, one Xbox controller, and one performer is meant to be an inverted approach to the *Foxconn Frequency* series.

Foxconn Frequency (no.2), which premiered in 2015, was our first attempt at using a digital game mechanic in the performing arts. The system was simple: The pianist performed the piano passages over a certain accuracy threshold to move forward in the piece, or they were asked to repeat the passage until they were successful in achieving the required accuracy.

It was an oppressive system where the player had very little agency; they could not make any meaningful decisions beyond how they decided to achieve their required win conditions.

On the topic of simplicity—*Foxconn Frequency* (no.2) had win/lose conditions. This binary outcome was intentional, but if I truly believed in game mechanics as a new way of performance making, how could I continue to rely on something as basic as a win/lose condition, when many experimental indie video games have already moved past the need for a ‘win’ or a ‘lose’? How could the only example that I had for one of these systems be an oppressive one?

new eyes—for [single] player was created to address these questions, seeking to give the player a large degree of agency to express their ‘playstyle,’ while also removing any success or fail conditions. As opposed to the *Foxconn Frequency* series, which was made for specialists (pianists), *new eyes* is designed for anyone who wants to try. A player *could* get very good at playing it, but newbies were encouraged.

I realize that, as much as games (of all kinds) have been a part of my life and my reason for getting into the arts in the first place, they have little place in my practice.

In the work, players navigate a 3-D space filled with floating nodes that contain audiovisual content which is then output for the audience. The player can traverse this space by moving horizontally and vertically, or by zooming in and out. Players control which nodes can be picked by the computer, selecting the possibility space by enlarging or shrinking a red bounding box. Every time the player decides to make an input through the controller, they spend a ‘movement allowance.’ This allowance regenerates over time, but if the player is not careful, they will end up with no allowance, and be unable to move or affect the system.

The computer also has an allowance. The more the player moves, the less agency the computer has over the output. But if the player recklessly spends their movement allowance, the computer

slowly gains more and more agency until it is very difficult to pull the system back to player control.

This mechanic creates a push-pull between the player and the computer. Many playstyles emerged while prototyping the work. My own personal playstyle always involved being too haphazard and overspending my allowance, leading to a constant struggle with the computer. Paul's playstyle emphasized the player/computer relationship by always trying to balance both allowances. In a move inspired by the 'quiet music' movements across Europe, the system accommodates a player who wants to create *no* input at all, thus relinquishing all agency to the computer for the duration of the work.

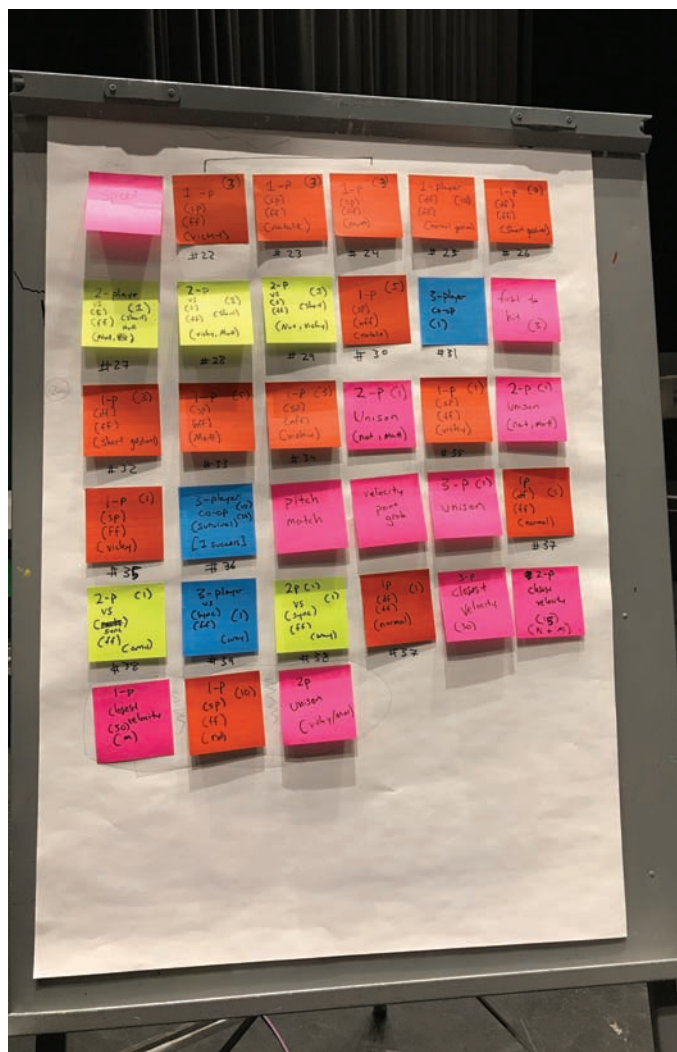
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After we finish performing the work for our peers, one of my close friends and collaborators, Conor Wylie (A Wake of Vultures), lists things he thought would be cool to see, and asks if I could compose those moments to tighten the work.

"Yeah," I say, "I've played this too many times today already."

I tell him that those moments that he described are possible, but it's not my 'playstyle.'

I pass him the controller. "You're welcome to try, though."



Post-it notes describing the modes at Banff Centre for the Arts. Photo by Remy Siu

13 August 2018 // The Skinny, Russian Hall, Vancouver

Chelsea Haberlin (Newworld Theatre), Marcus Youssef, and I are sitting at the Russian Hall discussing the possibilities of a work-in-progress called *Niall and Marcus Talk about Sh!t Niall Likes*, starring Marcus and Niall McNiell (a playwright and actor with Down syndrome). This project, I'm told, was born out of a section from the radically inclusive *King Arthur's Night*, where Niall and Marcus talk through a series of slides made in PowerPoint.

In *Sh!t Niall Likes*, however, the Newworld folks are worried that Marcus has too much agency in PowerPoint, as he is the one who creates the slides. Also, PowerPoint is linear by nature, and Niall's thought processes are more non-linear. How can we create a system that foregrounds his way of thinking? Newworld asked me to start by making a system that is not dissimilar to a video jockey (VJ) app like VDMX, but since we are building it in TouchDesigner, we can customize the user interface to Niall's liking.

I suggest that we can incorporate game mechanics into the system as well, since the flow of the work is a back and forth with Marcus and Niall interacting with certain photos, songs, videos, or instructions; it is similar to Japanese turn-based role-playing games, like the *Final Fantasy* series or *Pokémon*. One agent does something, and then another agent does something.

We jam about how these game mechanics can shift the power dynamic in a different way every performance, keeping the interactions between Marcus and Niall present and fresh.

Chelsea says, "The dramaturgical reason for them is to flatten the hierarchy between you [Marcus] and Niall."

"Game mechanics are like policy," I say.

Marcus nods, "They are policy!"

"On algorithmic theatre and process"

20 May 2016 // City University of Hong Kong, International Symposium of Electronic Art

Paul, Vicky, and I have just finished a difficult performance of *Foxconn Frequency (no.2)*. Usually, the work is around twenty-one minutes, but this performance was forty minutes. Vicky is jet-lagged.

We are sitting in the audience now, watching Benjamin Bratton (University of California, San Diego) give an amazing talk based on his research that feels like science fiction, yet it's not.

"We didn't invent the algorithm," he says. "We discovered it."

4 September 2017 // Banff Centre for the Arts

The whole team for *Foxconn Frequency (no.3)* is gathered around a bunch of coloured Post-it notes stuck to a whiteboard. Natalie, Vicky, Paul, Milton Lim (Hong Kong Exile), Matt Poon (Toronto-based composer-pianist), and myself.

Each Post-it note represents a different 'mode' possible in the work. Some modes are variations of a single game mechanic; something we call 'general testing.' Other modes depend on an entirely different set of mechanics; we call these modes 'mini-games.' We figure that we can organize these modes much like the video game *Mario Party*—where there is a base set of mechanics and rules that

[protocol]://ctr.utpjournals.press/doi/pdf/10.3138/ctr.178.010 - Remy Siu <remysiu@gmail.com> - Tuesday, March 19, 2019 8:45:17 AM - IP Address: 81.149.38.197



Foxconn Frequency (no.3) is a highly portable show—everything we carry with us is in this picture.

Photo by Remy Siu

persist throughout the session, which is then punctured by these mini-games with unique and varying mechanics.

Each mode, regardless of whether it is general testing or a mini-game, has varying parameters that give us some control over difficulty, duration, affect, and the rhythm of performer movement. These parameters are:

- The number of piano passages in the section ('steps' or 'turns')
- The range of piano passages that can be called by the computer
- The range of performer accuracy thresholds that determine whether they have succeeded or failed a passage
- The range of duration given to the performer to succeed per passage (if time runs out, it's automatic failure)

Foxconn Frequency (no.2) was created for Vicky—one performer—and had these modes:

- General testing with 'fail-forward' (if she fails, the turn still increments)
- General testing with no 'fail-forward' (if she fails, she is stuck until she succeeds)

A majority of the work uses the second mode. The first mode is used only on special occasions for effect or to demonstrate a mechanic for the audience.

Foxconn Frequency (no.3) is created for Vicky, Natalie, and one rotating male-identifying player. Unlike the previous entry in the series—a single-player game, essentially—this work is a *multiplayer* game. It shifts from being about isolation to relation, from individual to community. This greatly increases the number of modes we could develop:

- One player (general testing)
 - Fail-forward (on/off)
 - Same/different player per turn
- Two players (general testing)
 - Fail-forward (on/off)

- Same/different player per turn
- Per turn synchronization or separate tracks
- Cooperative mode (together)
- Cooperative mode (survival)
- Three players (general testing)
 - Fail-forward (on/off)
 - Same/different player per turn
 - Per turn synchronization or separate tracks
 - Cooperative mode (together)
 - Cooperative mode (survival)
- Speed test (mini-game)
 - Static target
 - Moving target
 - 'Impossible' target
- Unison test (mini-game)
 - Two players
 - Three players
- Velocity test (mini-game)
 - Two players
 - Three players
- Closest velocity test (mini-game)
 - Two players
 - Three players
- First-to-hit test (mini-game)
 - Two players
 - Three players
- Pitch match (mini-game)
 - Two players
 - Three players

With more modes than steps in a traditional Western music diatonic scale, can we attempt to create function? Could we arrange the modes to create intervallic relationships? Could we create a mode cadence? Would simultaneous modes allow us to create a mode counterpoint?

We begin to arrange them to answer these questions.

Sometime in October 2015 // Vancouver Community College

I am sitting with a group of high school students eating lunch in the Vancouver Community College cafeteria.

My longtime friend Gabsung Lim (Namoo Nara) and I are teaching these high school students Ableton Live and a bit of creative coding through the Western Front education program. These students are sharp and engaged.

They are sitting and eating together—a group of young people of different genders—talking about video games in great detail. They unpack the mechanics of a particular game, exchanging tips and other kinds of knowledge. One of them says that they mostly watch their sibling play but have worked out the mechanics without ever playing the game themselves.

This is my ideal audience, I think.

Gamers are good at reading digital game mechanics and algorithms. We have to learn a whole new set of rules for every new game we play, sometimes simply based on observation. This is good, I think, especially in a time when machine deep learning and other algorithms are becoming more complex, and their uses more transgressive.

Right Now, 22 August 2018 // Monument-National, MUTEK Montreal

I don't have a story for this part.

I am writing this at Monument-National during MUTEK Montreal 2018. One floor above me, *Keychange :: Amplify* is happening for the first time at MUTEK. It highlights women in digital arts and electronic music, and it is packed. The theatre is at capacity, and I came late, so they won't let me in today.

I want to acknowledge that the term 'algorithmic theatre,' to my knowledge, was coined by artist Annie Dorsen in her 2012 essay, "On Algorithmic Theatre." She says in this essay:

We have already given over large areas of decision-making to algorithms, and we have already (mostly) agreed to participate in the conversion of our lives into data, which algorithms will use. Algorithmic theatre makes their functioning available for observation and contemplation, so that we may begin to understand not only how they work, but how we work with them. (5–6)

I have not spoken directly about the content in *Foxconn Frequency (no.3)*. I would like to direct the reader, if they are interested, to an article by Godfre Leung about the work called "Factory and Chinese Mall, Catastrophe and Dreamworld," published in *Yishu: Journal of Contemporary Chinese Art* (May/June 2018). He says many things better than I can.

"On current/future work"

19 May 2018 // Mayfest with Theatre Replacement, Bristol, UK

I get a notification on my phone that Conor Wylie has written a new short story for our work-in-progress algorithmic-theatre-science-fiction-bike-chase. The work is titled *GIRL RIDES BIKE*. There are eight writers on this project trying to populate the fictional universe with enough interesting content that every night will be a vastly different experience, based on what narrative points are activated.

The work is an attempt to take what I've learned about algorithmic processes in the performing arts into a narrative space; to challenge linear, paper script-based traditional theatre, and the consequences to narrative dramaturgical approaches in these wide possibility spaces.

If two audience members see the work on different instances, they should quickly begin to understand that they did not see the same thing.

I read Conor's story. His 250 words open up an entirely new branch of exciting possibilities, while completely contradicting my 4,000-word story featuring the same character. If the computer, or

the performers, choose Conor's entry in any given performance, my story will be eliminated from possibility.

Good, I think.

31 January 2018 // Foxconn Frequency (no.3) premiere, performance works

Foxconn Frequency (no.3) premieres in ten minutes.

I'm sitting to the side of the stage, where the computer is. I touch it and say things to the computer like, "Please don't crash," and "Be good, computer."

The show is designed so that there needs to be no human intervention behind the scenes, only performer input. All I need to do is press one software button, and the show will run until the end conditions are met, at which point the show is over.

I hear the audience settle, and the PuSh opening speech. Natalie, Vicky, and Andrei enter the stage and do a small bow, in the style of the many traumatizing piano recitals we've performed in the past. The house lights dim.

I press GO and freak the fuck out.

List of performances mentioned (in order)

Retainers of Anarchy, Howie Tsui (2017)
River of Wisdom, Shanghai EXPO China Pavilion (2010)
Dance Machine, Lee Su-Feh (2017)
Winners and Losers, Newworld Theatre and Theatre Replacement (2012)
NINEEIGHT, Hong Kong Exile (2014)
Room 2048, Hong Kong Exile (2017)
King Arthur's Night, Newworld Theatre (2017)

Works Cited

Dorsen, Annie. "On Algorithmic Theatre." *AnnieDorsen.com*, 2012, anniedorsen.com/useruploads/files/on_algorithmic_theatre.pdf.
 Leung, Godfre. "Factory and Chinese Mall, Catastrophe and Dreamworld." *Yishu: Journal of Contemporary Chinese Art*, vol. 17, no. 3, 2018, pp. 84–88.
 "Real-Time." *Oxford Living Dictionaries*, 2018, https://en.oxforddictionaries.com/definition/real_time.

About the Author

Remy Siu (蕭逸南) is a composer and new-media artist based in Vancouver, British Columbia. He is the co-Artistic Director of Hong Kong Exile. He actively creates with Mahaila Patterson-O'Brien, Theatre Replacement, and Howie Tsui. During 2017–2019, he will be one of two composers-in-residence with the National Arts Centre Orchestra (Canada). He is also currently curator-in-residence at Contemporary Musiking Hong Kong. In 2019, he was nominated for the Gaudeamus Award.