

Diversity = Algorithmic

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ABSTRACT

In this paper we explore methods for tackling issues around diversity in music technology through algorithmic operations. If we consider diversity as a continuous task rather than a goal state we can break down that task into input, operations and outputs. We argue that some operations may lead to fields such as electronic music becoming or staying monocultural, and explore strategies we could adopt to break this cycle. We propose that considering diversity in terms of algorithmic procedures may help in reducing the impact of emotional layers that can hinder the progress of diversity initiatives. We see live coders as having the requisite skills to undertake this task, given their expertise in algorithm design and evaluation.

INTRODUCTION

Though programming was historically a female domain, with origins in weaving preceding the women 'computers' of the early 20th century, socio-cultural factors in the mid-late 20th century led to a homogenisation of the computational domains (Ensmenger, 2010). Creative arts on the other hand have historically side-lined women in the promotion of male-genius, with few female figures making it into the historical canon. Sitting on the intersection of computation and creative arts this legacy of monoculture, combined with slow movement in the quest for diversification means our current field of practice in music technology remains largely occupied by white men.

Cognitive diversity is important in developing group creativity as 'the integration of diverse perspectives and previously unconnected knowledge underpins the generation of new knowledge' (Mitchell 2006). Therefore breaking the historical cycle of monoculture and aiming for diversity in our communities is beneficial for the entire community and of importance to the progress of the field as whole.

In this paper we use live coding as a case study for developing strategies to break the cycle of monoculture in our field of practice. In terms of practice we are referring to several intersecting activities in the field, including: talking about; teaching of; recruitment (of students, staff and practitioners); citing of; and programming music technology. However, our methods could equally be applied to other communities of practice in music technology. The concept however is specifically relevant to live coding in terms of it's algorithmic nature, and the practice of editing code to effect the output in real time.

BACKGROUND AND METHODOLOGY

This paper focusses on gender diversity in electronic music and live coding. The authors are keenly aligned with Intersectional Feminism (Crenshaw 1989), and involved in activism and academic inquiry in this area, as it relates to electronic music. We support all forms of diversity in identifying and addressing barriers in the field. The processes described in this paper were developed through: our lived experiences as women in a male dominated technical field; as performers of algorithmic music; and as facilitators of female-centric education and activism; and a review of related literature.

As both authors are European, Anglophone, working class, white, straight, cis-women with a personal lived experience of disability we focus on gender as we do not claim, or wish, to speak on the behalf of other lived

experiences. However, we propose that the method we develop could be useful in addressing other forms of diversity, and supply some limited examples of this. We welcome input from other demographics as to whether this model could be adapted to approach other forms of diversity.

EQUALITY AS TASK

Progress has been made in developing diversity in music technology fields in recent years, but too often equality is considered as a credential to be achieved. However, as Sara Ahmed asserts “Equality is not a credential, it is a task” (Ahmed 2017). This perspective highlights both the importance of ongoing work to push back against social hierarchies, and the labour involved in this. It requires us to be vigilant as to the outcomes of our actions, and to adjust those actions in order to improve our outcomes.

If we reconsider equality as an ongoing act, rather than a discrete state to be reached, we can begin to identify a series of processes we can undertake to implement equality. To work out what these processes should be necessitates an ongoing analysis of the state of the system; determining where that system fails to undertake the task of equality; and suggestions of how those processes can be changed in order to improve the task of equality. In the context of music technology, live coders (and other algorithmic composers) have an advantage of working with algorithms. If we use live coding – which inherently includes an ongoing evaluation loop – as an analogy the task of equality can be defined as such:

What does my code produce?

Why does my code produce this?

What do I want my code to produce?

What changes can I make to my code in order to get the results I am seeking?

Plainly speaking, algorithms are recipes: what you put in, and the instructions you give for the handling of that input, govern what you get out. Or in equality terms, who enters the field in the first place, and how the community treats them, will determine who stays in the field and who leaves to join other communities who treat their members differently. In terms of developing diversity in the field, we need to ensure our input and our community defining algorithms, will result in the desired outcome of our equality efforts.

input + handling = output

Unlike live coding and algorithmic music however, diversity and equality has a layer of emotion complicating the process. Equality, as it is directly related to power and the value of one’s voice, inevitably involves an emotional process for all involved, those requesting more power, and those being asked to relinquish power. However, the conflating of the emotional responses to equality, and the tasks to be carried out can impede the development of progressive processes. These complex emotions, including anger, frustration, denial and vulnerability are deeply experienced, and must be recognised, but must not detract from the actions required to create equality.

These layers of emotion lead us into a faux position in terms of equality. Most of the fight is held here, those reacting and those defending. Whilst understandable, and a necessary part of the process, this battle often distracts us from direct action. As Ahmed says, “it is a task”. And to clarify the processual nature of this, here we’ll define this task in terms of computational operations.

We’ll use the following situation to model a diversity loop with pseudo-code:

Claim: “We don’t need an accessible campus because we don’t have disabled students here”

Analysis: It’s probably the case that no disabled students chose this campus because it was not accessible.

In this instance:

```
set numCampuses = random()
```

```

set campusAccessibility = []

  for numCampuses
    campusAccessibility[i] = [accessible, notAccessible].choose
  end for;

set disabledStudent

for campusAccessibility
  if campusAccessibility[i] == accessible
    disabledStudent.considers()
  else
    disabledStudent.doesNotConsider()
  end if;
end for;

```

We can see, that what we put in, (campus accessibility) governs what we get out (whether or not disabled students consider this campus for study). This is clearly an overly simplistic example, but it shows us how we can start looking at algorithmic changes.

If output required = disabled students attending
 Then input required = accessible spaces

On a secondary level, we have the *handling* of the input data.

Given the case of an inaccessible campus, one possible handling would be to action necessary changes to facilitate disabled students accessing classes and facilities. Another handling option could be as follows:

Input = no accessible spaces
 Handling of data = inaction on willingness to change and listen to disabled activists
 Outcome = message to disabled students that this university is not going to be flexible or open to your complex needs throughout your studies

In the first condition, a disabled student might still consider attending. The second alternative is more likely to send a signal that compounds the initial input (i.e. inaccessible facilities).

Let's consider this as pseudo-code:

```

set numCampuses = random()
set campusAccessibility = []

  for numCampuses
    campusAccessibility[i] = [accessible, notAccessible].choose
  end for;

set disabledStudent

for campusAccessibility
  if campusAccessibility[i] == accessible
    disabledStudent.considers()
  else
    if university.willingToChange() || university.listensToActivists()
      disabledStudent.considers()
    else
      disabledStudent.doesNotConsider()
    end if;
  end if;
end for;

```

Our input and processing, determine the outcome of the system.

1. INPUTS

So what do we put in, in music technology? For the sake of brevity and focusing on the lived-experience of the authors, we're going to discuss gender in the next sections. Here are examples of six different data inputs in the field of music technology.

1. Male Dominance in Teaching

The 2013 *Equality in Higher Education Statistical Report* found that

“The majority of professors were male (79.5%). This was true across part- and full-time staff and within SET and non-SET areas. The gender difference was most prominently observed in full-time professorial roles in SET, where men comprised 84.0% of staff.” (Equality 2013).

And alarmingly,

“The proportion of male academic staff earning over £50,000 was nearly double that of female academic staff (32.8% compared with 18.1%).” (Equality 2013).

2. Lack of Female Students in Post Graduate Training

“In our subject we are relatively fortunate that on a graduate level it seems to be 50-50...but if you go to Masters level already I think it begins to shift, at PhD level it is quite stark and at every step of the way it gets a little bit more extreme, more wider [sic].” (Bogdanovic 2015).

3. Complex Codes of Language and Acceptance

“Social boundaries rooted in technical knowledge and language also exacerbate studio labor divisions (Porcello 1991). In this study, Porcello analyzes conversations between producers and students who are part of a sound recording technology program at a public Texas university. He argues that the success of these programs is determined by how well students can reproduce the complex technical discourse-full of metaphors, industry terminology, and abbreviation.” (Farrugia and Swiss, 2008).

“In other words, from a producer's perspective, allowing outsiders access to this male-centered, technology space would demystify the production process and potentially lower the symbolic and/or use value of the studio space.” (Farrugia and Swiss 2008).

Porcello argues that Women have fewer opportunities to access this language as a result of educational structures around music theory and computing in high schools.

4. Lack of Opportunities for Women to Progress their Careers (Lack of women booked as performers / lack of visibility.)

Thump Magazine ran a survey on the gender balance of professional dance music performers.

“The numbers speak for themselves: survey after survey shows that the divide of dance music fans is roughly even between men and women. Yet, in 2014, such equality was still not reflected it where it mattered most for the business of the industry: festival lineups, club billings and agencies. In a pair of articles, THUMP ran the numbers on women in dance music-specifically at festival lineups and agency rosters-and revealed some stark statistics. On average, female artists made up just 7.85% of artists at North America's biggest talent agencies.” (Lhooq 2014.)

5. Overt Sexism Throughout the Industry (see all of the above)

Thousands of anecdotal quotes are available to evidence this experience by female electronic musicians.

Bjork

“but some media could not get their head around that I was not "performing" and "hiding" behind desks... and my male counterparts not” (Bjork. 2016.).

Kučka

“You have to prove yourself so much harder if you’re a woman. People still don’t believe you produce. On my Soundcloud, it says I’m a producer, and on heaps of my tracks there are comments saying ‘who produced this??’” (Lott-Lavigna, 2016).

Suzanne Ciani

“I learned to ignore all innuendo and all negative statements. There were places where I couldn’t go - corporations I couldn’t do music for because of their ethos and their misogyny - like some of the car companies in Detroit. It was demeaning. You have to develop a tough skin. Some of them had such an old boys club.” (Lott-Lavigna, R. 2016).

6. Unconscious Bias

However much we don’t wish to acknowledge that gender influences us, we have experienced a lifetime of societal bias and social programming. Overcoming that is not just a test of will. Claudia Goldin and Cecilia Rouse (2000) looked at the hiring rates of musicians for symphony orchestras, for both open and blind auditions (meaning that the assessors could not see the race, gender or disability of a player).

“Blind” auditions for symphony orchestras reduced sex-biased hiring and improved female musicians’ likelihood of advancing out of preliminary rounds.

- Using a screen to conceal candidates from the jury during preliminary auditions increased the likelihood that a female musician would advance to the next round by 11 percentage points. During the final round, “blind” auditions increased the likelihood of female musicians being selected by 30%.
- According to analysis using roster data, the transition to blind auditions from 1970 to the 1990s can explain 30 percent of the increase in the proportion of females among new hires and possibly 25 percent of the increase in the percentage of female in the orchestras.
- In short, “blind” auditions significantly reduced gender-biased hiring and the gender gap in symphony orchestra compositions. (Goldin & Rouse. 2000.)

2. OUTPUTS

In developing our community defining algorithms we can think of each of the above data points as functions which reduce our input population according to particular criteria. You put some random data in (e.g. mixed human populations) and get a population with a male bias out.

In some cases these are filtering functions that let through more men than women (e.g. 1.6), in other cases the function has more male input to begin with (e.g. 1.2), so even if the function itself doesn’t filter out men and women evenly, we’re not putting as many women into the algorithm in the first place.

These functions and filters are key to our eventual output, i.e. a community of music technologists and live coders with a heavy male bias.

Let's consider some of the above examples as pseudo-code:

```
set populationSize = random()
set population = []

for populationSize
  population[i] = [male, female].choose
```

```

    end for;
set PGStudyEncouraged = []
for population
  if population[i] == male
    PGStudyEncouraged[i] = true.probability(>0.5)
  else
    PGStudyEncouraged[i] = true.probability(<0.5)
  end if;
end for;
for PGStudyEncouraged
  if PGStudyEncouraged [i] == true
    population[i].completesStudyAndAppliedForTeachingRole().probability(>0.5)
  else
    population[i].doesNotCompleteStudy().probability(>0.5)
  end if;
end for;

```

Though clearly not a comprehensive analysis of how women are filtered out of academic music technology, we see that from a 50:50 population, women are filtered out at each stage of the algorithm. The knock on effects of this can be considered as follows:

If input = lack of support for females to undertake postgraduate studies in the field
 Then Output = high volume of male tutors applying for teaching roles

If input = high volume of male tutors
 Then handling = students do not experience female point of view or expertise
 Output = students fail to learn the contributions of female music technologists, perpetuating the myth that there are no women contributors, or if there are, they are not 'high level contributors'

If input = Majority male students fail to learn of women's contribution to music technology
 Then Handling = claim women's invisibility is due to there being no good female artists
 Output = fewer performances of women's work
 fewer citations of women's contributions
 students fail to learn the contributions of female music technologists, perpetuating the myth that there are no women contributors

If input = fewer performances of women's work
 Then handling = claim women's invisibility is due to there being no good female artists
 Output = Majority male students fail to learn of women's contribution to music technology

THEREFORE

We theorise that if we change the algorithm, we will receive different outputs. If we keep applying the same rules to our input data, we will continue to get the same results. Like live coding, diversity can be algorithmic, and we can change the rules. Let us consider what changes we might make to change the output of our algorithms:

So if output required = more diverse (in these example cases: female) coders

What input is required?

If Input = more performances by women
 Then handling = More citations and programme notes informing others about work
 Output = More male students aware of women's contribution + More opportunities for professional performances for women

If input = More male students aware of women's contribution
Then handling ≠ claim women's invisibility is due to there being no good female artists
Output = Less sexist environment for women to enter

If Input = Less sexist environment for women to enter
Then handling = encouragement of female undergrads to continue to masters and PhD level
Output = More women applying for teaching jobs

If Input = More women applying for teaching jobs
Then Handling = Blind bias control
Output = More women in teaching roles

If Input = More women in teaching roles
Then Handling = More male students aware of women's contribution
More opportunities for professional performances for women
More women cited in academia
Output = More balanced departments and performance spaces.

We see that many of these algorithms are interrelated and the output of one, may effect the input of another.

EXTRAPOLATION

In previous sections we have looked at some of the key aspects for change that have been identified in research related to gender diversity. In order to address other forms of inequality (race, disability, age, economic status, sexuality etc) we need to look at the functions which are filtering these people out, and then adapt them so that their output brings those people through the process of learning about music technology, to performing, teaching and writing about it. (This list is not exhaustive and is meant as an indication and conversation initiator).

For example,

1. Economic Discrimination

If technology = expensive
Output = only economically advantaged people will be able to take part

If technology = free
Output = people from a wider range of economic backgrounds able to take part

(This is one area where Live Coding does better than other forms of Music Technology which place higher financial burdens on performers).

1.2 Transgender Discrimination

For transgender people, safety is often a high concern. According to the 2015 U.S. Transgender Survey:

- “Nearly half (46%) of respondents were verbally harassed in the past year because of being transgender.
- Nearly one in ten (9%) respondents were physically attacked in the past year because of being transgender.
- Nearly half (47%) of respondents were sexually assaulted at some point in their lifetime and one in ten (10%) were sexually assaulted in the past year. In communities of color, these numbers are higher: 53% of Black respondents were sexually assaulted in their lifetime and 13% were sexually assaulted in the last year.” (James et. Al. 2016)

If space = not safe

Then handling = no safe or private transport available and late night concerts

Output = Transgender people may not feel safe to attend

If space = run by LGBTQI+ people, in well lit area

Then handling = cabs available, parking available

Output = transgender people feel less vulnerable and more likely to attend

1.3 Religion

As an example of religious exclusion, many faiths do not feel comfortable attending events where alcohol is served, or is prevalent. "Many of the region's Muslims welcome opportunities to go to events where alcohol is not served; sacred spaces allow access to such events, such as those organised by Islamic student's societies." (Jones et.al 2014).

In addition to this, there are complex rules and beliefs surrounding women and music performance, which vary across different groups of Muslims.

"Female Muslim performers, for instance, can come under severe scrutiny regarding their choices about hijab, dancing and many additional details. This may be in part because some Muslims believe that women should not sing or perform in front of unrelated men, an attitude by no means universal within Muslim communities." (Richards and Omidvar 2014)

If space = contains alcohol and men

Output = some faiths and women will not wish to attend

If space = art gallery, alcohol free, women only

The handling = marketing directed towards Muslim, Sikh, Hindu, Buddhist and other religious cultures

Output = Increase in people from religions which choose not to drink and mix gender in art form feel more able to engage

1.4 Disability

If space = no parking, uneven floors, no lift, no quiet space

Then handling = performance is late, or conference is spread over a long day and then a night performance

Output = Many disabled people will find this a challenge to engage with and will choose to stay at home

If space = parking, easy access, lift, chill space

Then handling = performance opportunities in early evening + performance or conference can be accessed and performed remotely

Output = more disabled people able to engage with performance opportunities

CONCLUSIONS

We are at a key point in time in terms of awareness of diversity issues in electronic music, and developing strategies for improving that. Approaching diversity as a task allows us to define a series of steps which can be taken. Those steps should reference the barriers to diversity, which have been identified by research and lived experience of under-represented groups, and address them. Along with statistical methods, consulting with, and listening to, those facing barriers is a key part of the process to properly determine strategies to address them.

Research has shown that there are multiple barriers to equality in the field of electronic music and live coding. We can see that there are approaches to diversity where our live coding skills and modes of thinking could be very useful. Initially we need to extract the emotional layer from diversity, and work as a team on a task. Once we are able to look at diversity as a task, we can begin to imagine an algorithmic approach to

dealing with the task. We begin by looking at what is prohibiting access. This can be determined by asking those from outside of your core group to identify issues. We can then use our live coding thought processes to design systems and strategies which address those prohibitions.

The basic structure of a diversity task requires considering: Input, Handling and Output. Modify input and handling, and the output will also change. This can be edited in real time as with live coding. For example, if your marketing materials are attracting a certain type of person, try changing fonts, colours, pictures, wording and venue to see if that affects your output.

Live coding skills can be used as an approach to diversity in order to affect change positively. By thinking about this in terms of algorithms we can approach a social sciences subject from a computational perspective. Live coders are uniquely placed to do this within the broader community of electronic music, as their algorithmic art-form allows them to: think in terms of processes; constantly monitor outcomes; and adjust inputs and processes accordingly.

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