Modulating Matters of Computation, Modelling and Hyper-Separations

Selena Savić
FHNW Academy of Art and Design
Basel, Switzerland
selena.savic@fhnw.ch

Shintaro Miyazaki
Humboldt-Universität zu Berlin
Berlin, Germany
shintaro.miyazaki@hu-berlin.de

We engage in a conversation with critical ecofeminism, which proposed to transform the colonialism-racism-capitalism-patriarchalism induced environmental crisis by non-essentialist countering of oppressions and hyper-separations produced by human/nature dualism. We modulate the critical ecofeminist approach by countering a similar dualism, namely that of nature/technology. Furthermore, our theoretical balance-act has a praxis-oriented side: we believe that computation can be included in ecofeminist action. By providing alternative forms of engagement to instrumentalization, we trace pathways to different futures, countering the binary narratives of technology but also its moralizing of socio-cultural mediation. We take an intersectional approach to outcomes of computational modelling (simulations, visualisations, forecasts) and discuss the ecofeminist method of synthesis as a way to include different perspectives into computational processes. We work with two 'modulated models' that pay attention to assumptions, observations and thinking about urban commoning initiatives, and amateur knowledge of radio telecommunications. We aspire to provoke discussions about different modes of inclusion in communities and archives that are centred on shared, environment-friendly, solidarity oriented life-style and mutual care. Our approach engages with feminist arguments and inquiries into ways patriarchalism is embedded in our relationship to technoscience and engineering. We explore modes of resistance by proposing skilled and alternative uses of these techniques.

Critical eco-feminism. Computational modelling. Synthesis. Intersectionality. Counter-computation.

1. INTRODUCTION

Ecological crisis in form of man-induced climate change, environmental migration and complementary political and economic crises render many longstanding oppositions inadequate, forcing us to embrace undecidabilities. Gayatri Chakravorty Spivak observed in postmodern literature a pattern of "undecidability between Europe and its other, in sexual difference; and undecidability between the human and its other" (Spivak 2003, 26). The difference between human and its other is critically addressed in feminist posthumanism by Rossi Braidotti, as well as other feminist new materialists who challenged the (in)distinction between culture and nature, and the Western conceptualization of this difference (Kirby 2017). Val Plumwood theorised these as hyper-separations, deep conceptual splits between men and their other, subordinated nature. She traced this split from ancient Greek androcentric conceptualisation of society, through the way it was inherited by the dominant Western religious movements of Christianity to Modern science import of oppositional and supremacist ideals of rationality and humanity: "The dual connection of women and other subordinated groups with nature and of male elites with reason is the key to the fundamental colonising problematic of Western culture." (Plumwood 2004, 47). It is necessary to challenge the naturalization of difference such as sex, gender, being or nature.

In this paper, we modulate ecofeminist critique with the practice of computational modelling. This modulation will take issue with the liberal premise of the autonomous subject with regards to collectivity. We will discuss computational modelling in the context of a community of people gathered around the interest in sustainable housing. We will also explore the collectivity in the knowledge space of a community-maintained digital archive of radio signals. In both cases, the fluid and temporary identities formed in the process of computational abstraction demonstrate the risk and difficulty to fix a boundary of difference. We are particularly interested in the analysis of computation that goes beyond recognizing its mechanical tendency to instrumentalise and operationalise difference. Our work with computational modelling suggests possible ways of embracing undecidability, for the

sake of articulating fluid identities and simulation outcomes.

We understand computational modelling processes as the active and intentional reduction of worldly experiences, processes and their encoding as interdependent relations. In the essence of computational machines is the operationalization of difference. One of the origins of general-purpose computing can be located in the work of Charles Babbage in 1820s and 30s, on his difference engine and later the analytical engine. Babbage experimented with encoding a wide range of problems as mathematical equations whose calculation can be automated. Similar aspirations to encode and articulate problems so that we can attempt to solve them with calculations remains strong today in computer science and its engagements with disciplines such as biology, sociology or urban planning. For example, in the field of animal population dynamics the relationship between the size of a wolf pack, the well-being and reproduction patterns of a heard of sheep and growth pattern of the grass field can be encoded in a computational model that explores the stability of this ecosystem depending on changing parameters (Wilensky & Reisman 1998). Another well-known example is the Segregation Model that establishes a computable relationship between race, life-style preferences and the resulting habitation patterns in a neighbourhood (Schelling 1971). Such models, which are more generally called agent-based-models, are meant to facilitate exploration of emerging patterns and tipping points in complex organisation of animal populations, elementary particles, nodes in networks or people in a society. The reduction can be useful to deduce optimal policy for social or resource management. We are, however, not interested in using computation to come up with policy, or optimise resource use. Countering the instrumentalization of difference in these reductions, we aspire to engage and offer ways to learn with computation for open-ended outcome of simulations and training. Working with models requires deliberation, intentionality and disclosure of one's interests. We propose to envision a different relationship between collective behaviour and statistical implications, between society and computation.

2. CRITICAL ECO-FEMINISM AND COUNTER-COMPUTING

Critical ecofeminism proposes to transform the techno-societal, colonialism-racism-capitalism-patriarchalism induced environmental crisis by a non-essentialist and non-solution-oriented countering of oppressions and hyper-separations. Eco-feminism is partly a project of synthesis. It draws on late 20th century attempts to connect feminist and ecological perspectives, as a critique of green politics complacency in capitalist status-quo. Because there is a common thread to feminine suffering across the planet, ecofeminist proposals coming from divergent political ideals all recognised the need for a paradigm shift that would resolve the contradictory tension between fixed oppositions that characterise Western thought. These proposals centred on challenging the human/nature dualism as an ideology that enables exploitation of the non-human world.

Ariel Salleh proposed ecofeminist synthesis as a project of dialectic recontextualisation and re-framing of the hyper-separation problem (Salleh 2017). She aspired to characterise women as pertaining to multiple contradicting levels of abstraction, as 'common' to colonisation of territory (nature) and people (women); an occupation of bodies and thought. Ecofeminism should unite North and South, the thinking and acting, the concern for destruction of environments, and concerns for individual (political) rights. Even though Salleh's conceptualisation of women can be seen as essentialist and at times romantic, the method of synthesis points towards a way to bring things together, to always include more. While some authors see feminism as not sufficiently universal to address environmentalism, Salleh insisted on uniting force of feminine suffering, and its strong relation to environmental issues. Plumwood was more careful with essentialism in her take on ecofeminism. While proposing any fixed definition of women carries the risk of uncritical affirmation and cultural universalism, recognizing feminism as uniting thread across diverse forms of exploitation and suffering does emphasise critical affirmation and solidarity (Plumwood 2004). It quickly becomes clear why challenging the hyper-separation of the 'human' is central to the project of countering oppressions: throughout history, parts of humanity such as slaves, foreigners (barbarians) or women, were considered non- or lesser-human. Contemporary rendering of the human/nature hyper-separation still "conceives the human as not only superior to but as different in kind from the non-human, which as a lower sphere exists as a mere resource for the higher human one." (Plumwood 2004, 44). As an antidote to that, Oxana Timofeeva considers 'human' to be everything that is doing labour. Recognizing this labour in form of (legal) employment is another story, extensively discussed in her treatise on animals (Timofeeva 2018).

Synthesis is a concept that pertains to many discourses and has 'travelled' widely across domains and time. It is the resolution of the Hegelian dialectic method, a new proposition that comes out of the consideration of a thesis and its antithesis. Synthesis features prominently in Herbert Simon's characterization of design knowledge as synthetic, implying a categorical difference between the ambition to intervene in the way things are by

assembling objects – pertaining to design – and the aspiration to treat natural phenomena analytically and objectively – as in natural sciences (Simon 1969). Mathematician Fernando Zalamea associated the analytical scientific method with modern thinking tradition: dissecting objects from within and analysing them in terms of their elements (Zalamea 2012). Zalamea used 'synthetic' to propose a philosophy that would address objects always in correlation with their ambient milieu. A fourth direction to consider is Iannis Xenakis use of term 'alloy' in his treatment of the relation between art and science or more precisely, music and mathematics (Xenakis 1985). Xenakis aspired to describe this relationship as that of mutual inference. Art, claimed Xenakis, is a mechanism of inference, a plane on which all theories of mathematical, physical and human sciences move about. He presented these cross-pollination processes as densification, coagulation, creating alloys. Taking clue from these discussions, we propose synthesis as a way of thinking that hosts a multiplicity of perspectives and enables articulations of polarities without taking sides.

Intersectional feminism has shown that, instead of analysing each form of oppression, limitation or crisis separately, we learn more by looking at how they intersect. Intersectionality focuses attention on social, identity and ideological forces that affect and legitimise power (Crenshaw 2017). The synthesis of these diverse layers of oppression that intersectionality proposes is of high interest to the method and approach to computational modelling that we develop in this text. An intersectional analysis of computation would bring out the ways in which systems for computing and classification perpetuate oppression. The method of synthesis we propose is close to the intersectional approach in that it also looks at the social, ideological, technical and material forces involved and aspires to counter hyper-separations by addressing multiple levels of concern at once.

We think, that counter computing could build an alliance with critical ecofeminism. While computation and computing usually are embedded within colonialism, imperialism, racism, capitalism, or patriarchalism, counter computing aims to counter the context it originates from. To counter means to go or engage against, while to encounter means to meet or come across. As a noun, counter means a table, where accounts are made or persons meet, thus an object, which is in opposition. A counter is also a device that counts. As an adverb, it describes a way that opposes something. It operates as a prefix to something to oppose or to react to. Counter computing wants to encounter, account and oppose computing in heterogenous ways. It resonates with ecofeminist synthesis, since computing, at least understood from its etymological past in the Latin words *com-* and *putare* meaning putting things

together, potentially is a form of synthesis. Computing as a concrete physical activity of signal processing in electronic hardware surely is synthesis in a more mundane manner, but calculation, simulation and modelling could not be merely used for profit-generation, but also as putting things together as a gesture of solidarity and mutual care. Thus, counter computing could reveal means that could amplify or modulate ecofeminist synthesis. Again, on a technological basis, computing incorporates forms of communication, but this microform or kernel of communality could get amplified by algorithmic machinery into systems, protocols and as we specify further below into models build and programmed with the intention to re-link, synthesise or put together formerly disparate fields and matters.

Our approach to computing does not aspire to bring out certainty and resolve undecidabilities. To the contrary, we embrace an always temporary perspective from our situated positions, and what Donna Haraway called 'feminist objectivity'. In laying out tensions between the critical movement of 'radical constructivism' and 'feminist critical empiricism', both aspiring to challenge the 'inexplicable scientific objectivity', Haraway focused her critique on relativism, as a way of being everywhere equally, implying a false universality and also a denial of responsibility (Haraway 1988). As a gesture of switching metaphors, she proposed feminist objectivity – which implies situated knowledges and partial perspectives. She insisted on the importance and persistence of vision as 1) a way to avoid binary oppositions, and 2) an embodied gaze enabling a new doctrine of objectivity. Partiality, in the sense of the way Haraway characterises situated knowledges, becomes key for articulating counter hegemonic strategies. Working towards such vision informs the way we work with computational modelling that could host a multitude of perspectives, while disclosing our interests and positions. We explored working with real and imaginary data and creating interfaces, or observatories of these computational processes.

3. MODULATING MODELLING

Modulating computational modelling engages with feminist arguments and inquiries into ways patriarchalism is embedded in our relationship to technoscience and engineering, instrumentalizing all that comes in its scope. We explore modes of resistance in the domain of computation through developing skilled and alternative uses of these techniques.

Different from approaches taken by a number of contemporary scholars engaged with archaeology and extractivism of media and technical systems (Parikka 2015; Yusoff 2018; Mattern 2021) whose

work we value and consider necessary, we do not propose to expose dirty metal and labour in computational processes, but to work out ways to change the methods of interpreting computational outcomes and power balances implied in the expectations of (masculine) objectivity. Documenting data, material and biological injustice is of great importance to challenge established disorders and paths of exploitation. We aspire to contribute to this documentation from the side of already instrumentalised machines, efficient calculators of difference, by proposing to formulate and practice feminist expectations from computational processes.

Situating commoning and computation through modelling as praxis aims to develop their partialities, not universality, opening up the way to insights made from bodies, which are complex, contradictory, structuring and structured, not from above but from within. Such a persistence on partialities would safeguard commoning from repeated appropriation by paradigms of control, power, efficiency and applicability. We will discuss two distinct approaches to modelling that situate researchers' knowledge and interests in a communicative setup between abstraction (reducing the world to computable relations) and imaginary narratives and identities (explosion, synthesis).

Our first example of a 'modulated model' resulted from our loose (open-ended) collaboration with three housing cooperatives. A heterogeneous set of interests, opinions, insights and tendencies emerged in our interactions with these groups. Our discussions focused on 'common labour' or the idea of voluntarily contributing one's work for the betterment of the community. We built four related agent-based models from these, demonstrating how individual behaviour can be constrained (or not) by a regulatory mechanism. The models operate as catalysts for thinking two distinct systems of governance through: 'accumulation' and 'banking', and ways in which these systems affect the stability of simulated communities. We questioned how much an individual strategy affects the overall working balance, and how different rules account for collectivity. Such rules address decisions on when and how much one would contribute to the community. For example, a number of individuals might choose to do all their work at the beginning of the month, resulting in the lack of work-force when certain tasks need to be done later. We documented this approach to critical modelling practice (Savić et al. 2020) and presented outputs from the two models, emphasizing the narrative element (Savić & Martins 2021). Our modulated models aspire to help write new stories, new episodes of commoning.

The second 'modulated model' is an exploration of the digital archive of radio signals gathered by a community of radio enthusiasts. The research into the identification of radio signals is motivated by an interest in synthesis – combining, transforming, joining things – and a discontent with the capacity of fixed oppositions (i.e human/nature) to host learning and sensorial and cognitive coupling with radio signals. Computational explorations of data on radio signals start from this premise that an identity of a signal is best understood when compared and measured with other signals in an archive, a computational process which enables an intersectional perspective on data (D'Ignazio & Klein 2020). By putting the data together and processing its different aspects with machine learning algorithms, we forego the modernist taxonomical classification of radio signals which is attuned at disclosing their instrumentality (i.e. what is a signal 'for'). The models 'self-organise' around different perspectives on the dataset, offering stories and resistance in place of hard discrete data. It is an attempts to update Braidotti's nomadic theory (Braidotti 2012) to address materiality of neural networks and data on radio signals (Savić, In Press).

Our work on 'modulating models' establishes communication channels between imaginary reality and real reality. The two models are examples of a method of synthesis that pertains to ecofeminist values outlined at the beginning of this text, and pertaining to discussions initiated by Salleh or Plumwood, among many others. We explore the generative power of synthesis both in terms of artificiality and inclusion. Modelling carries a hypothetical index thus, we argue, it often comes across as utopia. Modelling furthermore is a way to materialise possibility spaces and can pertain to counter-hegemonic activities. Models do not lead to more scientific certainty but in fact generate more complications, opening up an insolvable spectrum of interpretations, attitudes and opinions. Instead of lamenting about the seeming loss of scientific certainty, we think that such a loss could be a powerful insight, especially in terms of politically engaged humanities-driven, experimental (media) design research.

Media studies scholar Claus Pias argues, that "because various people model and simulate the same problem in various ways, what eventually emerges – instead of certainty – is an un-circumventable spectrum of opinions and interpretations. And it is to this degree that simulations contain an element of sophistry and take sides." (Pias 2011, 52). Simulations take sides, and imply an interested entity that makes sense of computed outputs in form of probability predictions, or simply stories and (societal) narratives. Following philosopher of science Isabelle Stengers we recognise that modelling as part of what she characterized as "Western science" has always been linked to engaged political positions (Stengers 2000). We explore the generative potential of undecidability, of the presence of a multitude of

things at once. We engage with ways of putting computational frameworks and processes not only together but also back into their genealogical contexts, so that new ways of arguing about their outputs can form.

4. TOWARDS AN ECOFEMINIST METHOD OF SYNTHESIS

Feminism stands for the struggle against essentialization of women and naturalization of gender, as well as other differences such as race or sexual orientation. We observe a similar logic of essentialisation and instrumentalization in technical systems that perform computation. They are historically based on establishing and computing difference, in form of finite mathematical values (integer or rational numbers), states of conductivity (transistors and chips), fulfilment of conditions (if/then/else). Even more problematically for our aspiration to counter oppressions and hyper-separations through an engagement with ecofeminism, every definition of women seems to bring along some form of essentialism. In tracing a common thread across humans that qualify as 'women' essentialism propagates exclusion: there is always someone who does not fit. Conversely, the assumption that those whom the previous thread would circumvent should identify as women or only women essentialises their position. A definition of the other is necessary whenever we want to (de)limit the ongoing exploitation of humans and nature. This points to the importance of making careful and fluid, rather than fixed separations of women as other, or rather ourselves and our other. While the other is that which, by virtue of not being in the centre of politics, lends itself to exploitation, we read ecofeminist proposals as invoking the agency of the other - the other gender, race, being or matter. This other is addressed by a diffractive look, which can never be 'focused' and requires a politics that favours decentring of the subject.

As an outlook towards articulating a different new gesture, we recognize that computing systems are able to bring together concerns of mathematics and matter. Technologies as tools and bodies, are not opposites, but intermingled. Situating computation and modelling takes "the way out of the maze of dualisms in which we have explained our bodies and our tools to ourselves" (Haraway 1987, 42). We consider *com-putation* as a process of putting things together.

4.1. Sympoiesis in Com-putation

With our proposal for a humble contribution to computing towards a praxis of modelling differently, we establish intersectional connections between the work of machines and people - both in terms of the topic of our first modulated models, and the

sensibility for their inseparability and mutual effects. In this sense, we appreciate the raising concerns for the way our 'digital lives' affect us individually and partly align with the proposal such as 'slow computing' (Kitchin & Fraser 2020). We think it is important to emphasise the possibility to use computing to slow down things and connect to other ongoing processes. We also aspire to affirm the different capacities in which we learn to use computational processes, such as putting algorithms, frameworks and models together. Furthermore, we also do not affirm the authoritarian concept of knowledge that pertains to Enlightenment and the gesture of emancipating masses from ignorance. To the contrary, we view knowledge more abstractly, as the political and learning process of engagement, or sensorial and cognitive coupling with our world. Knowledge and knowing is not reducible to emancipation or transparency: if someone was presented with letters, or data, they would not be able to make sense of them. Being a practitioner of a language or a writer renders one knowledgeable, or cognitively and sensorially coupled with the world. That is where knowledge manifests and appears: It enables one to use language, or computation, in any way they want. Cognitive and sensorial coupling with computational systems enable political deliberation with regards to these systems, as well as skilfulness in reading and writing, or understanding how information processing works.

We propose computing and modelling as praxis of *sympoiesis*, again referring to Haraway, extending at the same time the medium of written, text-based fiction, she is proposing to a more interactive and the same time techno-scientific way of *fictioning*, which we discuss here as (computational) modelling. *Sympoiesis* means writing or making together. While writing new stories together surely is constructive, we propose to additionally program and design new models together, which unfold time in different ways compared to texts and might trigger different and alternative ways of *futuring*.

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