Research Article

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Toys for Conviviality. Situating Commoning, Computation and Modelling

Abstract: This article explores the use of agent-based modelling as a critical and playful form of engagement with cooperative housing organizations. Because of its inherent complexities vis-à-vis decision-making, commoning is a well-suited field of study to explore the potential of humanities-driven experimental design (media) research to provoke critical reflection, problem-finding and productive complication. By introducing two different agent-based models, the interdisciplinary research team discusses their experience with setting up parameters for modelling, their implications, and the possibilities and limits of employing modelling techniques as a basis for decision-making. While it shows that modelling can be helpful in detecting long-term results of decisions or testing out effects of unlikely yet challenging events, modelling might act as a discursive practice uncovering hidden assumptions inherent in the model setup and generating an increase of scientific uncertainty. The project "ThinkingToys for Commoning" thus argues for a critical modelling practice and culture, in which models act as toys for probing alternative modes of living together and exploring the constructedness of methods. In countering late forms of capitalism, the resulting situated and critical practice provides avenues for enabling more self-determined forms of governance.

Keywords: Commoning; Modelling; Conviviality; (media) design research; Housing cooperatives

It was no surprise when Elinor Ostrom was awarded the 2009 Nobel prize in economics for her work on governing the commons merely one year after the financial crisis of 2008. During the decade that followed we witnessed the rise of powerful conglomerates of information technology companies such as Amazon, Google, Facebook and Apple solidifying the formation of neoliberal techno-capitalism, a development which Marxist media studies scholar McKenzie Wark called "something worse" (13). Others have, in parallel lines and often inspired by Ostrom, conceptualized and popularized alternatives to the latest forms of capitalism: commons-based economy and commoning as more self-determined, sometimes feminist, often resilient forms of governance (Gibson-Graham et al. 138; Bollier and Helfrich 27; Federici, *Re-Enchanting the World* 86). Arguing from a similar, alternative, standpoint, this article wants to address the following question: How to conceptualize and rethink practices using (media) technology, specifically computation and modelling, so that they benefit community organisation, commoning and open up pathways to an increase in self-determination? On the side of community interests, one might assume that self-organization is made easier, in part, by the availability of 'free' communication services such as chat apps (e.g. WhatsApp, Viber, Signal, Telegram, etc.) or shared online collaborative spreadsheets (e.g. Google Sheet). These are again mostly offered by profit-oriented companies and don't allow for self-determined change, adaptation or development in terms of commoning. Furthermore, studies of the gig economy have confirmed that technologies such as managerial apps often deprive its users, who are also workers, from self-organizing resistance and unionization (Gandini 1051). These developments demonstrate how easily technical

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systems can become means of oppression and the basis for hierarchical, data-based economies of power. This perspective extends to the nature of these systems: they can encode patterns of power and efficiency (Winner 134) in attempts to render human activity more compatible with the market (Harvey 3). Contrary to the conception of technologies as inherently capitalist tools that, in their neoliberal alignment as the product and the market for techno-innovation, are restricted in their usage in autonomous and self-determined ways, philosopher Ivan Illich proposed in the 1970s to look at tools through the lens of conviviality. More recently, this relationship has been examined by a number of scholars and their different approaches (Kerschner et al. 1623), including our own. Illich described how tools, technologies and institutions can force society into the position of subserviently accommodating their logics. To counter this, he conceptualized tools for conviviality as a "guarantee for each member of the most ample and free access to the tools of the community" (25) for supporting people in their social and human endeavours. For Illich, the alphabet and literacy are the essence of retooling society and its capacity to educate itself. And while the alphabet is a prime and yet not so obvious case of a tool, on the level of concrete usage, tools and their instrumentality are not challenged in Illich's articulations of conviviality. On a societal level, though, he criticized what he defined as the „planned and engineered instrumentality" of „industrial tools" (34), which reduce our „poetics of self-affirmation" (106). We will address this in our discussion below, including one on 'toys' and propose toys for conviviality. A third line of technological critique, which developed sometimes disentangled from common-based economies and commoning, are techno-optimistic communities of interest such as those formed around the *Free/Libre Open Source Software (F/LOSS)* movement.[1] And importantly, these communities share similar aspirations towards distributed information-sharing processes that offer potentials for generating synergies.

Operating within these fields of concerns, problems and opportunities, *ThinkingToys for Commoning* is an ongoing research project (2018–2021) which envisions alternative relationships between commoning and computation. The project is developed in collaboration with three Swiss housing cooperatives – *NeNa1* from Zurich, *LeNa* from Basel, and *Warmbächli* from Bern – which are all part of a broader, post-growth and sustainable living movement called *Neustart Schweiz*. *ThinkingToys for Commoning* explores, together with them, a computational modelling technique, called *agent-based modelling*,[2] applied to situations specific to their ways of living and commoning such as mutual aid, infrastructure maintenance, voluntary work, time-banking, bottom-up decision making, or self-organized information sharing in a playful, critical and non-solution oriented way. Neither of the three cooperatives are living together in a building yet, but are planning to do so in the near future.[3] Currently they are exploring different 'designs' of commoning and frameworks for governing the commons. This marks a moment which we, the authors, used as an entry point for collaborating with them. As a multidisciplinary team of five researchers with heterogeneous backgrounds ranging from media art, history and theory, philosophy, architecture to programming, visual communication, and design, we focus on a pluralistic set of methods in the evolving field of experimental (media) design research.[4] Situated at a Swiss art and design university, we are inspired by approaches in participatory design or co-design (Sanders/Stappers 6). In this scope, we conducted two rounds of workshops with the cooperatives working with drawings, construction toys, enactment, and role play. Using video documentation and notes from these workshops, we identified key topics that we were going to address in the project. We extended our engagement with these topics by building computer-based, interactive models and testing them with cooperatives as playful exploration of different arrangements of shared living, commoning and conviviality. Furthermore, as we will unfold further below, we also fused this practical work with humanities-driven methods such as historical contextualization or the focus on the mediality of media as often pursued

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1 See (Miyazaki 271, 274) for a more critical account on how F/LOSS and capitalism are entangled.

2 Agent-based modelling (ABM) is a computational technique which programs agents with particular properties and (inter)actions in order to simulate the behavior of people, processes and phenomena using a simple rule set. Agents interact with their environment and with other agents (Wilensky and Rand 32). ABM has been popularized via the simple programming language and integrated development environment *NetLogo*. Released in 1999, *NetLogo* is a late derivative of *Logo*, which was designed in the late 1960s and early 1970s by computer scientist Seymour Papert. ABM is a widely used tool across many disciplines dealing with complex systems made up of autonomous entities for the purpose of environmental, social and traffic simulations. ABMs also emerged as promising tools for planners, decision-makers, citizens and activists to better understand the complexities of urban life and support negotiations as well as decision-making through simulations of future scenarios.

3 Warmbächli located in Bern for example started their construction in September 2019 and currently is planning the distribution of their flats and apartments. Lena located in Basel are still negotiating with their architects, but will soon start with the construction phase. Nena1, active in Zurich, still need to find a location to build their cooperative.

4 See our previous approaches from the research team (Miyazaki and Hertrich 83; Savić and Huang 2; Bedö 52).

by (German) Media Studies, and finally (Feminist) Science and Technology Studies. This peculiar mix promises to make complex processes of commoning not only visible or tangible but also comprehensible. As we will describe in this article our aim is not to provide finished designs and solutions to dilemmas arising in commoning processes, but to offer playful and open-ended provocations that challenge biases of modelling and computation and thus allow for critical reflections, problem-finding, and productive complication. Following Illich's stance on convivial tools, we augment it with the concept of '(thinking) toys', to circumvent the always instrumental notion of tools into playful and open-ended experiences. We argue subsequently that technical knowledge of computation and modelling, for example, can be used directly against consumerist alienation and in order to foster community life. Crucial reference concepts here are Donna Haraway's "situated knowledge" and "cyborg". Situating commoning and computation from cyborgian perspectives takes the "way out of the maze of dualisms in which we have explained our bodies and our tools to ourselves" ("Cyborg Manifesto" 181). Technologies as tools and bodies, are not opposites, but intermingled, therefore, we constantly are provoked both to build and destroy our machines, identities, categories, relationships and narrations. Situating commoning and computation furthermore 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 ("Situated Knowledge" 195). Such a persistence on partialities would safeguard commoning from becoming appropriated again by paradigms of control, power, efficiency and applicability.

This article begins by contextualizing the *Neustart Schweiz* movement by describing the highly influential utopian novel *Bolo'bolo* published in the early 1980s, and continues with relating utopian scenarios to computing, simulation, and modelling and its epistemological, historical, and political aspects. Arguing that computational models do not lead to more scientific certainty, but open up an insolvable spectrum of solutions, we turn towards a politically engaged way of modelling. The second section re-starts this argument and is dedicated to discussing agent-based modelling as an adequate way to inquire into the manifold processes of commoning from the bottom up. It continues with an in-depth explanation of two exemplary models and ends with a description of the complications we faced. The third part discusses the potential of a critical modelling practice and the implications of linking commoning with computation. Furthermore, this part suggests that an extension of modelling towards explorations of playing with toys and the insights gained through embodied knowledge allow for extensive experimentations with computer models. The article ends by arguing for problem finding instead of problem solving. It concludes by proposing to explore the potentials of the partial, situated knowledge that comes forth when modelling and commoning are brought together.

1 Utopia > Modelling

The utopian novel *Bolo'bolo* (1983) proposes and describes the societal transformation from the 1980s growth-obsessed economy to a distributed network of "neighbourhoods", "bolos" in the novel's jargon, formed by small communities, not larger than 500 people, with a fully sustainable and self-sufficient economy. Fifteen years later, the novel's author P.M.[5], Hans Widmer's pseudonym, was amongst the initiators of the *Neustart Schweiz* movement. *Bolo'bolo*'s transformed utopian society is described through 27 concepts for a new planetary system of living, working, exchange, and even conflict mediation. "Bolos" are gathered around a "nima": common values, interests, culture, and lifestyle. Everyone must produce food and tools for themselves, but some will prefer to grow and do some sort of urban farming while others read. Individuals contribute to the community on a voluntary basis. Ten to twenty "bolos" build town infrastructures such as hospitals. Common goods are distributed as needed. Communication and solidarity in *Bolo'bolo* are both essential for the working of communities, along with subversive techniques for dismantling the "planetary work machine" through intentional misinformation, "dysproduction", and "dysruption" (P.M. 31). It is not by accident, that *Bolo'bolo*'s utopian world and concepts seem to resonate both with Illich's notion of "conviviality" and more recent approaches of re-enchantment, environmentalism, and eco-activism as formulated by feminist scholar Silvia Federici in "Re-enchanting the World". Federici and Widmer met in the late 1970s and became friends, while both lived in New York and were members of the *Midnight Notes* collective (with George Caffentzis, Peter Linebaugh and others), who all share links to the more recent theories of commoning (Caffentzis 41; Linebaugh 7).

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5 Assumed to be the most common initials in Switzerland.

Having analysed exemplary utopian novels and stories concerning their relevance for a not yet established "digital socialism", Marxist media scholar Christian Fuchs regards *Bolo'bolo* as a book which inspires him to think about the necessary organizational features to overcome class, capitalism, the state, nations, borders, exploitation, and domination by forming a participatory society, a grassroots democracy with self-managed production and autonomous life. Still, he argues, there are "limits of P.M.'s vision in respect to the use of communication technologies, computers, and robots, where the book is not visionary and not utopian enough ..." (176). Here, Fuchs suggests inquiring into ways of self-organizing "economic allocation" combined with the implementation of a "socialist gift economy". More specifically, he focuses on the allocation of production capacity of cooperatives to the quantities of goods requested by commoners, so that production is optimized to keep transport distances at a minimum (173ff.). Exploring, reflecting and observing how such suggestions, projections, forecasts or if-then scenarios might unfold has been the realm of computer modelling since its beginning, as science historian Peter Galison has elaborated upon(120). Media studies scholar Claus Pias furthermore argues, that

> [t]he knowledge of simulations is always furnished with a hypothetical index, and because various people model and simulate the same problem in various ways, what eventually emerges – instead of certainty – is an uncircumventable spectrum of opinions and interpretations. And it is to this degree that simulations contain an element of sophistry and take sides. Description, explanation and fiction come together in an experimental compound (52).

Not only do simulations take sides, or, if you will, are political, but with the dawn of computer modelling, theory and experimentation reciprocally influence each other in accelerated ways, generating "an epistemic shift of considerable magnitude" (30). Even fiction plays its role here. Modelling carries a hypothetical index thus, we argue, it often comes close to utopia. Following philosopher of science Isabelle Stengers, we conclude that modelling as part of "Western science" has always been linked to "political engagement" (59), regardless of its purpose. Stengers points out that science is a social activity: driven by passions that make it more than bureaucracy of numbers, it is a vulnerable undertaking which is not autonomous from its socio-political environment. She affirms the political in science, aiming to articulate science and politics without confounding them, or reducing one to the other. This double articulation informed the way Stengers then questioned analysis as instrumental for scientific thought: refraining from the position of a 'judge', she appreciated the inventive and caring use of words that would preserve their ambiguity and multiplicity of meanings (as opposed to purification and objectivity). This resistance to analytic methods, in part shapes our understanding of the role of modelling in the experimental design research context, seeking to engage with, rather than explain complex processes. The research project *ThinkingToys for Commoning* therefore builds both on Pias' cautionary tale that simulations and models do not lead to more scientific certainty but in fact generate more complications, opening up an insolvable spectrum of interpretations, attitudes and opinions, while it also aligns with Stengers' argument and engages politically with the entanglements of commoning and modelling. 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. Modelling is the process of abstracting from ecological or physico-socio-material contexts of environments, objects, individuals, and their interactions in order to create discrete, computable entities. This process is inherently prone to disregarding differences in lifestyle, physical and mental capacities, gender, or sensory sensitivity. Therefore, we also want to address and situate a model's weaknesses, biases, blind spots, and socio-systemic implications.

2 Modelling Studies (Intermezzo)

During the first workshops with the three housing cooperatives, we identified an overarching interest in negotiating voluntary contributions to common maintenance tasks (i.e. cleaning the common kitchen, managing the common food depot, childcare, etc). Activities were often theorized as being hidden and gendered (Federici, *Revolution at Point Zero* 31). We found this topic particularly fitting to agent-based modelling, because it requires taking into account both the perspectives of an individual and that of the community. For fostering conversations and discussion, which go beyond language and discourse, we used tangible objects made of wood, paper or other crafts materials to represent different elements and mechanisms involved in such a maintenance problem. Furthermore, we documented these making-talk-

ing-toying workshops, analysed them, and filtered selected insights, concerns and processes in order to finally translate these into a first JavaScript-based model. In the following text, we present a detailed description of two models developed based on these insights. Thereby we also interweave some reflections on the developments processes of those models. Both relate to dynamics of common maintenance tasks, observing time as the measure of individual contribution.

Our principal interest in agent-based modelling stems from the fact that ABMs are good at showing how an individual agent's actions contribute to and depend on the system as a whole. An ABM offers an idealised but strategic view on the future, on how things would unfold. Therefore, it also contains some utopianism and resonates with fictionality. The other important feature of all ABMs is the control of simulation speed. They enact situations through a huge range of possibilities faster than we could do, for example, in real-time, human re-enactment.

2.1 First model

Our first modelling experiment was based on a heterogeneous set of interests, opinions, insights and tendencies that we collected and documented from the workshop participants and members of housing cooperatives. We attempted to model the cooperative's level of discomfort concerning its organization of commoning tasks, including aspects of negotiation, fairness and more generally the dilemmas which accompany these processes. With this focus, we aimed to challenge some general assumptions about community work: for example, that once everybody accepts their duty, a task could be decoupled from notions of happiness or (dis)comfort or quality; or that the pre-planning of commoning tasks is not necessary because these processes are best regulated in spontaneous negotiations or learned by doing.

Modelling started by defining the commoners as agents, which means an abstraction of one member of a housing cooperative, from here on called agent-commoner. In the model, the agent-commoner is informed about continuously upcoming common tasks that require maintenance or care, to which it can react by taking them up or not. When an agent-commoner does not take up the task, it either 'swaps' for another or refuses to work all together in favour of 'resting'. We modelled four different agent-commoner types with different tendencies to do, swap or rest, leading us to a quite complicated model. Furthermore, the model has two different modes of accounting for the time agent-commoners take to do maintenance work. In the so-called *time accumulation* mode, they are 'rewarded' by the right to rest for every task they complete, and free to choose when they will use this privilege. Time here is modelled as an entity agent-commoners can accumulate as exchangeable units. In the second mode, called *time-banking*, they need to 'spend' a certain amount of hours (equal for everyone) working for the community. Time here, even though still an exchangeable measure of work, is donated or promised, if you will, to a cooperatively organized storage system, called 'time-bank'. All members donate the same amount and its spending modalities have been negotiated beforehand. Initial tests with the 'time-banking' mode showed significantly lower levels of discomfort when agent-commoners were attributed enough hours to work monthly. We interpret this tentatively as pointing to a possible benefit of regulation over non-regulation. We explored this briefly in the previously described time accumulation mode, which resulted in the finding that limiting and regulating the amount of 'resting' time an agent-commoner can store reduces discomfort and work is distributed more equally. The complexity of this first model made it difficult for us to observe interesting patterns and tipping-points of its dynamics.

2.2 Second model

More recently, we developed another, much simpler, time-banking based ABM. Different from the first model, agents here are moving step-wise and randomly around the commonly used premises of the housing cooperative. The area is represented by a grid of squared cells representing unspecified, commonly shared resources (see Fig. 1). Each cell gets used up and damaged with time and agents passing, and agent-commoners (blue dots, see Fig. 1) need to repair and maintain it after a while, otherwise the commons will deplete and become unusable. This simplified model addresses the relationships between the conditions of shared resources (maintained/usable (grey shades), soon to be depleted/damaged (black) and depleted (red)), the monthly hours, abstracted into time-units, that each commoner-agent offers
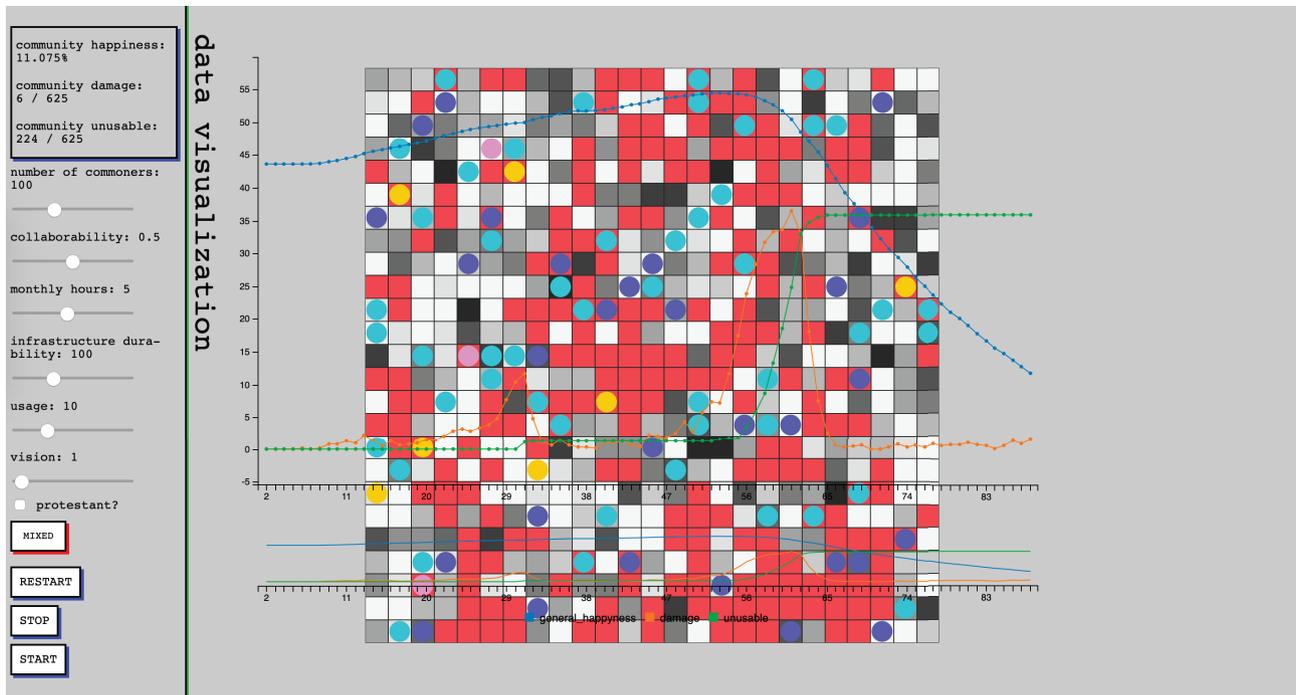
Figure 1: Screenshot of 2nd model

voluntarily to maintain these and the cooperative's level of 'happiness'[6] that is linked to how the maintenance is done. Maintenance work is triggered by an agent's proximity to a damaged cell, while the sensible range to detect damaged cells is called 'vision'. The agent then moves to the damaged cell and decides whether it does maintenance work or swaps the cell with the next upcoming damaged cell (becoming dark pink) or it will take a rest (becoming dark yellow). There are four agent-commoner traits: tendency to maintain, to rest, to swap work, or to exhibit no particular preference for any of the previous three. When an agent does maintenance work on a cell, a certain amount of time units get subtracted from the amount of time units the whole cooperative agreed to donate for maintenance work, following the principles of time-banking. Each agent-commoner needs to use, invest or spend time units. When more agent-commoners detect the same damaged cell, two situations may take place depending on the parameter we call "ability to collaborate": In the first case the involved agent-commoners divide the task between them using a fraction of the needed time. In the second case, which we call "conflict", a single agent will execute the task and the other agents will "lose happiness". The "ability to collaborate" is a ratio or chance distribution of how often which situation will occur. A value closer to the minimum means that there are more situations of conflict and a value closer to the maximum means that there are more collaborative situations, where time units to spend get divided. An agent-commoner will gain "happiness" by resting and also by collaborating with other agents. But, it will lose "happiness", firstly when it has a conflict with another agent, or secondly when stepping onto a part of the grid that is depleted or, thirdly when not being able to spend all time units it promised to donate to the cooperative at the end of a month. When an agent-commoner manages to spend all time units as promised, it turns turquoise.

One major insight we gained from coding and exploring this model is that the amount of time units each member of a cooperative offers voluntarily to maintain the common resources (time they contribute to the "time bank") is crucial for the overall happiness of the model community, as well as for the conditions of the resources in the model. In case only a few monthly hours are agreed upon for agent-commoners, it will lead to an almost exponential decline of a parameter we tentatively called 'happiness'. The time units are not enough to fulfil all the maintenance work fundamental to a 'happy' cooperative. Resources will deplete and agents will lose 'happiness' when walking on a depleted resource cell. While most real cooperatives will surely have several methods to understand how many hours are needed

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6 We address "happiness" not as actual happiness nor as a normative concept, but rather imagine more or less harmonius situations and this is in our models expressed by an abstract value we named "happiness".

to cover all the tasks that a community needs, unexpected scenarios, such as natural disasters or incidents such as the Covid-19 pandemic may always happen. This would be one obvious potential situation where our model could be useful to community-based discussions/negotiations/assemblies. In such cases, despite the reduced usage of the commons, some basics still need to be covered and a reduced "manpower" translated in a reduced number of monthly hours. We implemented some experimental parameters into the model, such as the durability of the resources which would ultimately require less repair. A high ability to collaborate also improves the negative decline ever so slightly, since it leads to less discomfort. Another, rather foreseeable aspect of the model is that the overall tendency to "rest" leads to less maintenance work getting done, and thus resources start to get depleted earlier in the model run-time as compared to model settings in which the overall tendencies are set to prefer maintenance work or to swap. Still the overall tendency to rest does not reduce the overall happiness of all agent-commoners, since resting also increases happiness. In order to prevent the depletion of resources while the agents tend to rest, a high durability of resources, many dedicated time units, a lot of agents and a high ability to collaborate are again needed. The tendency to swap on the other side results in a constellation where a relatively low ability to collaborate still prevents depletion of resources and a rise of unhappiness, since swapping causes an avoidance of conflict. When all agents are too eager to fulfil what they have promised, this case leads to a regular and rather great loss of happiness when they are not able to do so. To avoid this, the cooperative would need to operate both with a relatively low amount of maintenance work and an extremely high number of workers available, which seems unrealistic. We thus extrapolated that it would be more beneficial not to work with normative sanctions, which are linked to the fulfilment of promises. Another insight is that a seemingly stable configuration sometimes turns out to be merely a very slow development toward a negative outcome, which might get amplified by some unforeseeable event.

Finally, a rather complicated but crucial aspect we found while exploring this model, is contradicting the basic assumption that the greater the 'vision' of an agent-commoner is, the better it would be for overall happiness. Vision being the range of an agent's information sensibility, this assumption at first glance seems unproblematic. With better 'vision', agent-commoners can also detect damaged cells, which are further away from their position and this could be a beneficial condition. With the greatest vision, an agent can detect damaged cells in about a quarter of the whole grid size at any moment. While a configuration in which all members of a cooperative are well-informed about the condition of each of their surrounding resources, even those far away from their position, seems to be helpful, better vision, in fact, leads to more conflicts, particularly when the general ability to collaborate is low. In order to reduce conflicting cases, it is more beneficial to have a limited vision, meaning that it might be more adequate to operate more locally, not seeing and knowing too much, but also not too little. On the other hand, in case all agents have a far-reaching vision, it is better to reduce conflicting situations by increasing the agent's ability to collaborate. More generally formulated, the range of an agent-commoner's information sensibility (vision) needs to be adjusted according to its ability to collaborate, turning it either into a helpful ability or the complete opposite. To avoid constellations where commoner-agents have far-reaching vision, which could be compared to having a central information source, relying on small-scale local, distributed, decentralized information seems more effective for avoiding conflict. Furthermore, the ability to collaborate, although desirable, is not a self-evident skill amongst actual commoners. And while this proves valuable inside the modelling context, it is by no means an indication that people who appear less collaborative do not show other traits that are beneficial for the 'real' cooperative. Decentralized, local and self-organized forms of communication appear to have further explorative potentials, therefore we are currently investigating the manifold channels, networks and affordances of information storage, transmission, and processing for a cooperative, that could unfold by programming and experimenting with additional agent-based models.

Participatory aspects of our modelling process can be related to architect Markus Miessen's work with communities from the Caracas barrios. Although essentially critical of the expected emancipatory effect of participation, Miessen recognized that certain participatory design processes instantiate a more democratic idea of literacy (Miessen 39). This can be projected back off Illich's emancipative stance on literacy, as something that is a starting point for further development and appropriation of tools. In this respect, our work with the communities addresses and promotes literacy of future explorations through computational modelling that are different from prediction.

Our experiments with modelling situations of voluntary work contribution demonstrate the open-ended character of our modelling process, and a relativity of any conclusions to the particular ways we articulated the agents. Informed by what Stengers recognized as the role of 'passions' in scientific practice, our models are strongly shaped by the team values and beliefs, attuned at looking for harmonious setups in regulation, collaboration and information decentraliza-

tion. We consider this to be more than an implicit 'bias' – rather it is our intention to use models to construct narratives and show how things would unfold, with a focus on collaboration and self-organised management. Importantly, our dedication to certain values is not expressed in caring for concepts and the centrality of (political) debate as Stengers would put it. It manifests in experiences that pertain to certain playability of the models themselves, subverting the notion of tools (for literacy or prediction) into toys.

3 Modelling > Utopia => Thinking Toys

In the previous section we described two agent-based-models we programmed, their mechanisms and the insights we gained. The first model revealed, amongst those aspects described above, that a high level of abstraction and simplification is also necessary in order to make models more expressive and easier to explore. Based on these learnings, the second model shed new lights on unreflected assumptions we had implemented into the model. However, a more general reflection of a housing cooperative and its members' modelling process, radically reducing their excessive full spectrum of their diversity by abstracting them to agent-commoners, leads to the loss of a plethora of factors and aspects such as the 'real' architecture of the housing cooperatives building, the heterogeneity of commonly shared resources or activities beyond and besides community-oriented maintenance work (like sleeping or jobbing) and the variety of their sometimes even contradicting voices. The simple model, described secondly, radically excludes real-world networks of word-of-mouth, written analogue or digital messaging, along with other technologically-enhanced forms of communication. We simply reduced communications to operations of detection or triggering, if you will. Nevertheless, inspired by Haraway's concept of a cyborgian way, what we aim to explore is both: Applying abstraction as a strategy to enable easier manipulation and generalization by distancing from concrete experience and contexts is equally crucial as insisting on the lost complexities. Since our models are favouring modes of commoning instead of individualism and are biased towards our political and utopian interpretations of conviviality, (or to be more specific, they are biased towards concepts such as time banking or regulation) their performativity is an essential element of experimental (media) design research. Referring to the strong notion of media, as propagated by German media studies (Tholen 151), namely, that media are not solely neutral, and therefore weak, channels of instrumental rationality, but have influence on the messages they store, transmit and process, we argue that for a critical modelling practice to emerge, it is crucial to admit and recognize that models are not mere products of instrumental programmability. Models are not mere tools, but also media in its 'strong' meaning. Unreflected biases or separate assumptions – like better vision leads to better conditions – can in certain ensembles and combinations produce rather counterintuitive effects, including more conflict.

Our models perform as interactive, operational theory-arguments that enable us to talk about our political assumptions of commoning and utopian living, to situate them and us and to test different constellations and scenarios instead of extrapolating and speculating on solutions. Making comprehensible hidden biases does not aim to increase scientific certainty about the modelled processes under study as we learned from Pias, but to situate their constructedness, partiality and simulate their becoming in time and space, in quantity and quality. In order to foster this, we aim to reach a playful epistemo-aesthetic framework, which situates agent-based models close to toys. Or, to be more concrete, we want to interpret and situate modelling as a situation similar to playing with toys. Here, Illich's notion of conviviality operates as a condition to design and generate accessible, community-oriented tools, which turn into toys. Conviviality furthermore is not a scholarly-elaborated theory, it rather represents a positive stance and situated attitude towards technologies which care for the benefit of people, providing a framework for exchange which successfully resists forcing people to be determined by the technologies they use. Still, it allows for a playful, open-ended and non-solution-oriented exploration of different arrangements of shared living. Along these lines, we propose to develop 'thinking toys' for commoning, which are setups and artefacts that foster reflection on the past and the future (biases inherent in assumption and their potential unfoldings) as well as the playability of the complicated relations involved in commoning.[7] Thus we aim to amplify conviviality and decouple it to a certain extent from the notion of the tool, since we acknowledge the limits of Illich's conceptualization of the instrumentality of tools, while we want to explore

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7 See for example Studio Pas Mal's work on modes of governance: https://internetas.city.

the notion of conviviality. What he diagnosed as the fully engineered and pre-determined instrumentality of "industrial tools" (34) is still inherent in convivial tools, which arguably are also designed for particular purposes. The notion of toy seems both convivial and non-instrumental. The ambition is to create critical set-ups of playing with toys that reveal points of epistemic friction, as put forward by game designer Mary Flanagan (6, 256). These sort of media technologically augmented toys are partly filmic, interactive, computational, modular, tactile, sonic and visual.

Play amplifies the usually ignored utopian aspects of modelling. Play furthermore creates temporarily coherent spaces as yet-to-become places, in which we can act without being overwhelmed by the complexities of everyday life. This potential justifies its prominence in human culture, as cultural historian Johan Huizinga points out in *Homo Ludens*: "[P]lay creates order, is order. Into an imperfect world and into the confusion of life it brings a temporary, a limited perfection" (10). Huizinga moreover emphasises that play creates an experience beyond the ordinary when its more or less delineated sites are entered, such as the stage; the card-table; the tennis court or the 'magic circle' of sumo fights (10). This has been taken up by game designers Katie Salen Tekinbaş and Eric Zimmerman, who borrow the concept of the magic circle to describe the space that constitutes a frame outside real life, such as fictional, utopian scenarios, where the magic lies in exploring a game's own reality repeatedly and safely (94). But they also highlight the ways in which the magic circle has porous, permeable boundaries and how games and playful experiences vary in openness and closedness. Open games allow interchanges between them and their real-life environments. Their rules and fictions can seamlessly merge with rules and narratives of everyday life. This is underpinned by entanglements of actual experience with embodied concepts, which we consider promising for further exploration. Philosopher Henry H. Price argues that we think not only in abstract concepts and mental images but also "by means of the muscular sensations which accompany incipient actions, gestures or others, when these actions are not overtly performed" (300). A child might for example imagine, pretend, and 'simulate', if you will, that a toy aeroplane starts to fly, while starting a gesture, which looks like throwing it away, but then stops to do so, the mental image of the aeroplane flying still gets activated. Moreover, "[b]etween the two extremes – complete latency and complete actualization – there are many intermediate degrees of *sub*-activation" (317). Abstract concepts, mental images, actions, or just the readiness to act are (re)activated by actual experiences or acts of thinking, and at the same time cross-activate other things (to a varying degree) in a network of embodied concepts that tend to have been activated together in past experiences or thinking acts. New knowledge is generated on the fringes of this network of cross-activations as with every new experience implicit, embodied concepts might pass the threshold to becoming explicit. To explain it again through the image of a child playing: While playing with the toy aeroplane they might mentally reproduce, thus playfully model and simulate, the path of a plane in the sky (depending on the features of their room), images of pilots and holidays might be involved and maybe a slight bodily tension of bracing for a crash landing. If we swap the aeroplane for a spaceship, the play changes. The things that the child knows about space travel evoke different images and concepts; the bedsheet turns into the surface of a distant planet, and the child may be even experiencing a slight feeling of weightlessness. In play the cross-activations in the network of actions, images and concepts about everyday experiences are entangled with those pertaining to a game or a set of toys. Play can also change how we think about the world when it amplifies new (embodied) concepts or connections. All these aspects make play a powerful way to render visions, hypotheses, agendas, and implicit understandings of various matters explicit. Here, playing comes very close to modelling. Nevertheless, when designed as games, playful experiences often involve many simplifications and a narrow focus, due to strict rules and goals. These tamed and controlled spaces never truly do justice to the complexities of commoning. While trading in some, but not all of 'the temporal perfection' (see Huizinga above) we are currently planning to embrace somewhat more of the overwhelming complexities of commoning by creating toys that open-endedly evoke aspects of its context. Here, we draw inspiration from toys ranging from those simply representing 'real' things such as dolls, vehicles or miniatures, and those for playful construction such as wooden blocks, *Lego* or *Fischertechnik* to those based on simple mechanics such as spinning tops, paper planes, kites and finally those who foster physical activity, such as balls or ropes. We also think back to toy histories and changes in qualities, as discussed by Walter Benjamin. In the cultural history of toys, he observed how the simple change of toy size could affect the caregiving style (with large toys, the mother no longer needed to watch the child as closely as before). He also pointed out how toys were always created for, and sometimes also by children, through imaginative appropriation. Benjamin then continued to raise questions regarding the rhythmicity of play and the identity of those playing; children often play with repetition and imitation (of adults or animals), which is the essence of every profound experience, he claims. Since toys provoke both the imagination and togetherness of children and adults, with our 'thinking toys' we want and are planning to

extend this potential they offer to computational modelling and foster critical reflection by an extensive exploration of the mentioned embodied aspects of play. We are currently developing 'thinking toys' – playful experiences based on the agent-based models – that cause both reflections and imaginations of commoning, which wouldn't emerge without them. While playing with them, 'thinking toys' engender new links with everyday experiences. Notably, what we re-enact during such processes may vary in temporal and spatial scale, parts of objects can be re-enacted as well as whole objects (which are parts of other objects themselves). This shiftability and adaptability strengthen our argument for playing with toys. It is an open procedure compared to the constraints games offer, such as having a fixed goal or consisting of certain rules and containing moments in their unfolding that, when the game ends, are over. Our aim is to employ the thinking toy (an artefact consisting of models, co-developed rules of engagement, fictions and narratives) to focus on areas in the forming of commoning communities. Through its specific mechanics and qualities, the thinking toy marks the areas which are key to cultivating conviviality, which we identified in and through the work with the communities. Through its openness, it allows for engaged, risk-taking play to explore a variety of commoning scenarios and outcomes, venturing into more and less convivial outcomes of commoning and technology use. There is no inherent reason to stop while playing with toys except for running out of time, ideas, energy or other resources.

4 Problem finding, not problem solving

To conclude, as a first step, we have argued that utopian scenarios of commoning, such as *Bolo'Bolo*, are not only fostering new ideas for a transformed society and alternative living but, articulated in an algorithmic manner, they also lend themselves to concretization into computational models, which enable exploration of some of their basic functional architecture and underlying assumptions. Here we worked out the closeness of fiction, utopia, modelling and biases. In the second step, we described our specific cases and modelling studies situated in contexts of housing cooperatives aspiring to practice commoning and conviviality, where we implemented and designed computational models within the topic of voluntary maintenance work and their relation to parameters such as an agent's 'happiness', 'discomfort', 'negotiation', 'ability to collaborate' and 'information sensitivity'. We also described reflections about their programmed assumptions, about their design process and somewhat unexpected insights. In the third step, inspired by Pias and Stengers, we argued for a critical modelling practice which admits and recognizes that models are not mere products of instrumental programmability, nor do they offer a reduction of scientific uncertainty, but rather lead to an increase in complexity – a strategy attuned at problem finding, not problem solving. We then argued that extending from the state of somewhat 'serious' problem finding into a more playful, fiction-oriented and embodied approach appears to be a promising way for the further unfolding of our research project. This last step to explore fully is also supported by the entanglement of utopianism, fictional projection and computer modelling. The 'thinking toys' about commoning we plan to design in the next phase of the research project amplify the latent virtuality, mediality and conviviality already existent in conventional toys, thus they also open up to non-solutionist, non-instrumental, anti-oppressive and finally utopian ways to a never-ending inquiry of possibilities.

In conclusion, we addressed methods to create pathways for exploring the many potentials of the partial, situated knowledge activities that thinking about, planning for and modelling of commoning might generate. Critical modelling implies to bear, endure and resist the tension between appreciating the abstraction from experience and contexts for the sake of manipulation and generalization and the excessive loss of uncertainty and increase of complexity, while practising it. We are researchers entangled like cyborgs with our models, enabling us to perform interactively and operatively our theories, arguments and assumptions about commoning together with those who aspire to finally practice commoning in real life. We think that critical modelling using toys for conviviality could be one of many activities, that all together enable different futures other than those from our dystopian nightmares.

Acknowledgement

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