Algorithmic Sovereignty beyond the Leviathan and the Wicker Man
Sandboxes for Tactical and Participatory Automation

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Abstract

The metaphors of the Leviathan and Wicker Man introduced the idea of a modern state as an artificial and mechanical rather than spiritual unity. They framed sovereignty as an effect of the artificial and technical apparatus described as a social contract limiting the personal agency of the citizens or even sacrificing it to serve the new collective identity. The discussions of these metaphors of sovereignty and body politic offer an important context for understanding the present issues with smart contracts and algorithmic governance as the embodiments of the Leviathan (Reijers, O'Brolcháin, and Haynes 2016) or Wicker Man. The new forms of automation deprive the citizens of personal and social agency and limit their abilities to decide, regulate or envision the future, but in a different, less transparent way than the social contract. While citizens willingly limit their agency under the original social contract to create an artificial but collective unity, the new algorithmic "smart contract" reduces sovereignty to code that someone can design, own and even patent. To support the

engagement of citizens in the design and regulation of the new governance infrastructures, we need to rethink the concept of algorithmic sovereignty beyond the metaphors of the Leviathan and Wicker Man. It is essential to provide an environment and a process in which agency of the citizens is sacrificed to code under clear objectives and reasons and in transparent manner. Citizens have to test the connections between the emerging technology and their personal and social agency, infrastructure and regulation, to design the right algorithmic Leviathans. The testing environment that we propose is inspired by the existing regulatory sandboxes in the FinTech and emerging technologies domains (Gromova and Ivanc 2020), which are testing environments connecting various stakeholders responsible for the code and regulations to make decision about the future platforms and services. The sandbox that we created supports prototyping, experiencing and regulating future infrastructure based on smart contracts and blockchain automation as near-future examples of algorithmic governance. The Lithopy sandbox consists of a "testnet" for permissioned blockchain services, a design-fiction movie and a dashboard used in workshops to simulate different aspects of a future automated society. Participants explore various strategies of preserving their social and individual agency while defining the algorithmic sovereignty by regulating the automation and emerging infrastructure. The near-future scenario with the functional code of blockchain and satellite "smart contracts" for an imaginary village (Lithopy) is realistic enough to motivate the participants to engage in what we have described previously as a "regulation through dissonance" (Reshef Kera 2020a). The sandbox is a trading zone for the stakeholders to collaborate simultaneously on contested issues in policy and design. It supports testing and discussing the relationship between regulation and code, social agency and automation without insisting on strong consensus but identifying some *modus vivendi* for the future automated society. In this paper, we summarize the first five workshops in 2019 that changed the focus from issues of anticipatory governance to more pragmatic and experimental approaches of probing and defining a vision for algorithmic sovereignty (and automation) that is situated, tactical and participatory (Hee-jeong Choi, Forlano, and Reshef Kera 2020). The "situated" automation in the sandbox offers an alternative to the current governance-by-design regulatory compliance models (Mulligan and Bamberger 2018; Friedman and Kahn 2002; Michalis

2015). It critically reflects the present algorithmic governance as the fulfillment of the Hobbesian dream of an artificial (mechanical) governance that erodes social and individual agency. Algorithmic governance embodies the Hobbesian credo that it is "authority, not truth, which makes the law" (*sed auctoritas, non veritas, facit legem*) and defines automation as "authority" based on code (new technical infrastructure). The sandbox experiments with algorithmic sovereignty establish a possibility of tactical, participatory and open future-making processes that connect code and regulation beyond the promises of automation and absolute control.

Introduction

How do we achieve a political unity in an age of blockchain technologies, AI, social media platforms and other wonders of ledgers, algorithms and data that shape and extend the sovereignty and power of the modern state? Are citizens under the algorithmic rule members of a society and body politics based on contracts, norms and laws translated into algorithms and data structures? How do these new technical infrastructures exemplify the absolute power of the Leviathan, a social contract defining super-human and institutional sovereignty?

We claim that the technological "commonwealth" over various platforms defining algorithmic governance supports the idea of the absolute sovereignty of the Leviathan as a governance model but deprives the citizens of agency in more radical ways than the social contract theory had ever imagined (Reijers, O'Brolcháin, and Haynes 2016). Thomas Hobbes's metaphor of artificial and super-human governance served as an alternative to the redemption model of the Middle Age kingdoms searching for spiritual unity with Christ under the eschatological expectations of the second coming. Instead of redemption and "life in Christ" as a promise that will alleviate the suffering of the "natural condition," war and chaos, the modern state offered security and lately also efficiency.

The Leviathan was an alternative to the chaos of the Christian kingdoms guided by the vision of "corpus mysticum," a body of believers in Christ waiting for the second coming. Since every kingdom could claim to be the ideal Christian community with absolute sovereignty, this caused civil wars described by Hobbes as the "natural state" of the war of all against all. To prevent this state of chaos, Hobbes proposed an original solution of replacing the search of a

spiritual unity (and fighting over who is closer to God) with an artificial one, creating the conditions for our later notions of cybernetic ideas of similarity between animals, machines or states operating as systems. The Leviathan is a product of men rather than a cosmological or theological embodiment and historical mission of the second coming. It is a machine and "command mechanism," a technical apparatus demanding unconditional obedience to work correctly.

Inspired by Carl Schmitt's interpretation of the modern state as a technical, bureaucratic and "magical" mechanism defined by Hobbes, under which nothing is true but "everything here is command," we claim that algorithmic governance is a necessary consequence of the Leviathan. Algorithmic governance brings to a conclusion the most critical aspect of Hobbes's social contract theory – the emphasis on absolute and automatic authority as the only alternative to the natural condition. The algorithmic "Leviathans," such as blockchain "smart contracts" or machine learning algorithms optimizing social phenomena, expect citizens to support, trust and abide by this emerging infrastructure as a "miracle" defined by the state to support its sovereignty against any chaos. The super-individual sovereignty of the emerging technical infrastructure provides essential services and protection only when citizens accept its absolute authority (sometimes defined as smart cities, intelligent tracking systems during COVID-19 crises, and similar ideas).

The algorithmic Leviathans simply achieve the goal of the social contract "automatically" and literally via the data and code of the blockchain platforms, smart contracts, AI and machine learning algorithms, and other optimized systems. These mechanisms outsource the agency and sovereignty of the citizens to such super-human institutions that promise peace, stability and efficiency as the main goals of the modern state (discussed as governmentality and the emergence of "national interests" as *raison d'être* in Foucault). The resignation of natural rights is a necessary condition of all automatized systems paradoxically defined as an "agreement" between rational, free and equal persons by Hobbes. The Leviathan, as the outcome of this paradoxical social contract and later algorithmic governance, is anything but rational or equal. Instead, it places the absolute power with one artificially constructed "sovereign."

Leviathan or the Wicker Man

The rational agreement between the citizens defining the modern state as such sovereign and artificial Leviathan supports an irrational and absolute power that is automated and mechanical by default and serves as a tool of automated justice and security. The paradox of this contract is even more visible in the case of trustless and automated blockchain systems or machine learning platforms, which most citizens do not even understand. How can we claim there is a rational and free agreement in the case of algorithmic governance? The magic of the Leviathan's algorithmic embodiment only makes more visible the issues with the original metaphor and idea: that rational beings agree on an irrational and absolute control as the only alternative to lawlessness (natural state). The issues with such solutions are that they enforce rather than control the absolute and arbitrary power.

Algorithmic sovereignty over emerging technical infrastructure thus amplifies the old discussions whether the Leviathan is an institution that protects the citizens or sacrifices them in its evil twin, the Wicker Man. The 1676 image by Aylett Sammes of the Wicker Man summarizes the earliest critique of the Leviathan discussed as a pagan ritual similar to the description of human sacrifices by British people by Julius Caesar. They supposedly created an image of a super-human, godlike figure, in which they weaved the living people to burn them. This image served as a satirized social contract, a visually shocking critique of what the civic body (body politics) does to the individual (consumes, imprisons and destroys).

The most famous critique of the Leviathan, however, appears in the 1690 "Second Treatise of Civil Government" (Ch VII/93), in which John Locke describes the absolute sovereignty as a catastrophic lack of governance rather than a solution. To describe the horrors of such automated and mechanical power he uses the allegory of a society avoiding attacks by wild cats by letting the lion rule and devour everyone:

> To ask how you may be guarded from harm, or injury, on that side where the strongest hand is to do it, is presently the voice of faction and rebellion: as if when men quitting the state of nature entered into society, they agreed that all of them but one, should be under the restraint of laws, but that he should still retain all the liberty of the state of nature, increased with power, and made

> licentious by impunity. This is to think, that men are so foolish, that they take care to avoid what mischiefs may be done them by pole-cats, or foxes; but are content, nay, think it safety, to be devoured by lions.

The present issues with law and code in algorithmic governance echo these discussions about the relationship between sovereignty, power and law, might and right. While automation (absolute authority) for Hobbes is a necessary condition of law to exist, Lock criticizes it as a dangerous precedent that makes law impossible. Automated decision-making that is hardcoded without any human oversight is an heir of a Leviathan idea as mechanical and automated sovereignty. How should we engage with the authority of the code and automated control of the new algorithmic sovereigns (technological platforms as the Lockean lions) and contest their absolute power? How to engage the citizens in the formation of the algorithmic Leviathan without letting the algorithmic beasts devour their data and autonomy while promising to protect them from some small dangers (wild cats)?

The Leviathan as the origin of the cybernetic metaphors and algogovernance

Algorithmic governance – promising efficiency while taking advantage of the citizen data, freedom and agency – is just the latest embodiment of the Leviathan. It is a form of artificial system (a contract as a machine and mechanism) that has absolute authority over the citizens that trade their sovereignty and natural rights for security. In his analysis of the Leviathan, (Schmitt 1996, 50) described this as the emergence of a "state as a mechanism" model that becomes a "manmade product" that is neither holy, just nor ideal but efficient: "Considering the Leviathan as a great command mechanism of just or unjust states would ultimately be the same as 'discriminating' between just or unjust machine."

For Schmitt, it was this idea of a modern state as an artificial and mechanical rather than spiritual unity that enabled all later forms of industrial state to use new technologies as tools of sovereignty. The idea of a state as technical apparatus or what we call nowadays algorithmic governance was born with the Leviathan:

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> The intrinsic logic of the manmade, artificial product "state" does not culminate in a person but in a machine. Not the representation by a person but the factual, current accomplishment of genuine protection is what the state is all about. Representation is nothing if it is not *tutela praesens*. That, however, can only be attained by an effectively functioning mechanism of command. The state that came into being in the seventeenth century and prevailed on the continent of Europe is in fact a product of men and differs from all earlier kinds of political units ... (Ibid.)

The Hobbesian modern state leads directly to the present algorithmic (or technological) governance. It is the original prototype of absolute and arbitrary power that nothing can resist because everyone will submit to it willingly: "[T]hat state was created not only an essential intellectual or sociological precondition for the technical-industrial age that followed but also the typical, even the prototypical, work of the new technological era – the development of the state itself" (ibid.).

Schmitt also predicted that a state as a "product of human calculation" would necessarily lead to the automation, a technically perfect mechanism that is synonymous with absolute authority performs its structure:

> But the idea of the state as a technically completed, manmade magnum-artificium, a machine that realizes "right" and "truth" only in itself – namely, in its performance and function – was first grasped by Hobbes and systematically constructed by him into a clear concept. The connection between the highest degree of technical neutrality and the highest authority is, as a matter of fact, not alien to the ingenious thinkers of the seventeenth century. At the end of Campanella's vision of the "Sun State" appears a big ship without a rudder and a sail but driven by a mechanism that is commanded and guided by the possessor of "absolute authority" ... (Ibid.)

Algorithmic governance as the modern Leviathan, this "gigantic mechanism in the service of ensuring the physical protection of those governed" was pioneered by the cybernetic and military visions of warships in the past (Campanella) but also present. Schmitt quotes Ernst Jünger's vision of warships as "swimming outposts of enormous

power, armored compartments, in which the claim to power is compressed in a most narrow space" (ibid.). Campanella's vision of the "Sun State" becomes literal: "The technically perfect mechanism of a big ship in the hands of an absolute authority who determines its course" (ibid.).

Sandboxes for exploring alternatives to the Leviathan

Is there any alternative to this absolute victory of the modern state as an algorithmic machine or cybernetic warship that realizes its sovereignty through its structure and code while claiming to "save" and support the citizens' survival? How might/could we rethink algorithmic sovereignty beyond the image of the Leviathan and its shadow, the Wicker Man?

Instead of insisting on one perfect Leviathan, we propose to multiply them via hybrid regulatory sandboxes as zoos for "dangerous" algorithms that support participants (stakeholders) in understanding them but also experimenting with the gradual process of "domestication." The simulation of decision-making processes that combine blockchain services and smart contracts with the existing policy tools for regulations can help us find some balance between the new algorithmic wilderness and domestication via regulations. Instead of communities yielding power to one powerful super-platform (Lockean lion and Hobbesian Leviathan), we simply need to learn to live with the wild animals that threaten our sovereignty and design an ecology.

The sandboxes and various testing environments for algorithmic services offer a model for how to make the process of automation more transparent but also participatory, so citizens can see, at each step, why and how they decide to sacrifice their sovereignty and outsource it to the code. We tested just such an environment on the example of future services in an imaginary smart village community of Lithopy, to enable participants to understand and prototype smart contracts with regulations over templates and probe issues of bias and justice. The participants explored how to combine technology with existing institutions to support the quest for algorithmic sovereignty beyond the Leviathan and Wicker Man-style automation.

The Lithopy sandbox stands somewhere between a "fairytale with code" and a fully functional prototype of a community using satellite data to trigger blockchain transactions and services. The

citizens as participants in the workshop use it as a playground to experience and define the degree of automation and regulation, and comfortable levels of personal autonomy and algorithmic governance. While the project's documentation is on the "Digital Dozen" website where it won the Special Jury Award for the best 2020 digital storytelling project,[1] the code for running the simulation and creating such sandbox in a workshop is on Github.[2]

This design and policy playground or sandbox for exploring near-future scenarios of algorithmic governance and automation reflects upon the convergence of blockchain and satellite/drone technologies. It helps the participants to probe the power of the technology while understanding the different possibilities of regulation and getting around the algorithms' power. In this sense, it serves the goal of tactical, situated and "participatory" automation that embeds social and individual agency in the processes of designing the algorithms and transforming "the logic of binary states, yes and no, into the fuzzy states of maybes and perhaps" (Hee-jeong Choi, Forlano, and Reshef Kera 2020).

The sandbox created an environment where we use regulations and code to engage in what we can describe as everyday practice and tactics adapting to the strategy and structure of the algorithmic governance (Certeau 1984). The sandbox becomes an environment for "tactical" and "situated" automation that is also participatory and involves the citizens directly as individuals and as a group:

> These workshops support participation in automation by engaging human participants directly in the creation of technologies that are also used strategically to control their everyday practices through the dominant sociotechnical order but with tactical intention this sense. These participatory workshops make the actual physical production of the boards that is tedious a part of a community bonding experience that supports the peer economy and liberation rather than alienation of labor. (Hee-jeong Choi, Forlano, and Reshef Kera 2020)

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1 Digitaldozen, http://digitaldozen.io/projects/lithopy/.

2 Github, https://github.com/anonette/lithopia.

The design and policy sandboxes are similar to the workshops on making boards in the hackerspaces and maker faire events described in the article on situated and participatory automation (ibid.); they allow citizens to understand directly and participate in the development of the technology. In the case of Lithopy sandbox, we used Hyperledger Fabric blockchain "testnet" on a server, on which it is possible to test the prototypes of smart contracts using open satellite data (from Sentinel 2A and 2B) for various services and automation. The near-future scenarios and contracts shown as a design-fiction movie that participants view to decide on the interventions and changes they want to make in the workshops.

Lithopy: from installation to sandbox

The original purpose of the design-fiction movie and the code was to invite the participants to explore the possibility of anticipatory governance of blockchain technologies by prototyping, deliberating, regulating and modifying the contracts (Reshef Kera et al. 2019). The project used various formats of display and engagement to support this research agenda. It was exhibited as an installation during the Milan Design Triennial (March till September 2019) and the Week of Science and Technology in Prague (November 2019) and offered as a workshop in five locations (Germany, Israel, Bulgaria, USA, Czech Republic) over 2019. In the installation, the visitors watched a split-screen seven-channel design-fiction movie about Lithopy and interacted with the props of large 3D-printed LiCoins with mixed lithium featured in the movie as objects visible to the satellites that indicate change of property but also smart contracts over a dashboard created in a Node-RED environment connecting the various flows of data over open APIs. The workshops concentrated on preventing biases and bugs in the smart contracts after joining and becoming a Lithopian and offering an asset by registering a name over the dashboard added through REST API service to the simulated testnet ledger on the server. The workshop would explain the code of the smart contracts present on Github and support the participants in modifying them over templates. The participants would also experiment with various ways of applying regulation of code (or over the code) via guided templates.

The smart contracts or "codechains" (in the Hyperledger Fabric environment) deployed on the Hyperledger Fabric-permissioned

blockchain were hosted on the server functioning as a testnet for the whole project. It supported the experience of various technical and governance limits of the closed or permissioned blockchain services and offered to anyone interested in blockchain, satellite or emergent technologies a space to play with and improve them.

The Lithopy installation enabled visitors to experience a typical day in the "smart village" where people sing with 3D printers, follow the prices of cryptocurrencies, satellite position and weather data to trigger various contracts through their dashboard. The ideas were that the citizens of Lithopy use gestures for partnership contracts and land art types of interventions with red cloth visible to the satellites as a pixel of data to change the ownership of a property. They also move around large LiCoins with hidden lithium deposits in the plastic to indicate a transaction and change ownership of the coins visible to the drones and satellites.

These parodically overdone prototypes of near future services that use drone and satellite data for contracts (identity management, partnerships, assets) pushed the current issues with automation and surveillance to its limits. The conceptually and visually rich simulation of a smart village also reflected the lithium and cryptocurrency speculations in the Czech Republic. The message communicated by the "lithium punk" fiction and prototypes or props remained ambiguous. The goal was never to embrace nor criticize blockchain and satellite futures but to move beyond the current discourse on disruption as some form of new technology revelation to find more pragmatic, anticipatory and experimental approaches to algorithmic governance issues.

Most visitors of the installations experienced only the design-fiction movie, dashboard and the set of props. Many of them were unaware that the prototypes are actual functional proof of concept, such as the asset transaction that allows a change of ownership based on 10 x 10m of red cloth, creating a pixel of data for the satellites. In the workshops (5 locations with over 35 participants), everyone was invited to test, modify and play with such services and overcome the fear of code and regulatory tools. The participants would register themselves on Lithopy ledger on the testnet and then try to change the ownership of an asset through a simulated satellite data transaction that could also serve any activist projects claiming symbolic ownership of various natural and cultural resources.

During these workshops, we realized that the experience is closer to the form of a design and policy sandbox than a set of prototypes and simulations. Only in the workshops did the participants realize that these prototypes are functional and possible, and that motivated them to take the challenge more seriously. These theoretical promises and threats of the disruptive technology became less important than the actions they could take as stakeholders in the collective future of Lithopy. They could see directly how Hyperledger Fabric blockchain smart contracts work on the testnet, including the open API for satellite data and Node-RED interface for connecting the different digital data flows. In three to four hours, they would gain a basic understanding of the code and infrastructure which were "human-readable" thanks to JavaScript code and allow them to experiment with democratizing such "future-making" in a sandbox.

Anticipatory governance of algorithmic Leviathans

The original purpose of Lithopy as an installation, workshop and simulation was to present the possibilities of anticipatory governance of algorithmic futures, and only during the 2019 workshop did we realized that we needed to change the ambition into a more experimental form of governance. How to democratize, anticipate and regulate the emergent challenges of cryptocurrencies, smart contracts and many off-and-on-chain (ledger) interactions became less important than experiencing the issues in an attempt to combine regulation and code. Instead of searching for a well-designed system that makes impossible attacks, misuses and mistakes also described as frictionless and anticipatory design (Monus 2018; Sgarro 2019), the purpose of the sandbox became to show rather than hide the unequal power relations between the stakeholders.

The problem with any technocratic solutions creating algorithmic Leviathans is their democratic deficit that reduces the future citizens to users and subjects rather than active participants. The initial experience from the 2019 workshops led us to define the whole environment beyond anticipatory governance and improvement of user experiences of such future infrastructure. We started to think of it more as an actual design and policy sandbox that supports the participants' social and political agency. The view of citizens as stakeholders (Reshef Kera 2020b) rather than users of various future infrastructures is often ignored or reduced to participatory design issues

or co-design strategies that deal mainly with well-established rather than emerging technologies. Instead of only asking the participants to define their future stakes in the code and regulation of the future blockchain automated services and prepare the frictionless design, we realized it is more important to define a form of policy that actively promotes such experiments with future infrastructure as tactical and practical adaptation (rather than adoption).

To address the problem with the democratic deficit, we connected the participatory prototyping of blockchain future services over templates with actual voting and deliberating upon the regulations in Lithopy during the workshops. We transformed the whole environment from a simulation or participatory prototyping exercise into a type of experimental governance sandbox for experiencing alternative blockchain and automation futures. In the sandbox, participants could define their stakeholder role or use one of the templates. They experienced and addressed both the code and regulation and discussed them with other participants through their roles. The immersive experience of collectively discussing how the code should be regulated and realizing the limits of citizens agency led to various calls for a "contact" language or an interface that connects better regulation and code.

From the surveys with 20 semi-structured interview questions in 2019, to which only 18 participants adequately responded, the majority demanded auditing and certification services by independent organizations to intervene in the blockchain- and satellite-driven futures. The whole project evolved from passive simulation and installation for experiencing the shock or admiration of future services into a sandbox and testnet for democratizing future-making. The feasible, but still near future scenario about a convergence of satellite and blockchain technologies became a playground for imagining the future as a common good, one in which we have to question the present forms of algorithmic sovereignty.

Simulating, prototyping and sandboxing blockchain futures

The main scenario explored in the workshop was the possible misuses (bias) in selling property that excluded certain nationalities, to which the participants reacted by deciding whether to change the code and impose different forms of regulation. While, initially, we emphasized

the importance of participants reaching an agreement as a group, during 2019 workshops, it became clear that this is too ambitious. The Lithopy sandbox did not improve the "innovation," as in the case of regulatory sandboxes, offering instead direct agency experience with code and regulation beyond the aura of "expert tools." In this sense, it supported the goal of experimental and experimentalist governance as negotiation and consensus building in a power vacuum where individual stakeholders have to define their interests and relations but also norms and goals on the go (Sabel and Zeitlin 2012; Wolfe n.d.).

While most regulatory sandboxes insist on innovation, the Lithopy sandbox is more of a "trading zone," a productive environment for supporting coordination and exchange of knowledge and resources between dissimilar and even antagonistic stakeholders. We describe this as tactical and situated automation that allows adaptation to rather than adoption of emerging technologies and preserving certain forms of agency. The type of algorithmic sovereignty explored in the sandbox is tactical and situated. It is also plural and offers a variety of scenarios on how to survive and strive in such algorithmic futures while slowly defining a form of social and individual agency.

The result of Lithopy is neither an ideal code nor regulation but an open space for discussion, experience and decision-making that serves the citizens who would like to experience what is their stake in the future of this infrastructure that supports automation algorithmic governance. The environment invites the participants as stakeholders to "trade" and together define their shared future in this tactical and situated way that is supportive of "dissonance." At the beginning and end of every workshop, the participants voted on the future of their community and got such an immediate feedback how their interventions worked and whether they would form a community.

The model for this policy and design sandboxes as a "trading zones" was inspired by the STS scholar, Peter Galison's description of how innovation and discovery, and regulation happen in the case of particle physics in the 20th century (Galison 1997). Galison was able to show how successful exchanges between various stakeholders (scientists, but also policymakers and businesses) depend on preserving their identity and diversity rather than finding a single unified theory, practice, value or institution that makes the decisions. It is not the code nor the values and regulation that define the common

blockchain future; rather, it's the ability to "trade" with groups and stakeholders whom we do not understand and agree with:

> But here we can learn from the anthropologists who regularly study unlike cultures that do interact, most notably by trade. Two groups can agree on rules of exchange even if they ascribe utterly different significance to the objects being exchanged; they may even disagree on the meaning of the exchange process itself. Nonetheless, the trading partners can hammer out a local coordination despite vast global differences. In an even more sophisticated way, cultures in interaction frequently establish contact languages, systems of discourse that can vary from the most function-specific jargons, through semispecific pidgins, to full-fledged creoles rich enough to support activities as complex as poetry and metalinguistic reflection. (Galison 1997, 783)

The policy and design sandboxes as such trading zones are simply an opportunity for experimental governance. The different stakeholders attempt to create a contact language between code and regulation, the current institutions and future infrastructures, and define further their actions and coordination. The result is not a Leviathan to which they all outsource their sovereignty but rather a tactical and situated attempt to preserve agency while learning how to use the infrastructure for various agendas.

The Lithopy environment was never very robust and stable, and this proved to be important because it let the participants understand the technical limitations of such emerging infrastructure with the ambition to become the future of algorithmic governance. In the first six months between March and September, some 391 Lithopians registered on the testnet to offer a property or partnership, but because of a technical glitch and problems with the Linux server, some 150 Lithopians, their partnerships and assets were deleted in the first digital "genocide" in a June 2019 server crash. A similar disaster also destroyed the next generation of some 241 new Lithopians that offered 48 assets and 91 partnerships registered over the dashboard, but this time everything was saved on an excel sheet. The dashboard data are interesting because they show a disproportioned interest in smart contracts related to partnerships over ownership in this sandbox. The pre-June 2019 ledger data from the simulated nodes are still

buried somewhere on the server, which inspired an idea for a future workshop in which participants will define future professions, such as digital archeologists or a ledger forensic expert needed for this imaginary community.

The experiments with value exchange and "coins"

To illustrate how the Lithopy sandbox managed to create a trading zone for making surprising connections between regulation and code, programming and deliberating and performing the situated automation, we can use the experience with prototyping of the LiCoin currency. Based on the early workshops, the idea of cryptocurrency and mining as common in the blockchain projects was rejected entirely in favor of the existing genealogical exchanges already happening in the sandbox. The closed, permissioned blockchain services based on Hyperledger Fabric paradoxically allowed participants to explore different notions of ownership connected to genealogy (who owned what and when) rather than monetary or quantitative value.

The Lithopy process that initially involved directors, actors, graphic designers and blockchain developers and only later also participants and the more general public in the workshop, even exhibition visitors, formed the "trading zone" for interaction between various stakeholders over concepts and tools, in our case blockchain, lithium and satellites. The interactions between diverse individuals with different agendas led to the idea of blockchain beyond cryptocurrency applications and experiments with new economic models. While describing the different models of blockchain services, the original participants (core team that made the movie and designed the services) simply expressed a preference for exchanges based on the genealogy of ownership (names of owners) rather than the nominal value of a currency.

The project started with a trip to the mining city of Cinovec in North Bohemia, where we noticed the creative ways the villagers stored and preserved the lithium deposits on their house facades with glittering lithium plasters. These lithium facades made by locals used mining debris in the 1980s, when no one knew it would become a strategic resource and hidden treasure. We modeled Lithopy coins after this secretly stored material on the facades and made it a central point of the metaphysical, political and economic speculations. The LiCoins made from lithium sand mixed with 3D-printable plastic

created the tokens of "cryptocurrency" that have to be moved around to indicate ownership. Because this idea was difficult to implement and prototype with a 3D printer, we had to create large LiCoins, similar to the famous Pacific Rai stones, allowing to hide the illegally obtained lithium sand inside of them.

The LiCoins, just as the lithium facades, use the old mines' material to reclaim the ownership of the natural resources that is part of the inheritance rather than a market. Instead of a value of the coin, Lithopy ledger stores information about the genealogy of ownership of the coin, referring back to the cosmological origin of the lithium. All transactions in Lithopy emphasize this genealogy over exchange and stewardship over ownership, so there are no cryptocurrency coins, just timestamped data defining the different assets' genealogies. The exchange of money or tokens becomes a more complex interaction beyond quantification.

The blockchain services in Lithopy look more like rituals inspired by various indigenous cultures with different views of exchange of value. For Lithopians, just like Galison's peasants, money is not neutral means for accumulating capital but part of the genealogy of the oldest metal in the universe – lithium – created shortly after the big ban. As Galison shows, the trading zone offers such tactical and situated appropriation of technology or institution, such as money, to serve the opposite goals of the intended ones:

> Funds obtained in certain ways have intention, purpose, and moral properties, though perhaps none more striking than the practice of the secret baptism of money. In this ritual, a godparent-to-be hides a peso note in his or her hand while holding the child as the Catholic priest baptizes the infant. According to local belief, the peso bill – rather than the child – is consequently baptized, the bill acquires the child's name, and the godparent-to-be becomes the godparent of the bill. While putting the bill into circulation, the owner quietly calls it by its name three times; the faithful pesos will then return to the owner, accompanied by their kin, usually from the pocket of the recipient. So, when we narrow our gaze to the peasant buying eggs in a landowner's shop we may see two people harmoniously exchanging items. They depend on the exchange for survival. Out of our narrow view, however, are two vastly different symbolic and cultural systems, embedding

two incompatible valuations and understandings of the objects exchanged. (Galison 1997, 804)

In Lithopy, all coins have names and various rituals of exchange in front of the satellites and drones that make these blockchain futures closer to similar indigenous rituals of "baptizing" money or the Pacific Rai stones. The example illustrates what experimental governance of emerging technologies can mean and what is the value of sandbox engagements in material prototyping and political deliberation between different stakeholders.

Summary

Design and policy sandboxing offers a methodology for testing experimental governance of blockchain futures and explores the possibility of tactical and situated automation. The testing environment increases the engagement of citizens in the process of designing and deciding upon the algorithmic sovereignty and future Leviathans. They explore the possibility of tactical and situated automation in the experimental sandboxes by balancing the automation based on code with their personal and social agency. The citizens can decide at each step how much agency they are willing to sacrifice for automation promising frictionless and more efficient futures. By "domesticating" and taming the power of the algorithms and code, they avoid the extreme scenarios of future governance reduced to the Leviathan or Wicker Man. Instead of an efficient state that makes citizen agency obsolete (Leviathan) or even sacrifices it to optimize the system (Wicker Man), the sandbox offers a trading zone for making tactical decisions on the common future. Most importantly, it changes the narrative of disruptive technology into actual experiences with prototyping, deliberating and working together on the common future. Instead of one Leviathan, the experimental policy and design sandbox creates different "forks" and alternative timelines and ledgers of what can happen and how we can distribute power and resources. The alternative metaphor for the participatory and tactical algorithmic sovereignty is this William Gibson's recent metaphor of such alternative timelines and forks as "stubs" (Gibson 2014). Everyone is invited to participate in the sandbox for a limited time and define their own blockchain future that he or she can design by changing the code and regulation, the material prototypes and the "constitution." Every

workshop or implementation of the Github code as fork or stub can yield a different version of the blockchain and satellite futures until someone decides to implement such convergences for real. In that case, the alternative Lithopy forks as situated and participatory automation scenarios become experimental governance results and provide valuable lessons and comparisons rather than the absolute sovereignty of some Leviathan. The experience with the different futures and scenarios provides tools and examples for further deliberation and decision-making rather than complete loss of agency in some Wicker Man scenario.

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