Fostering More-than-Human Imaginaries: Introducing DIY Speculative Fabulation in Civic HCI

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ABSTRACT
Amidst the epistemological turbulence of the Anthropocene, forging new narratives has considerable importance. Departing from human-centred thinking and world-building, a shift in perspective towards a more-than-human worldview requires a continuous process of increasing awareness through various media and education. In our research on DIY tools and methodologies for urban civic interventions, we examine how applying a speculative fabulation method facilitates probing, informing and engaging citizens on a variety of human and more-than-human urban issues. Drawing on the theoretical backdrop from the environmental humanities, through an ethnographic account of two preliminary participatory design tracks, we describe how we infused our workshop interventions and participatory protocols with embodied and material storytelling that probes towards fostering more-than-human imaginaries. We discuss the potentials and pitfalls of using such an approach for tackling urban issues, and end the paper with a propositional outline for integrating the speculative fabulation method in civic HCI.

CCS CONCEPTS
• Human-centered computing → Human computer interaction (HCI).

KEYWORDS
More-than-human, urban informatics, storytelling, DIY, speculative fabulation

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1 INTRODUCTION
Amidst the current period dubbed the Anthropocene, marked by the rapid decline of biodiversity and changing climatic conditions due to human activity, coming up with new narratives or relaying old ones in novel ways has considerable importance [33, 34]. The Anthropocene, as a human-induced geological epoch, poses specific epistemological and ontological challenges. Yet, as a cultural model, the Anthropocene also presents historical opportunities [12, 34, 58]. It marks a moment of possibility to redress modern narratives – narratives that epistemologically split up mind/body and body/world, as well as ontologically separate nature/culture and human/nonhuman. Particularly the human exceptionalist narrative – in which we humans hyper-separate ourselves from nature - urgently needs to be redressed. For it is not only hazardous to non-humans but ultimately to ourselves [49]. As human-centred conceptual frameworks leave many humans – not in the least, human urbanites (cf. [35]) – unaffected by the fate of nonhuman others.

In recent years, within the field of HCI, we have seen the rise of different, interrelated strategies that expand upon and beyond human/computer binary. In civic HCI, there have been efforts to increase citizen engagement with a growing critical stance towards the current prevalence of (screen) technology [40, 41]. Moving from persuasive to ludic technology, from scientific to artful approaches, environmental HCI has sought to solicit changes in ecological awareness and subsequent behaviours [17, 20, 27]. Efforts in HCI concerned with participatory IoT and the smart city, finally, have been addressing the opening up, levelling out and decentring of an all too state- and corporately closed, top-down hierarchical, and human-, engineering- and technology-centred vision of the smart city and its constituents [2, 3, 16, 35, 56]. Many researchers in HCI have thus moved away from “the established hegemony of the engineering and technology-centric epistemology” [36, 1] “towards a cosmopolitics of design where aesthetics and materialization of
technology also act as an inquiry into issues of performance and social meaning-making” [51, 2].

Increasingly, HCI and smart city research are threaded through with more-than-human concerns [22, 23, 35, 36, 53]. When replacing the human-centered with a more-than-human lens, it becomes apparent how many more entities are actively participating in phenomena, communities, cities, and design processes [9, 21]; and how humans and nonhumans are historically entangled and how complexly interdependent they are – whether closely or remotely [58, 62]. Hence, HCI researchers are looking to “propose an alternative smart city agenda for the interaction design community in responding to a more-than-human perspective” [9, 1].

In our work in the SUCIB (Smart Urban Communities Interaction Blocks) project, we develop reusable DIY sensing and actuation tools for creating interactive urban interventions as well as participatory protocols that aim for smart citizen [8] and local civic actors to engage on urban issues with and within their communities. Critical factors in the project are the identification of – and sensitisation on – these urban issues, and making them understandable and approachable by a broad public; from children to adults, from fragile social groups to citizen with a higher socio-economic status. In our work, we are inspired by the extensive work that has been done in civic and environmental HCI, more specifically those HCI endeavours with ludic, aesthetic and speculative approaches. The main challenge we identified is to bring these approaches and methods ‘on a neighbourhood level’, not only as experimental research prototypes but as low-threshold tools that local neighbourhood organisations and communities are able and willing to appropriate. To ensure the accessibility of these prototypes, we started our co-design trajectory with a young public in urban public spaces, with the plan to extend participation to other groups and contexts over time. Coupled with the design trajectory of the tools, we set out to explore participatory methodologies to deepen the awareness on urban issues. The angle that previous paragraphs introduce and which we will further explore in this paper is creating awareness of more-than-human concerns on a neighbourhood level through speculative fabulation using a variety of ‘electronic species’ to triangulate between the urban issue and the citizens. We draw on work from the environmental humanities, for the expansion of knowledge on a vast array of nonhuman species, and its sensitising strategies through speculative, artful, and narrative approaches which amount into more-than-human world-making practices [4, 58, 61]. Although we did not arrive at this point yet, our ultimate goal is to deploy the interventions over more extended periods and to evaluate their effectiveness. This paper describes our theoretical framework, methodology and early experiments which unveil opportunities and potential pitfalls of more-than-human speculative fabulation.

With this paper, we make the following contributions to civic HCI: (1) we situate the problem of human exceptionalism, indicate how it is an obstacle for bringing into being more-than-human worlds, and how HCI could aid and respond; (2) we explore the potentialities of speculative fabulation with regard to fostering more-than-human imaginaries; (3) we give an ethnographic account of two participatory design tracks in which we applied the speculative fabulation method in our city neighbourhood workshop interventions, participatory protocols and interactive tools; (4) we discuss potentials and pitfalls and give an outline for integrating the speculative fabulation method into civic HCI.

2 WHEN NATURECULTURE CALLS (AND HOW HCI MIGHT RESPOND)

When it comes to redressing modern narratives in the Anthropocene, one of the most urgent ones to be tackled is the human exceptionalist narrative. Human exceptionalism emanates from the Western dualist philosophical tradition that split off mind from body and body from world. Later, with the rise of modernism – as a revolutionary political, scientific, and technological project – an act of ‘purification’ between nature and culture took place [43]. Nature was considered as a separate realm from Culture and Society – anterior and eternal, ‘out there’ for humans to be discovered and conquered. In the process, humans set themselves apart from and above non-humans, which at best became passive, docile entities awaiting human manipulation. With the rapid ecological transformations we are currently witnessing, we may acknowledge that the human exceptionalist posture has been much to the detriment of nonhumans, Earth, and ultimately humans themselves.

Usually, in discussions of human exceptionalism the focus lies on the epistemological schism: the dualist, hyper-separated categories with which Western knowledge thinks, such as human/nonhuman, nature/culture, mind/body, and fact/fiction. We would like to argue here to also bring attention to the affective consequences of this epistemological schism. As environmental humanities scholar Thom Van Dooren puts forward:

“(human exceptionalism) is implicated in the erasure of the significance of non-human others (...) As a dominant cultural narrative in many parts of the world, this is particularly so. The stories that we live by – as individuals and as societies – powerfully shape our ability to be affected by others. (...) The affective separation of human exceptionalism holds the more-than-human world at arm’s length: human exceptionalism plays a central role in the active process of our learning not to be affected by nonhuman others” [60, 141].

If we lay out the different aspects of this claim – (1) the affective dimension of the problem and (2) the importance of experience in forging sensitivities by (3) embedding them in broader narratives – we may come closer to addressing the problem of human exceptionalism and finding avenues towards a more-than-human future.

To this end, we can start by building further on existing strategies in HCI. In recent years sensing, polling, displaying objects in the fields of civic HCI, environmental HCI and participatory design for the smart city have seen new strategies emerge. In civic HCI, there is a growing critical stance towards the current prevalence of (touch)screen technology towards new ways of making the interfaces and visualisations tangible, accessible and engaging [5, 31, 40, 59], as well as the development of methodologies to infrastructure solutions with communities (e.g. [3]). This is telltale for the shift from wholesale formulas towards (hyper)local solutions, from more abstract services towards looking at specific situations and stakeholders. Increasingly, concerned researchers become more attentive to the “other”. Cultural gaps are bridged [29] and elderly
engaged [52], and there is a move from more activist stances [24] to forms of public engagement where both citizens and governments can benefit from [10]. We argue to introduce the "non-human other" in a next phase of this expansion. For example, animals (such as frogs [3] and birds [44]) have already been led to the stage in civic HCI.

In both environmental HCI and the wider field, researchers started looking to the arts to facilitate the questioning and re-imagination of interactive systems, enhancing or transforming science-dominated practices [15, 18]. We suggest this move to the artful to extend beyond objectal aesthetics, towards a more experiential, expansive and reflective proposal. Borrowing from the Fluxus and the Situationist movement, ludic and ambiguous approaches propose to disrupt the reduction of a system to singular narratives [26]. Ludic systems open up to a broader spectrum of use and interpretations, for which the outcomes are undetermined. This allows an ecology of objects with which such systems are to be appropriated (e.g. [28]), or even to provocations (e.g. [25]). The proposition towards the more-than-human requires a similar openness; not to the potential through and within oneself in relation to the (ludic) system, but outside one’s known ecology, towards the unrevealed, the taken-for-granted, the un- or lesser-known more-than-human other.

Approaches in participatory design for the smart city paved avenues to increase skills, knowledge, and resilience in citizens, concerned groups and civic organizations in order for them to appropriate urban informatics for the good of their communities. This led researchers and citizens to co-design and build electronic sensing and actuating devices, informing themselves and others through data gathering and dissemination, facilitating organization and mobilization [3]. At the start of such trajectories, organizers often feel the need to deepen the awareness of participants of the issue through moments of physical confrontation and connection with the matters at hand. This might be in the form of site-visits or walks, getting hands dirty with the matters under consideration, or even taking on nonhuman perspectives [9]. Through such acts, the human participants involved develop a sense of the richness and complexity of an issue, which electronic sensing devices alone are unable to offer. There is an alley for HCI to continue to look for ways in which to extend such ‘presence’ of matter and species in civic projects.

For this development, HCI may learn from environmental humanities, which emerged from interrelating the fields of STS, philosophy, literary studies, and anthropology [34, 39, 49, 50, 58, 60, 61]. As a field of study, also known as multispecies studies, it has ethnography as its main method. As multispecies anthropologists Kirksey & Helmreich [39, 549] put forward in one of the early seminal texts: “Multispecies ethnography involves writing culture in the Anthropocene, attending to the remaking of Anthropos as well as its companion and stranger species on planet Earth”. Correspondingly, an increasingly wide range of nonhuman entities (and their entanglements with humans) have been accounted for – from the organic to the inorganic, the living to the non-living – microbes, fungi, plants, insects, animals, rocks, soil, minerals, chemicals, ghosts …

From the outset, the field of environmental humanities did not only restrict itself to description. As a strategy to sensitize both researchers and the broader public to more-than-human worlds, proponents equally engaged in – and called for – intervention. With ‘the arts of noticing’ [58], they called on researchers for “transforming noticing into attentiveness - into the cultivation of skills for both paying attention to others and meaningfully responding” [61, 6]. Exemplary responses take the form of artful and narrative approaches. More-than-human humanities propose to imagine new ecological sympathies [4] and probe speculative dimensions of multispecies worlds [61], serving as a companion and catalyst practice “for thinking through and against nature-culture dichotomies” [39, 546]. Narrative approaches, it is argued, enact multispecies storied places, unearthing the intricate entanglements between humans and nonhumans in urban environments [62]. Conveying this knowledge to foster more-than-human sensitivity and bringing into being more-than-human worlds, a call for stories makes more than sense – for stories are practical technologies that have empathy-shaping, complexity-fostering and world-making capacities that affect, guide and enable us, not just as individuals, but also as communities, societies and cultures.

Thus, the environmental humanities propose to imagine new types of narratives and techniques to create trans-species sensitivities, as well as going the next step and craft those narratives (e.g. [55]). Here a call is uttered for which HCI is well-equipped to respond. We concur with Heitlinger and Comber [35, 10] when they write that “design is well placed to do this work, and is able to draw on existing and well documented methodologies to assist in this task. Speculative participatory design, ludic participatory design, design fictions, speculative civics, object oriented ontologies, and multi-species ethnographies to name just a few may be useful in decentering the human in design to consider the roles and perspectives of non-human others in smart cities”.

3 FOSTERING MORE-THAN-HUMAN IMAGINARIES: ON THE POTENTIALITY OF SPECULATIVE FABULATION

In this section we discuss the potentials of speculative fabulation as a method for civic HCI, navigating within this zone of alliance between HCI and environmental humanities. In our work on building civic tools and methodologies for urban environments, we are sensitive to the engagements and activities which are already happening on a neighbourhood level, as well as the concrete situation on-the-ground. In our zones of study, more often than not however, these look rather barren and grim. While it is a crucial strategy for HCI researchers right now to increase the more-than-human sensitivity by building interfaces that connect urban citizens with the fauna and flora that is (still/again) present in the city [9, 53], we should not underestimate the almost total absence of the latter in some city neighbourhoods. Indeed, as with the neighbourhoods we report on in this paper, there is such a poor presence of bios (let alone biodiversity), that experience thereof tends to have an overt human and urban exceptionalist feel.

In order to start imagining and fostering more-than-human futures, the strategy to start with then in such ‘poor’ city quarters sometimes cannot but be speculative and fabulated. Working with and for the forgotten (precarious) target groups and neighbourhoods became for us a credo and challenge, as through previous work we experienced the limitations of participatory design tracks that only consist of participants with higher socioeconomic status.
How can we motivate and engage those which traditional urban participatory design tracks did not reach? In line with Deleuze, we were drawn to fabulation as a strategy to start imagining an ‘otherwise-possible’. As philosopher Didier Debaise notes: “Deleuze proposes fabulation, which he considers the “art of the poor” because it is a way they can invent something other than the set of conditions offered to them by the situation they find themselves in” [19, 11]. In the current present, fabulation is more than welcome, for dreadful are the conditions we have to imagine ourselves a way out of. The latter, however, is not only the case for ‘poor’ neighbourhoods. By extension, it is rather a general condition for the contemporary society and the wider population: a condition of ‘poor’ imaginaries when it comes to more-than-human futures. We may well be in need of revitalizing our imaginations in these ‘catastrophic times’, “because it is not a matter of converting us but of repopulating the devastated desert of our imaginations” [54, 132]. Fabulations, then, can be narratives that delve interstices in our world, which could evoke new (more-than-human) attachments, and subsequently become ‘an act of repopulation’ [55, 152].

Speculative fabulation (henceforth ‘spec fab’) – and, by extension, science fiction (henceforth ‘SciFi’) – is more prevalent and thriving than ever nowadays, be it in mainstream popular culture, the arts, or even the humanities. In the humanities, for example, the field of anthropology is turning towards SciFi, characterizing anthropology “as a ‘fabulatory art’, with the capacity to disturb common-sense distinctions between the real and the fictive” [38, iii]. In this mutual cross-pollination, anthropology and SciFi engage in a material and textual adventure in “an effort to replace an understanding that sees ‘real’ and ‘fictional’ worlds as fundamentally, ontologically distinct, with images of looping, recursive implication, lateral movements, and blurred zones of interaction” [38, iv]. Drawing on these lateral movements, in which the strict boundaries between what is considered ‘real’ and ‘fictional’ are lifted, may also be an interesting endeavour for HCI to experimentally explore in real-world settings.

In the arts, artworks of an array of contemporary artists have been highlighted for their approaches of introducing speculative and fabulatory elements to arrive at eliciting more-than-human affect in human spectators [4, 9, 57]. That is, as Ballard observes [4, 256], these artists introduce “a possible method to think about how to use the imaginative tools of writing and contemporary art to understand human, animal, and machine relationships”. The spec fab video installation Time Machine by artist Anne Lislegaard, for example, presents a 3D animated anthropomorphic fox that is stuck in a time-travelling machine. It delivers a glitching and stuttering monologue warning human spectators about their own extinction. In I Roam, a video work by Sophie Lévy, the viewer follows a ‘real’ whale from the perspective of its back as it roams the sea. The discussion of its habits and mode of existence, delivered by subtitles, is actually sourced from a 19th Century semi-fictional documentary book written by a whale hunter. Here, too, what is at issue is to vibrate between scientific and fictional realities, “a blurring of both sides of the assumed division: the speculative turn that is palpable and the scientific turn that is fabulating” [57, 7].

Contemporary more-than-human spec fab in literature, finally, has been moving towards the mainstream. Writers like Margaret Atwood and Jeff Vandermeer have offered compelling and detailed speculative and fabulatory descriptions of respectively posthuman society-building and more-than-human subjectivities. In the last part of Atwood’s MaddAddam, human survivors of a global (human-made) pandemic develop a charter for living together with pigoons – a species of pigs spliced with human brains. With this charter, they lay the basis for a more-than-human society. Thus, spec fab may offer interesting texts which “consider what a political order might look like that takes seriously the participation of its nonhuman citizens” [34, 228]. Although set in an utterly grim dystopian city, the mutant-animal characters that Jeff Vandermeer presents in his books Borne and Dead Astronauts offer groundbreaking literary experiments with more-than-human subjectivity [42]. In Dead Astronauts, chapter-long inner monologues of a man-made biotech fish called ‘Behemoth’ tackles the questions of the rise of consciousness, ethics and (in)sanity in non-humans. Detailed description is given of the experience of ‘Mass’, a biotech vegetal being, inquires into utterly distributed somatic experience. The ‘Borne’ character, in the eponymous book, finally, is a nosophomous entity which grows and evolves by ingesting matter, objects, plants, animals and humans. As it can take on any quality or capacity of the latter, the reader explores together with the character how it feels (and what it means) to become human/nonhuman/inhuman. This experimental, performative writing also effects a performative reading experience. Such that, “the relevance of mutant figures to this discussion of more-than-human subjectivity lies in their capability to evoke affects and bodily feelings that both defamiliarize naturalized notions of human experience and suggest more-than-human modes of experience” [42, 248].

In the previous section, we discussed how we can build further on efforts in environmental and civic HCI, for which we argue to introduce the ‘non-human other’ in a next phase of expansion by adopting an artful, ludic, and diy approach so as to open up and multiply narratives instead of keeping them absent or narrowing them down. Furthermore we discussed how in the environmental humanities (speculative) narration is considered an important strategy, as it holds the promise for affective engagement with more-than-human others. In addition, the above paragraphs indicate the calls and applications of speculative fabulation, as it holds the potential to open up more-than-human imaginaries. However, as these highly imaginative works roam in realms that are confined to books, screens, art venues and scientific journals, we wonder how these highly potent sources of inspiration can be mobilized by civic HCI researchers and designers. In our work, we take up the challenge to introduce spec fab as a method in participatory design processes of civic HCI, by deploying diy electronic spec fab ‘out’ in city neighbourhoods. In so doing, we counter the oft-repeated critique of speculative methods (e.g. design fictions and speculative design) for their presumed elitism, and thus move beyond the realm of the museum exhibit. In the following sections, we present a first exploration of what this translation could look like through the discussion of a set of cases in urban neighbourhoods.

4 TAKING SPEC FAB TO THE STREETS: FROM SQUIDS AND GHOSTS TO ELECTRONICS

As part of the larger SUCIB project, in the first 18 months we worked on co-developing a workshop methodology and a set of interactive
electronics with a variety of participants. During the participatory design sessions, the team’s researchers took turns as observers, photographers, facilitators and co-designers. Rich with this participatory observation experience, they produced polyphonic and multimedia ethnographic accounts. In this section we focus on the accounts of two of these participatory design tracks.

4.1 Of squids, kids and basic electronics

Preamble. One of our first public interventions was on a square called Place Lehon in the Brussels commune of Schaarbeek. Through preliminary observations and interviews with passers-by as well as participatory mapping sessions, Place Lehon was described to us as a square that is heavily frequented, from the afternoon until late at night; very mixed, with a high degree of diversity in terms of nationalities and migration backgrounds, and age groups ranging from children over youngsters to parents and elderly people; finally, a square known to be very lively, with a lot of informal leisure activities taking place. As for its physical layout, Place Lehon is an open space with two basketball courts, a dozen of hedgerow enclosures and four patios with benches. Despite the lively character of the place, during the interviews, the need for more connective activities had been expressed, especially for children and youngsters. The major problem was the considerable lack of interaction between the extremely diverse inhabitants and users of the square, which often travel from other neighbourhoods.

Our goal became to stimulate (positive) interactions on the square, and imagined a robust interactive game-device to be installed either on a permanent basis or one flexible enough to be rolled in and out by local associations. We figured that such playful intervention would connect better to (and be more welcomed by) the local ecology/social environment if we would imagine and build the intervention collectively, but also weave it into a reflection/speculation on the future and identity of the neighbourhood.

As they did not share concerns, what foundation could we build on to reach out and imagine something more in common? In line with speculative approaches in participatory design [1], this led us to the idea of introducing a ‘spec fab figure’ to create a fertile soil to spark electronic imaginaries; as well as to stage a narrative environment (following [6]) for participants to find a connection in the co-creation process. We set out a protocol of two workshops to introduce and co-create an aesthetic and gameful spec fab figure, exploring the potentials of electronics and produce multiple prototypes which would pave the way to a more concrete proposal. The workshops were mainly aimed at the children and youngsters who use the square, which we intended to expand in a later phase to their parents as well as the residents around the square.

Selection of the species figure. Soon the team got captured by the species figure of the squid, and by extension, by a whole range of species figures of the Cephalopod’s class, and this both for their wondrous and imaginative capacities as well as the fit as cultural analogy with the situation on the square.

Squids are one of the more beautiful but bizarre beings on this planet. Nightly podcasts taught us about its chromatophores allowing it to change colour according to its environment; its suction cups able to taste; and its vast arrays of ways to glow, shine and glitter. The image library we put together showed the awing beauty of the Vampire squid, the Cockeyed squid, the Ghost squid, the Sepiola Atlantica and the Hawai’an bobtailed squid. From these phenomenal meanderings we seamlessly ended up reading through Peter Godfrey-Smith’s Other Minds [30], which accounts for the squid’s ‘alien’ intelligence and the particular distribution of its embodied cognition; the media archeology of Jussi Parikka [48] taught us about technological zoology and how it emerged from the historic entanglements between advancements in the fields of the study of animals and the development of interactive media technologies in the 19th Century. These made us imagine the vast possibilities for sensing and actuating with urban informatics. In short, they offered us a fertile soil to feed more-than-human electronic imaginaries. In turn, we wanted to relay these potentials to the workshop participants.

From the viewpoint of the squid as a cultural analogy, the figure presented features that we thought could well correlate with the experience that local inhabitants might have of the square. As a situated metaphor for Place Lehon and its dwellers, it offered indices: about the versatility of standing out and blending in (as many of the square’s users have a recent migration background); about resourcefulness in landscapes that are both rich and poor in affordances; about bridging the notion of otherness across human-nonhuman boundaries. As a metaphor, finally, it tied in with the potentialities of more-than-human spec fab. As Haraway reminds us, “(t)entacular beings make attachments and detachments: they cut and they knot, they weave pathways and consequences, but not determinisms; they are simultaneously open and knotted” [32, 44].

Workshop staging. To introduce the figure of the squid, initiate the narrative environment and set the stage for the workshops, we designed and deployed two types of posters as well as a giant electronic squid game. The first poster was a public invitation poster, placarded multiple days in advance on the square, titled “A bizarre electronic squid game. The first poster was a public invitation poster, containing a narrative pitch, thematic narrative and contextualised the game intervention and presented features that we thought could well correlate with the experience that local inhabitants might have of the square. As a situated metaphor for Place Lehon and its dwellers, it offered indices: about the versatility of standing out and blending in (as many of the square’s users have a recent migration background); about resourcefulness in landscapes that are both rich and poor in affordances; about bridging the notion of otherness across human-nonhuman boundaries. As a metaphor, finally, it tied in with the potentialities of more-than-human spec fab. As Haraway reminds us, “(t)entacular beings make attachments and detachments: they cut and they knot, they weave pathways and consequences, but not determinisms; they are simultaneously open and knotted” [32, 44].

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While the invitation poster attracted plenty of attention and sparked discussion and interest among the users of the square, the poster with the narrative pitch was less efficient. Our aim was to discursively frame the intervention, offering a textual narrative grasp for the potential workshop participants. However, this did not work out as we imagined. In fact, the discursive story elements were almost completely disregarded by the children and youngsters on the square, who instead of reading the story were more attracted to the game intervention and the workshop tools which we will describe later.

**Workshop unfolding.** Two workshops were set up, one introducing narrative elements using paper, carton and crafts materials, and a second workshop also including basic electronics.

We held the first squids workshop (SW1) outside, under a patio on the square, paired up side by side with the squid game. We made available laser cut stencils and markers to make and decorate small paper figures. The stencils featured all kinds of squid icons, urban elements and icons referring to technological connectivity. We designed them to be suggestive and orient the exercise but allowed additional free-hand drawing. The workshop resulted in multiple speculative imageries. The children created known and new unknown (hybrids) of more-than-human entities, at times joined together into aquatic or abstract landscapes. What emerged was a proliferation of more-than-human entities: squids of all sorts, WiFi and Bluetooth signs, basketballs, hearts, bubbles, cars, stars, suns, worms, brittle stars, bees, sheer colour gradients, sea-scapes, flowers, caterpillars, … We invited the workshop participants to add their craftworks to a mesh of strings that we hung to the side of the patio. Through these gestures, participants connected and interwove imagery and imaginaries of bio species, technological and urban elements into a lo-fi, more-than-human speculative ecology. However remote from the present reality, the result did spark imagination, offering spec fab glimpses of otherwise-possible futures. The results formed the basis for a reflection on how to integrate (basic) electronics as craft materials into our next workshop (SW2).

We held the second workshop (SW2) inside a venue adjoining the square, in order to allow more focussed attention. In order to convene to different age categories, we divided the workshop into three parts. Deepening the work of SW1, in the first part (SW2a), we invited children aged 4 to 8 to decorate cardboard squid figure cutouts. They either drew with markers and applied gems, or stuck prints of squid photographs onto the cutouts. Together, we explored different ways to represent an animal, e.g. more realistically or more fantastically, wavering between different semiotic regimes: from the iconographic, over the indexical, to the symbolic. To gradually converge the craftwork with the electronics, we gathered the finished figures on an animated RGB LED string, with the LEDs placed through the eye sockets (Fig. 1). This hands-on exercise not only initiated the children into designing (basic) HCI, but the bringing together of imagery and imaginary, narrative and appropriation, craft materials and electronics made them enact a novel material-semiotic knot (see [32, 33]).

The second part of the workshop (SW2b) invited children aged 8 to 12 to assemble a simple kit, which resulted in a 2 x 4 cm luminous squid that could hold onto metallic urban surfaces. It featured a single LED, a coin battery, a magnet, an opaque acrylic laser-cut plate to keep the components into place and two laser-cut carton panels (featuring a squid) to hold it all together using small screws. Drawing on the tradition of LED art and artistic activism, the idea was for the children to discover the magic of (easy) electronics and the re-appropriation of urban space; and this in the form of small electronic species. However small their contribution, with these
basic electronic critters the children could now help in inciting others to pave the way towards a more-than-human public realm.

The third part of the workshop (SW2c) invited youngsters aged 12 and up to put together urban (civic) messages on a basic display. We made available an off-the-shelf lightbox into which to insert a series of translucent strips. These strips included colour gradients, icons of squids and urban elements, emojis, texts, as well as empty strips which could be appropriated with markers – all of which the participants superimposed into novel combinations. The prototype afforded participants to express messages, feelings, intensities, and the like, imbricating communicational registers of discourse and affect. The outcome presented an early version of an urban displaying device where human language and symbols were brought together with the nonhuman bio- and technological worlds of representational media; for, as [48] reminds us: we – humans, animals, and technology – all "are media and of media".

We got a first brittle glimpse on how to grow more-than-human imaginaries and interest from the bottom up in urban neighbourhoods with often forgotten target-groups. To realise our urban squid game at the square, however, our team realised we needed to integrate the learnings from the workshop and advance our technologies. To do that we devised a second workshop track to further the co-creation on the messaging displays, this time in the setting of an elementary school.

4.2 Of ghosts, sounds and prototype urban informatics

Preamble. Located 1.6 km from Place Lehon (cf. previous section), the Schaarbeek Helmet quarter has a vibrant activist community. One of their points of concern was the abundance of traffic in the area, resulting in sound nuisances (e.g. 'rodeo driving', hooting), air quality and road safety. In these efforts, a local primary school positioned itself as a crucial actor in sensitising both parents and children on the issues. Together with the school, we decided to work on the topic of sound quality in the quarter, which we connected to the figure of the ghost and took as an opportunity to co-create messaging displays and advance our more-than-human participatory methodologies. Over the course of three months, we held a series of four workshops with children 6 to 10-year-old, framed as an extracurricular school activity.

Selection of the species figure. Ghosts are polymorphous and ambivalent entities, which makes them a robust candidate for versatile enactments. Although ghosts are not a biological species, they are increasingly prevalent in contemporary more-than-human narratives, both as metaphor and as entities per se. In Arts of Living on a Damaged Planet [58], for example, ghosts are threaded through ancient forests, mud volcanoes, nuclear mushroom clouds, past megafauna worlds, lichens and graveyards. Of recent, and precisely due to the epistemological instability between the human and the nonhuman, between life and non-life that the Anthropocene brings about, the question was raised whether to include the ghostly in the ranks of the more-than-human, alongside flora, fauna, and geology [7].

Ghosts and spectrality also have an intrinsic relation to the rise of modern technologies. While the rise of technology in the 19th Century coincided with the demise of believing in ghosts (in the West at least), residues have always persisted when technology fails to accord to human will. Instead of deriding people’s belief in ghosts, in a more-than-human world there may be a need to maintain what is left and even resuscitate ghosts and their agency [14]. As such, figures of the ghost may offer SF opportunities for civic HCI. As an act of more-than-human resistance against an all too closed, neat and secular version of the smart city, why not resuscitate ghosts in the city through DIY spec fab urban informatics? What better place to start than addressing urban sound nuisances in a participatory prototyping workshop with 6 to 10-year-olds?

Workshop setup. The workshop setup borrowed elements from the previous workshop series: beforehand we distributed an introductory poster and on the day of the workshop we installed an electronic game on the school playground. The poster, titled “Haunted Helmet”, featured an illustration of a multi-coloured multiplicity of translucent ghosts superimposed on a photograph of a nearby local landmark that characterizes the neighbourhood. Again, this introductory poster wavered between realism and fabulation. The electronic game had the same gameplay but was mutated into a ghost for the occasion. It set the theme of the workshop, attracted interest, and gathered participants before we entered the nearby workshop space.

Workshop unfolding. In the first ghost workshop (GW1), we started by narratively describing the sound ghost protagonists to the participants. Sound ghosts, we suggested, can take on any form, travel through walls, pop up and disappear just like that, are sometimes difficult to locate, congregate at certain spots and times, and it is not always clear whether they are good or bad, material or not. With this in mind, we listened to samples of a spectrum of urban sounds ranging from what could be perceived as a nuisance (such as heavy traffic) to the more pleasant (such as birdsong), and we asked the participants to wonder which ghosts could be implied. This set up a perfect ‘perceptual bridge’ between the children’s daily world and the speculative element we wanted to introduce [1]. With this exercise, we started knotting together narratively a ‘real-life’ urban issue (urban sound quality), its phenomenological qualities (sounds), and a fabulated narrative figure (the ghost).

We then asked the participants whether there were other sound ghosts they could think of, and to draw them. This resulted in an explosion of types and figures of ghosts such as the ‘shouting ghost’, the ‘machine’, ‘tram’, ‘aeroplane’ and ‘crane ghost’, the ‘smartphone ghost’ and the ‘dog ghost’ (Fig. 2 (b)). The figure of the ghost served as a gateway for the participants to open up their experience, accessing their emotions, imagination, and memory. Equally – or equivocally (cf. [14]) – diffraction through the sound ghosts opened a gateway to a parallel city, where “it becomes a site full of new active entities that articulate differently” [13, 122]. The latter underscores the idea put forward by [26], how an aesthetic and ludic approach broadens or multiplies possible narratives, avoiding singular narratives. Additionally, it also served us, as researchers, as a triangulation to indirectly approach the participants, allowing us to bridge age and cultural gaps and let a new common language emerge.

In the next workshop (GW2), we tapped into the cultural trope of the ‘helper ghost’ – which is featured in many ghost stories and movies. The idea grew out of the observation that many of the ghost figures proposed by the participants had been nuisances of some
kind, which we aimed to mitigate by introducing an object that could potentially spark the imagination towards potential solutions or different viewpoints. We asked the participants to imagine and draw a good companion ghost, to help them ward off the sound ghosts that bothered them. Subsequently, we asked them to colour the helper ghosts according to different moods or feelings – from angry to happy.

By that time, we had developed a prototype of a low-resolution interactive ‘lightbox’ display (Fig. 2 (f)), which we planned using in a later phase as actuators of (sound) sensing devices. The display, combined with a scenario and kit of workshop materials, enabled it to gradually evolve from freehand drawings of ghost figures (GW2) to displays depicting luminous, geometric ghosts (GW3), towards ghosts expressing various behaviours and emotions through LED animation (GW4). Step by step we moved from a quasi-intangible urban phenomenon (i.e. sounds) and speculative entity (i.e. ghost figure) to coincide with a prototype of a tool for civic HCI.

Drawing from the performative roles of materiality for collective creativity during workshops [37], the design of the workshop tools, prototypes and methodologies was kept as tangible and open as possible. Throughout the workshops, participants each developed their own personal ghost through hands-on, experiential input and embodied interactions with both material and digital interfaces. A wide range of appropriations emerged, situated on multiple contextual, semiotic, material and narrative planes. Firstly, the participants choose to work on a specific sound based on their own experience with the neighbourhood. While the workshop addressed sound quality inspired by the traffic issues in the area, participants extended this frame, such as by mentioning road works (‘crane ghost’), social issues (‘shouting ghost’) and more-than-human entities (‘dog ghosts’). Secondly, the participants conceptualised and drew their own helper ghosts, at times complemented by messages. The helper ghost, as a conceptual and narrative device, proved successful in facilitating the enrichment of the problem space through contributing story-elements and perspectives, while not requiring these to be ‘complete’. Thirdly, the participants transformed their free drawings into tangible and functional display prototypes. Our workshop materials and methodologies facilitated this process by growing an experiential understanding of the material-technical intricacies of the display device; notably the practice of placing acrylic ‘light separator’ parts on a geometric ‘grid structure’ (see Fig. 2 (d & e)). Lastly, the participants animated their helper ghosts by using our LED-animation software, which allowed them to dynamically light up the geometries of the shape into animated colours, gradients and shadows. With ‘animating’ we do not only denote the process of designing movement. Through electronics, code and narration, the participants had the power to invigorate and bring to live their ghosts.

5 DISCUSSION: WHEN SPEC FAB MEETS CIVIC HCI

In this section, drawing on the cases described in the previous section, we start by providing critical attention points on our contribution, its strengths and weaknesses for the HCI community. At the end of this section we give a first outline of propositions with regard to introducing DIY electronic spec fab into civic HCI.

5.1 Potentials and pitfalls of the case results

Imagining and fostering more-than-human futures. While it is a crucial strategy for HCI researchers to increase the more-than-human sensitivity by building interfaces that connect urban citizens with the fauna and flora that is (still) present in the city [9, 53], we should not underestimate the almost total absence of the latter in some city neighbourhoods. In order to start imagining and fostering more-than-human futures, the starting point for an intervention in ‘poor’ neighbourhood conditions, as well as the condition of ‘poor’
imaginaries in contemporary society and the wider population, sometimes cannot but be speculative and fabulated.

**Selection and versatility of the spec fab figures.** The power of the ghost figure we introduced in the workshops lies in its versatility. It was a figure that all children immediately understood. They learned about it, heard stories about it, and it is part of the collective imagination. This helps in jumpstarting workshops. Its versatility also makes it open to different adaptations, shapes, symbols. In contrast, the squid is also a known figure, but knowledge about it is not as readily available or deep with participants as what had inspired us. We foresee extra steps necessary to incrementally introduce less readily known species figures. We suggest letting species speak for themselves by working more on evocative (re)presentations in which the species are (re)presented to facilitate a gradual transfer of knowledge and opening up towards newer and more profound imaginaries, while maintaining as much of their richness as possible.

**Deploying spec fab in urban neighbourhoods.** While spec fab may be rather prevalent in contemporary literature, arts, and humanities, and has been employed as a speculative method in participatory design in HCI, they are only indirectly connected to everyday experience. Even if spec fab presents itself as a method for thought provoking, critical or highly inspiring reflections on issues in contemporary society, in most cases endeavors are contained in particular realms of representation, such as in books, series, movies, video games or venues like the art gallery. As these have their proper merits, they often need bigger ‘perceptual bridges’ to span between spec fab elements introduced and the everyday reality of people. Our contribution highlights that there may be avenues for bringing spec fab, through civic HCI, to the streets by situating it there, in the public space of neighbourhoods, and knotting it with the local issues that matter to the people involved.

**Sensitising age-up, and finding the ‘favourable stretch’ of spec fab.** In the presented cases, we noticed that civic engagement through open, playful and crafty DIY aesthetic often is very child-compatible. We have observed children talking about the workshop enthusiastically to their (hard to reach) parents and caretakers. There could be benefits to extend this through an ‘age-up effect’: engaged children often draw their parents or caretakers into their world, which potentially sensitises and engages them when they find out the relevance of the matters. However, we suggest this needs a clarity of the speculative proposal from the start. While the introductory poster kept the proposal very open, it might have been misread as ‘just’ an invitation to a workshop, not as also a speculative exercise towards an alternative for the square. Adults might have interpreted the fabulesque imagery as childlike or non-serious. There is a balance to be found between teasing, inspiring and keeping things open, and clearly steering towards the common ground of the speculative proposal. We suggest to find a ‘favourable stretch’ between the speculative and fabulatory potential and the everyday reality on the ground with which the spec fab is to be knotted (and thus not stretching it too far).

**Narrating with textual devices.** In many more-than-human projects, part of the objectives is to transfer a certain amount of knowledge about the relevant subjects, such as biological, ecological, inter-species qualities, requirements and abilities. A potential pitfall is to rely too much on textual constructions in this endeavor. In our workshops, we underestimated the challenge to grasp and keep attention using verbal and written stories in a public space environment. While the narrative pitch (poster) might have worked in a closed setting, it did not in an open, unhedged space. In future work, we plan to experiment with chopping the larger narrative up in paragraphs, phrases, words, scenes; as well as unload it on the staging devices and (interactive) workshop materials.

**Narrating through tangible matters and play.** Our observations show that the narrative capture was situated not in the posters, but in the non-discursive elements and in the action. With our ‘bizarre electronic squid’ we physically introduced a spec fab electronic more-than-human figure on a public square for people to explore, collectively gather around and engage with. By deploying a squid-like electronic game installation, we not only wanted to make ourselves visible on the square and attract potential workshop participants. It also acted as a spec fab electronic ‘speculative lure’ [11]: a thing with a strong attractive quality that both announces what may be to come but is still unknown, articulating persons, things and issues, and may potentially act as a springboard towards further engagement with those involved. The success of the squid game makes us identify opportunities for integrating the narrative environments into the gameplay itself, making the stories even more tangible, experiential and interwoven in the matters and technologies of the workshop.

### 5.2 A propositional outline for integrating spec fab in civic HCI

**Making-with spec fab and electronics.** Building on the process of ‘thinking-with’ [50], which is about "creating new patterns out of previous multiplicities" and "to connect worlds that do not easily connect", spec fab introduces a method which can be designated as making-with. By "fostering contagious potential" of kingdom Animalia and basic DIY electronics and reaching out with it to participants, ‘making-with’ reveals itself as a practical, descriptive, and speculative technology, for it brings into being an embodied, novel inscription which connects things hitherto detached. Concurring with thinking-with, making-with is not only oriented towards what it aims to include or represent, but also towards what it generates: ‘how it actually creates a collective and populates a world” [50].

**More-than-human spec fab electronic figures.** Introducing DIY electronic spec fab in civic HCI first and foremost is about making a metaphorical connection between more-than-human species, electronics and interactions/code/matters, in the form of spec fab electronic species by simultaneously tapping and feeding into broader imaginative webs. Depending on the cases, there can be a differential distribution between ‘real’ and ‘fabulated’ qualities in each of these figures, but they are always drawn on (f)actual biological and ethological features and (f)actual scientific and environmental data.

**Knotted and situated spec fab.** If spec fab is to be introduced ‘correctly’ into civic HCI, it needs to be knotted with the ‘real’ world. This implies that when a spec fab figure is introduced somewhere, it is tied in with real-life urban issues. It follows that it is situated, both in the problem space and geographically. The speculative ‘jump’ of spec fab is related to a specific ground or problem, i.e. the local enactment of (an) urban issue(s), the processes and
actors it draws together locally, and the social and physical space in which it is to emerge. The ground which is the springboard for the ‘jump’ of speculation also sets the conditions for that jump. Contrary to most common understanding, speculation is not an ‘anything goes’ mode of thinking. Rather, speculation emerges from and is immersed in the real world, and cannot (and should not) be detached from it. Bringing spec fab into the civic HCI worldbuilding equation, it becomes entangled in the art-science-fabulation-technology-community knot (cf. [32, 33]).

Material spec fab. Whereas spec fab is often set in an immaterial realm, its integration in HCI affords it to become material. Materializing spec fab makes the imaginary tangible, and therefore pulls it from the virtual and unattainable to the actual and doable. What’s more, materializing spec fab with electronics allows a move from the inanimate, docile, inert to emerge through code into something animate, obstinate, and interactive. As such, it simultaneously opens up imaginaries of the possible, while also putting material constraints on those possibilities.

Participatory spec fab. In contrast to being a spectator (however active) or a recipient (however effective) of spec fab, in civic HCI it becomes a participatory process. Citizens become participants in crafting the spec fab-civic intervention. Being able to become part of what is imagined and built has the benefit of incitement, empowerment and involvement. Additionally, through participation, the participants can move beyond, besides, or counter that which the researcher-designer initially proposed.

Performative spec fab. The introduction of spec fab in civic HCI draws on a double understanding of performativity. In the first sense, this means that it is based on participants’ experiential engagement with the civic HCI interventions, relying on practice, on doing (instead of ‘merely’ being a spectator) In a second sense, as a ‘performative method’, it also aims at bringing into being realities [45]. This means that the material-semiotic interplay of the spec fab knots may have world-building capacities that in the long run come to shape more-than-human neighbourhoods.

Modest spec fab. From the outset, it must be underlined and acknowledged that our proposed spec fab civic HCI is modest in its intent, elaboration and consequential effect. As it is dependent on rather modest material interventions and deployments, it also has a more temperate effect on the results and experience of these results in citizens and participants. Thus, we suggest to temper intentions by starting with playful, experimental, small-scale interventions with which we “do not wish to impose (our) inventions on the participants in crafting the spec fab-civic intervention. Being able to become part of what is imagined and built has the benefit of incitement, empowerment and involvement. Additionally, through participation, the participants can move beyond, besides, or counter that which the researcher-designer initially proposed.

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6 CONCLUSION

In this paper, we provided avenues for HCI to redress the fallacy of human exceptionalism, which leaves humans – and particularly urbanites – unaffected by the fate of nonhumans and keeps a more-than-human world at bay. By building on ludic, aesthetic/artful, and speculative approaches developed in civic and environmental HCI, we took up the challenge to introduce speculative fabulation in participatory design processes of civic HCI. We did so by deploying DIY electronic spec fab ‘out’ in city neighbourhoods. We arrived at this by infusing our interventions, participatory protocols, and interactive tools with more-than-human elements and progressively knotting them together; that is, bringing together bio and techno imaginaries, urbanites, urban issues, and appropriable DIY urban displays in differential material-semiotic knots.

Not only did we introduce ‘electronic species’ figures as ghosts and squids in order to spark new more-than-human imaginaries for the Anthropocene, but we also elaborated performative and material ways of making-with, in order to make researchers and participants actively and physically engage with a multiplicity of (electronic) entities and matters. Throughout the cases, we thus experimented with various ways of fostering affective engagement and opening up more-than-human imaginaries.

Through an ethnographic account of two different participatory design tracks, we described the potentials of unfolding more-than-human DIY electronic spec fab in city neighbourhoods. Bringing together theory and practice from both HCI and the environmental humanities, we drafted a first outline for integrating DIY spec fab into civic HCI.

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