On the Robosphere: A Philosophical Explication of the Socio-technical Status of Social Robots

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Abstract

As the Fourth Industrial Revolution advances, socially-situated robots are increasingly not exclusively human-like (i.e. humanoids). They also include socially interactive animaloids. How does this myriad of socially intelligent artefacts emerge as members of a cyber-physical social system in which they are accorded the standing of *social* robots? And how are we to account for the nature of the universe-of-meaning that emerges from this human-artificial social reality? Utilizing conceptual tools derived from the philosophical fields of phenomenology and “new materialism”, I proffer a theoretic account of robotic sociality. I postulate how robots become members of a cyber-physical social network that is cohabited with sapient humans. Two novel functional constructs are introduced in the process: “the humanoidic” and “the robosphere”. The former illuminates that spontaneous bestowal of sociality on robots is tantamount to a recognition of their social agency. I then demonstrate how this psychical process of the recognition of these humanoidic artefacts instantiates an emergence of a shared human–robot cyber-physical world of relational meaning-making, a robosphere. As a corroboration of the self-manifestation of the robosphere as a concrete social system, it is shown that Industry 4.0 adumbrates Society 4.0, a cybernetic social formation, and the envisioned advance of this into the more technocratic super-smart Society 5.0.

Keywords Cyber-physical social systems · Existential phenomenology · Hegel · Human–Robot Interaction (HRI) · Social robotics · Society 5.0

1 Introduction

How does the process of the socialization of robots, that is, our designation and embrace of them as *social robots*, occur? What does this phenomenal installation that results in the robots assuming a social ontology¹ eventuate into, socio-logically? And how does the resultant hybridized artificial sociality affect our human social-being? Addressing this triadic series of questions is the remit of this paper.

¹ Social ontology, as used here, refers to the assumption and/or attainment of the status of being a social entity. Indeed, “social ontology is the study of the nature and properties of the social world. It is concerned with analyzing the various entities in the world that arise from social interaction” according to Epstein, Brian, “Social Ontology”, *The Stanford Encyclopedia of Philosophy* (Summer 2018 Edition), Edward N. Zalta (ed.), <https://plato.stanford.edu/archives/sum2018/entries/social-ontology/>.

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A 2009 article by Allesandro Pollini titled “A Theoretical Perspective on Social Agency” once alerted that “how to conceive sociality of robotic agents is ‘a core challenge’ within the emerging field of human–robot interaction” [33]. He further observed that “it is still to be understood how notions of sociality might change as a result of an enlargement of the social sphere in a way that includes a variety of artificial social agents” (ibid.). Pollini’s concern remains the most challenging *problematic* within research in social robotics.² Within the same context of inquiry, Oliver Korn [26] recently edited a pertinent volume with insightful contributions, among which is a chapter by Tarek Mokhtar [30] titled “Designing Social Robots at Scales Beyond the Humanoid” in which Mokhtar theorizes the place of humans in what is becoming an increasingly ubiquitous intelligent (computerized) and automata-populated environment. The remaining challenge is to explicate this process whereby sociality, which is inherently a human-to-human trait, is

² See Coeckelbergh et al. [3]; Bartneck et al. [1]; Nørskov & Nørskov [32].

forced to negotiate itself in a cyber-physical world shared with humanoids (human-like robots), animaloids (animal-like robots) and a myriad of socially-interactive intelligent machines.

Against this challenge as endeavoured by contributors to Korn's volume and Pollini's stated attempt at theorizing human–robot sociality “through the dynamics of interpretation, signification and attribution” [33], my objective is to perform an explicative analysis of processes that frame human conception of, or regard of socially-situated and reactive robots through the aid of an advanced phenomenological method. This is a philosophical method that takes the foundational schema of Georg W. F. Hegel's phenomenology and augments this schema with three interpretive lenses: an object-oriented (contra subject-oriented) approach to cognition that is derived from Bruno Latour [29]; Jean-Paul Sartre's Marxian-sensitive existentialism [40]; and Peter-Paul Verbeek's postphenomenology [49]. The functional analytical prism I derive from a fusion of these traditions is a materialist epistemology that accords the “object”, that is, the perceived artefact, epistemic sovereignty within sociological networks that emerge as humans relate with their world. The Verbeek element in this process aids my hypothesis to account for what I demonstrate to be a consequential co-evolution of a novel social ontology that emerges as the machine-object is cognized by the human-subject. With our object being a robotic artefact that displays human behavioral or physiological traits, the socio-psychic ramifications of this reversal of the classic subject-object relation and the evolution of the new sense of *being*, are explored with insights derived from Sartre's existential phenomenology. The complication I here theorize, however, is that this robotic-objects, are not only human-like, a fact that would have made thinking about sociality easier; they also come in animal-like forms!

Overall, I am here venturing a theoretic amplification of Anna Strasser's assertion that “where previous [scientific] revolutions have dramatically changed our environments, this one has the potential to substantially change our *understanding* of sociality” [44]. This “understanding” demands systematic taxonomization, as well as conceptualization of new categories of social ontology since, as alerted by postphenomenologists, the human subject is susceptible to being re-ontologized by the affective presence of a techno-social object. The scientific explication of this co-evolution into new forms of *being-with* in a world of machines, is the burden of this paper. It is a propaedeutic treatise on the sociomorphology of a world shared with socially intelligent machines: an endeavour at propelling and extending the vistas of research in social robotics from preoccupations with concerns about the anthropomorphy of singular robots to the complexity involved in the genesis, nature and normative implications of this extra/posthuman forms of sociality.

I begin by introducing “the robosphere” as my descriptor of the phenomenal *world* that is shared by humans and robots. This is followed by a philosophical postulation of how artificial agents emerge into the robosphere as co-existants in a cyber-physical social system. I conclude with a demonstration of the utility of key Hegelian conceptual tools in the making sense of the world of socially-situated robots (object cognition, self-consciousness and recognition), and the implications of the contextualization of these conceptual tools on human self-consciousness when they are applied to non-human objects. As a quasi-empirical demonstration of my defended hypothesis, the robotic-human society envisioned in Japan's National Science, Technology and Innovation Strategy [13], the “super smart society” dubbed Society 5.0, is analyzed as a case in point, prior to a summative conclusion.

2 On the Humanoidic Robosphere

In “Irreductions”, Latour [29] persuasively posits a metaphysics that rejects and subverts the view of reality in binary terms of human subjects and exteriorized objects. He pleads for the cessation of an epistemological tendency of reductionism whereby perceived “things” are cognitively cast according to particularised subjective perspectives. All things must be conceived as *irreducibles* with their independent epistemic sovereignty, he insists. Both Subject and Object are equal actors in the knowing experience. However, to underscore that this is not only about the human subject, but about all elements and forces that makeup what he conceives as a holistic network, he systematically substituted the humanistically exclusive “actors” with the term *actants* [29] Both humans and automata are actants in a cybernetic network [14].

Based on this object-oriented philosophy that epistemologically preserves the irreducibility of all experienced reality as actants, it can be argued that a rigorous and judicious theory of social robotics has to be metaphysically comprehensive and epistemically equitable. It has to include and involve all social actants, both human and non-human, and treat them as irreducible equals. In this context, my argument is that sociality, as the constitutive essence of a “social robot”, or as manifesting in technological artefacts that are designed to exhibit it, has to be granted an all-encompassing nuance that breaches its exclusive anthropocentric application. The full import of the psychical affect on humans of socially-persuasive or situated robots, be they human-like, animal-like or just shapeless robotic “things”, needs to be given adequate appreciation.

Traditionally, the word “humanoid” applies generically to a product, be it mythical, imaginative, or technological whose appearance resembles humans. In pursuance of my

argument for the extension of sociality, I propose the notion of “the *humanoidic*” as a conceptual extension of the noun “the humanoid”; the verb “humanoidic” points to artificial mimicry of human social life. It will denote the emergence of robotic devices, automata and technological actants that are not necessarily and strictly developed to resemble a human person (humanoids), but are intentionally designed to be socially interactive with humans, and do evoke, persuasively, the human affectivity of relationality. It is more an expression of relationality, that is, sociality, than of physiography. PARO (Shibata), a seal-like robot popularly deployed as a therapeutic companion for senior citizens, would be categorized as humanoidic. It is not a humanoid, but it has humanoidic affectivity of companionship.³ Similarly, SPOT (Boston Dynamics), a dog-like animaloid, when conceived as a pet, would be humanoidic.

Implicit in my introduction of the category of the humanoidic is the presupposition that bears valence to the theme elaborated in the course of this paper, namely, that sociality, qua “being social”, is a characteristic that is exclusively native to humans. I hold, and will explain that sociality can only be conferred on other non-human and inanimate agents by a phenomenology of human cognition. This conferment of human-relationality manifests across the entire spectrum of human imaginative-intentionality that spans from religious mysticism (e.g. iconization of the “Holy family”) right into the technological sphere (“companion robot”). How this humanoidic impulse enables participation of this non-human actants in social being is our primary concern.

The sociological and philosophical interrogation of the theoretical gaps in accounting for the dynamics of this human–robot relationality, starting with the insight emanating from the application of “humanoidic”, led me to the construct of “the robosphere”. As I will justify, robosphere, manifests as an experience of the encroachment of humanoidic artificial agents into the human psychical and socio-cultural space. It is a multi-dimensional world of both meaning-making and actual social-physical space sharing that emerges during human–robot social interlocution. Ultimately, it is a representation of the resultant materiality of the psychological and epistemological intercourse between the human actant and the robotic artefact.

The phenomenon of the robosphere as a sociological occurrence coheres with one of the classic views of philosophy which has been expounded by Hegel: the postulation of Reason as *Das Geist* (Absolute Mind, Spirit, “God”) that actualizes itself through cultural, social and political institutions [20]. Extrapolating this phenomenology of Spirit within the confines of this paper onto the technological process, it will be demonstrated that human apprehension of the realities

(facticity) of the technologies of Industry 4.0, phenomenologically, results into cyber-physical social networks, Society 4.0, as well as the progressively developing new forms of cybernetic social formations, Society 5.0 and so forth. What happens at the level of thought in relation to an artefact (robot) actualizes into a social formation. A comprehension of the peculiarities of the genesis and epistemic architecture of this advancing “de-anthropized and multi-species”⁴ smart social formation (Society 5.0) demanded a functional construct, hence robosphere.

In proffering the construct of the robosphere, I am propositioning a theoretical tool for the analysis of an observation that is summed up in *Living with Robots* by Dumouchel & Damiano [8] that:

we are witnessing an emergence of what may be thought of as new social species—novel artificial agents of various kinds whose advent marks the beginning of a form of co-evolution that will transform human beings as surely as the discovery of the Americas changed the lives, for better and for worse, of peoples on both sides of the Atlantic (p. xiii).

In deciphering the robosphere as the conceptualization of the cybernetics of the socio-technical world of the digital age, in Hegelian terms, I thus collaterally demonstrate that the task of philosophy involves recognizing *the concept* (*Der Begriff*) with “scientific” rigour from the mere representations (*Vorstellungen*) of everyday life [34].

My search for precedent usages of the word “robosphere” led me to the market-branding of a technology edutainment park in La Chaux-de-Fonds in Switzerland.⁵ As far as scholarly literature is concerned, I could only find three sources: a speech by Humberto Romesin [36], a journal article by Silvano Colombano [5], and another one jointly authored by Dudley-Rowley and Colombano [6]. The last cited authors were researchers at the United States National Aeronautics and Space Administration (NASA) and used the term in their advocacy for the construction of a self-sustaining machine ecology in outer space, i.e. in Mars. This celestial ecosystem of self-repairing machines, according to them, would be an infrastructural “robosphere” constituted by self-maintaining robots that are deployed as precursors to long-duration space exploration missions involving human astronauts. Romesin [36], on the other hand, interestingly, deploys the term in a historicist-evolutionary sense that laments that the robotization of industrial processes is a marker of the degeneration of human civilization as “a living system”. His thesis, in 1998, was that “the *biosphere* gave rise to the *homosphere*, which is the period where we now are—and we are leading into what I shall call the ‘*robosphere*’ I have distinguished

³ <https://www.marieclaire.co.uk/news/master-of-none-buy-paro-the-healing-seal-online-30740> (Accessed December 4, 2020).

⁴ See (Gladden [12]).

⁵ www.robosphere.ch (Accessed October 30, 2020).

these three periods according to what is conserved.” [36]. The robosphere, for him, marks the progressive obliteration of the vitality of the human social system.

Despite optimistic projections such as those by “Robotics2020” that had predicted that by 2020 robotics will “influence every aspect of work and home”,⁶ research by Bartneck et al. [1] indicates that, with the exception of Japanese society, there is a cautious acceptance of robots as part of the human social environment. They, however, conclude that with contributory factors such as advances in artificial intelligence and the technoscience of social robotics, the lowering of the cost of acquisition of personal robots, and breakthroughs on problems HRI (human–robot interaction) studies are currently seized with, we are bound to progressively share a social-cognitive domain with artificial humanoid agents in a manner that is autochthonous to the Fourth Industrial Revolution (4IR).

It is not the mission nor argument of this paper to make an empirical claim that the world is overwhelmingly proliferated with humanoid robots and that we are therefore in a robosphere. As will be shown in my elaboration of Japan’s *5th Science and Technology Basic Plan*, such a reality of robot density is depended on advancements in artificial intelligence technology, the stage of economic development of a given country, and the demands of its peculiar demographic challenges. The crux of my mission is merely to posit a conceptual inventory for a critical appreciation of this emergent hybridized sociality between animate and socialized inanimate agents.

In the following section I proceed to elucidate the theoretical-philosophical formation and architecture of this human–robot sociality. I have elected to take the phenomenological approach as the phenomenological method is technically directed at how humans experience “things”. If these humanoid robots are things, phenomenology should guide how they end up becoming social, which is to say, acquire social status and agency. *A fortiori*, this should also explain the genesis of the socio-ontological reality that I identify as the robosphere.

3 Justification of Robosphere

An encounter between a human cognitive agent and a robotic artefact that is adorned with behavioural cues typically exhibited in human-to-human socially supportive environments is not an epistemically innocuous event. It is an arena of a complex process that straddles the boundaries of cognitive psychology and phenomenology in dynamic ways that are

yet to be systematically articulated. From a philosophical vantage point, a human–robot interaction is an interlocutory field bursting with intentional meaning-formation, semiotic connotations, as well as identity-forming reactions, which the human subject is intuitively/spontaneously subjected to (see Sonesson [45]; Berghofer [2]; Lamola [27]). As revealed by our application of the category of “the humanoidic”, this phenomenological ferment applies not only and exclusively as an HRI event pertaining to humanoids such as ASIMO (Honda) and SOPHIA (Hanson). It is also applicable to being-with animaloids such as SPOT-the-dog (Boston-Dynamics) or PARO-the-seal (Shibata) that mimic human companionship and security.

Peremptorily named “social robots”, ontologically, these robots are first and foremost *persuasively* human-like, and only thereafter, *social*. The mental acts (fondness, love, trust etc.) which are intuitively provoked from their human users persuade these users into a belief that they, the robots, have some human-like agency and utility [52]. Notwithstanding current explorations on the operation of human “self-delusion” [53], or “suspended disbelief” [7] when encountering a robot, including the theorization on “the uncanny valley” [30], I assert that at this originary stage the robot is merely an object of *intentional intuition*. The complementary part of the *being* of this robot occurs when those who design, manufacture or purchase them, do so with the premeditated intention of the social role or psychological need such a robot would fulfil. A robot is designed or acquired with a use-purpose in mind. This is the elementary principle of user-based design in technology management; in philosophy, this is *social intentionality*.

Given this social-instrumental intentionality, I would then maintain that the manufacturing and eventual existence of a social robot as a deployed (purchased-used) object sets its epistemic status beyond that of noumenally “knowable” object. It is not an inert object that can just be apprehended, as one would encounter a rock. As designed, built or purchased, a humanoidic robot is brought into being with an express ontological purpose. It has an inherent quality that assures the effect it would have on “the knowing processes” of the human subject sensing (seeing, feeling, owning, naming) it. It is, by design, *ontically* persuasive.

Socially-interactive and situated robots are intersubjective actants (Latour) that can only be appreciated in terms of their socio-ontological hypostasis. Their being-there as things to be noticed or impressed on the mind (qualia) was predetermined during their manufacturing and at the point of procurement. They are predetermined to command understanding of their likeness and communion with us. As an illustration: During its design and manufacturing stages, my sex robot was designed to exude the social companionship that optimally equates that of a human sex-partner. In my shopping, as the intending-user, I ensured that I procured a

⁶ https://www.carlsbergfondet.dk/da/Forskningsaktiviteter/Forskningsprojekter/Semper-Ardens-forskningsprojekter/Johanna-Seibt_Integrative-Social-Robotics.

robot with features that would maximally fulfil my socio-psychological need for sexual companionship.

As socially-situated robots, they are, therefore, not only persuasive, but ultimately *situated*. A cognitive act (*cogito*, for Descartes, and *noesis* in Husserl) recognizes (Hegel) them as humanoidic, that is, as imbued with an inherent social value. In their self-presentation (self-revelation) through their human-like looks and cues, a reciprocal authentication from us declares them socially-efficacious and thereby socially-situatable robots. Their humalike self-presentation have earned their *Eigentlichkeit* (“authenticity” in Heidegger and Sartre). Ineluctably, we have authenticated, socially-situated them as sufficient *Mitsein* (what we can be with to fulfil our being). But, in Latourian terms, that does not mean that their authenticity is contingent on our recognition of them; on the contrary, the very force of their humanoidic features psychically impels us to recognize them. There is a spontaneous and symbiotic cognitive-hermeneutic exchange between “object as is” and “subject as is”, which, as we shall see, is explicated in Hegel’s dialectical epistemology.

The act of the ontological recognition of a robot in its self-situation (“as is”) by a human—the ascription of social agency happens at the point of conception of the intended relation or use (comprehension) of the robot. It occurs variously, at the point of market-focused manufacturing or commercial acquisition of the robot, as illustrated above. The act of my social-need-induced listing of procurement specifications when I go shopping for a robot, or of the engineering decisions I take on the design properties of the robot I am building, is tantamount to me conferring a standing of a relatable-being to this robot. This resonates with Heidegger’s postulate of *ek-sistent*, which implies “to stand out” into *being* from the inert state of the given, the *physis* [15, 16]. Role specification ontologizes the social robot; it brings out its mode and purpose for existence. This point is further buttressed in Hegel and Sartre since according to both, consciousness (as the reflective ego) is manifest as a self-defining social ontology. The identitarian role one assumes or plays in any given situation derives from the interplay between their self-consciousness and our imposing gaze on them, our ascription of who they are [41]. Is my robot made into a servile humanoid that will subserviently pander to my commands and needs, or is it going to be a robot that has superior intelligence and capacities from me, an artefact that I will look up to for help and salvation in time of need, say a military robot? It all depends on me, the designer and procuring-user. As commercially produced, social robots are expressly manufactured based on what they are needed for. This user-based design principle obviates the economic disaster of the production of obsolete, unused robots[26].⁷ *Mutatis mutandis* to

our postulation, such an obsolete unused robot is in a state of “shattered being”, it is Nothing. It has remained in the zone of non-being.

Significantly, during the design phase and the shopping-planning stage, we *imagine* the ontology of the humanoidic robot as a representation of our human-being, its intended role emulates human sociality. On encounter, as it is impressed on our sense, or, in other words, reveals itself as a phenomenon, it is then accepted (recognized, through eidetic performance) within our psychic space as the type of artefact that we had imagined. Our cognitive activity (*cogito*) spontaneously relates to (apprehends) the humanoidic, the cues of sociality that renders the robot as the simulacra of the most fundamental of the constitutive elements of human existence, existence-in-community-with others. We are in this way, as explained above, then *Mitsein* (*being-with-others* as a complement of our being human) with socially persuasive robots [15]. The current digital age may be an era of life-with-machines; in the philosophy of social robots, it is an epoch of *being-with* artificial agents in which our self-consciousness and social ontology are autonomously and inexorably impacted. Could robots be complementing our sense of being human? If that be the case, is the reality of a multi-species posthuman social network our authentic future social being? These questions impel us to search for a nuanced concept of the robosphere that could apply to this new human–machine shared space.

In Verbeek’s words, as technological artefacts, our humanoidic robots “... mediate ways of existence (subjectivities) and experienced realities (objectivities) not because people told them to do so, but because of the relation between humans and *the world that comes about through them*” (my emphasis) [50]. This “world that comes about through them”, the novel epistemic universe of a genitive socio-cognitive consciousness, the new ontological technosocial sphere emanating from this phenomenal experience of *being-with-robot*, I aver, is best named *the robosphere*, in its philosophic sense. The sustained phenomenological interlocution between the robot and the human described above, instantiates a reciprocally creative cognitive processes and a technologically charged *universe* of novel meanings, an *umwelt*. This *umwelt* is our robosphere.

Whilst according to my explanation, ab initio, the proclivity of ascription of sociality to robots lies with the human Subject, in the ultimate end the presence of the robot forces the human to rethink and adapt her consciousness to the robotized environment. In *Alone Together: Why we expect more from technology and less from each other* Sherry Turkle notes that “for decades computers have asked us to think with them; these days, computers and robots, deemed sociable, affective,

⁷ From the perspective of our discussion, this economic fact of obsolete, useless or “aborted robotic projects” is rich with ontological meanings

of misrecognition/unrecognition, even “robot mortality”, which I am unable to elaborate within the constraints of this paper.

and relational, ask us to feel” [47]. We may now add that they do not only ask us to feel, but that they prompt eidetic intentionality that impels us to situate ourselves authentically with them as socially-situated artificial agents. This is what I explain in the next section. As we psychically authenticate their standing, that is, their existence as *social* robots (and not as some useless technology, or technology deemed as weird), so are we simultaneously self-authenticating as robot-related, advanced technogenetic beings.

4 Self-consciousness and the Robot Other

In addition to my grounding template on the “object-oriented philosophy” which I derive from Latour’s seamless metaphysics, my view is that an account of the coming-into-being of robots as constituents of a social network with humans is best elucidated through the philosophy of Hegel, and by extension, that of Sartre. In *Being and Nothingness* Sartre comments that Hegel’s original exposition of the role of consciousness in the instantiation of relations with others trumps Edmund Husserl’s articulation of conscious experience [41]. Sartre developed his dialectics of alterity—the quixotic intersubjectivity between the introspective Self and the exteriorized Other—from Hegel’s phenomenology of self-consciousness [38].

Hegel’s philosophy is instrumental as his primary concern was with the movement between *thought* and *reality*, and on how this actualized itself in human institutions. He boldly postulated the nature of the relationship between interiorized consciousness and the exterior world based on his discovery of the intricate hypostasis of the estrangement, reconciliation and new creations that emanate from this dynamic of Reason. In him, there is no static difference between (the subjective) self-consciousness and the (object) world. It is all in the totalized loop of cognition, self-cognition and recognition [21, 37]. The Self and the Other are dissolved into time-defying unity. The appreciation of the import of this “unity” of Subject and Object is crucial for social robotics because as a feature of the philosophy of technology, the study of social robots has no choice but to stay “object-oriented”. My earlier endorsement of Latour and postphenomenologists, Verbeek and Don Ihde is pertinent in this regard [25].

In Hegel’s schema, the intercourse between the perceiver and the perceived is a natural given. Experience of “what is happening” is inexorably unavoidable.⁸ *Thinking*, as cognition, is the self-resolution of what is mentally conceived

(*Idee*) through its modal stages, starting with perfunctory understanding and directed towards the full comprehension of the essence of what is being understood. It is a phenomenology of Spirit (*Das Geist*) that is conceived in theological pantheistic terms that are analogous to the *modus vivendi* of an omnipresent Christian God [18]. To deny “thoughtfulness” or self-awareness is to deny God’s omnipresence, as “He” is Absolute Mind; by extrapolation, it is *mutatis mutandis* to deny human existential consciousness. We cannot be but be thinking, resolving our understanding of the world we are in, and part of: that, for Hegel, is consciousness. It is spontaneous and bereft of what Husserl would later assert that it has intentionality (noesis) as its inherent motor [2], an observation which, in turn, Sartre would develop into a key foundation of his existentialist philosophy of the freedom to Self-create [39]. Therefore, according to what we learn from Hegel at this stage, a human being perceiving or being aware of a robot is immediately epistemologically implicated into recognizing that robot. This recognition, in Hegel’s system, as we will notice, is crucial as it imposes intersubjective ontologization between the self-conscious *being* and the external/objectified other.

Where does this possibility of intersubjectivity take us in relation to the robots that we have deployed into our social space and the household system as carers and companions? Yes, we cannot avoid recognizing them as socially-interactive artefacts, but they still do not have consciousness akin to the *human* consciousness that Hegel was so obsessed about that he would even deny it to the “Negroes” of his time, as their religious practices appeared not to be aligned with the Christian *Geist* [23]. Admittedly, social robots are not sapient, even as they are powered by artificial *intelligence* (AI). In spite of the Turing Test quandary [28], we have electronically endowed them with abilities emblematic of *Homo sapiens* and psychically accorded them the status of Aristotle’s *Homo politicus*: as assistive robots, they mimic human *rationality* and exhibit social etiquette, decorum, and duty. As actants in the robosphere, we have recognized them as we would human beings, which according to Hegel is essential for our self-consciousness.

Phenomenology is about the “knowing process” of what we experience. Therefore, before I close my conclusions on recognition and self-recognition, let us first dispose of the first leg of this “knowing process” in the context of our discussion, namely, the spontaneity of cognition hinted to above [38]. In Hegel, the operation of the thought-process is the actual mode of the self-actualization of the Absolute Spirit (‘God’ or Mind) in historical reality. This proceeds from the “knowing Subject” to the Object being cogitated upon in a progressively dialectical but singular movement of what he could call the *Idee*. This convoluted movement is the quantum instant of thought. Thought always manifests in an alienated state, as the enquiring, wondering Subject who

⁸ Hegel (2010/1812, 127 ‘In representing to itself an intended object which it feels, or intuit, and so forth, consciousness already contains in itself as consciousness the determination of being for-itself; that is, it has in it the content of that object, which is thus an idealization; even as it intuit, or in general becomes involved in the negative of itself, in the other, it abides with itself’.

seeks understanding into (of) the Object is estranged, and is immediately reconciled back to itself as apprehension (*Der begriff*) or knowledge (of the object) occurs. Objects, and by implication everything in the world, exist as potentiality, imbued with *Das Geist* (Reason = capacity to be known) awaiting their actualization in thought, their consummation as “the known”. In Latourian terms, this grants the object an irreducible standing, albeit, in Hegel, a momentary standing of sublation (*aufheben*), self-negation, into its actuality as “the known” to the Subject [29].⁹

An experienced object moves from being the estranged content of the Subject’s understanding (*Verstehen*, cognition), and eventuates as reconciled with the Subject as the comprehended (*begreifen*, recognition). There is a subtle intersubjectivity of the subject and object here which is expressed as an ultimate unity between them. Objects of cognition are actualized as they are comprehended, that is, in the Hegelian tradition, as we grasp their *essence*. The world is knowable! Otherwise, there would be no Absolute Spirit, no Mind.

If robots are objects, that is ontic (knowable) objects, then they are candidates for comprehension by the human knowing subject. That would be the simple fact that is generically applicable to the whole of reality, including some bot-like technological gadget or an industrial robot. But we are here dealing with *social* robots that have already been framed into the human existential space. We *experience* (*Verstehen*, understand) the social robot as intuitively affective, we then *comprehend* its essence, its sociality. But in the quantum cycle of the *modus vivendi* of Reason, or the thinking process, there is also an accommodation of the *imagination* that happens before the socially-purposed robot is designed or purchased, what we discussed earlier. The introduction of the role of *comprehension* there is applicable here. This comprehension, or strategic framing of this robot-in-the-making, is tantamount to its recognition, in the philosophical sense of the word. It is *recognized* as a relationally efficacious agent. In *recognizing* it as social robot we have accorded *social being* to it, and have in the process undergone the dialectical resolution of the “us” and “it”. In this socio-ontological unity, we are now sharing the cybernetic *umwelt* of the robosphere. Yes, the essence of our sociality, the comprehension of our social consciousness is transformed; it has morphed into a symbiotic socio-epistemic network with human-like machines.

In Hegelian phenomenology, this transformation of our sociality by being-with robots has a deeper dimension that resonates with what I again elect to express through the words of Verbeek: “when technologies are used, they co-shape

human-world relationships: they make possible practices and experiences, and in so doing, they play an active role in the way humans can be present in their world and vice versa” [49]. Being present-in-one’s-world refers to *self-consciousness*. Given the hypostasis of the unity of the subject and object in Hegel’s system, in being aware of the Other, I am simultaneously and necessarily being aware of myself. My self-consciousness is contingent upon reciprocal recognition with the Other Self. This pivotal point from Hegel’s *Phenomenology of Spirit* [17] has been monumentalized by Frantz Fanon’s citation in *Black Skin, White Mask* with regard to the unrecognition that happens between a subjective superior white complex and an objectified black inferior complex in an ontologically asymmetrical anti-black racist world: “Self-consciousness exists in itself and for itself, in that, and by the fact that it exists for another self-consciousness; that is to say, self-consciousness *is* only by being acknowledged or recognized” [9]. An elderly person imagining PARO as his companion “Other” derives psychological comfort and affirmation of his ontological wellness from his recognition of PARO as an adequate being to be with (*Mitsein*).

In *Being and Nothingness* Sartre underscored this postulation of ontological interdependence by quoting Hegel, that “self-consciousness is real only in so far as it recognizes its echo (and its reflection) in another” [41]. Could this be stretched to apply in the cyber-physical robospheric world? Would my self-consciousness not be real until I recognize a robot in my social space? Did Sartre ever think that it would apply to robots when he was writing the following in 1945?

It is not only oneself that one discovers in the *cogito* but also the existence of others. Contrary to the philosophy of Descartes, or of Kant, when we say ‘I think’, we each attain ourselves in the presence of the other, and we are just as certain of the other as we are of ourselves. Therefore, the man who becomes aware of himself directly in the *cogito* also perceives all others, and he does so as the condition of his own existence . . . I cannot discover any truth whatsoever about myself except through the mediation of another. The other is essential to my existence, as well as to the knowledge I have of myself’ [42].

Underscoring the pivotal point that this self-consciousness is constituted through the recognizing consummation by the other (the object), Hegel stated in *Science of Logic*: “Consciousness is *phenomenal*; self-consciousness, on the contrary, is being-for-itself brought to *completion* and *posited*” [21]. The experience of robots, their phenomenal entrance of our conscious space as humanoidic agents does not only destabilize our view of ourselves, they ultimately challenge the completion of our self-consciousness, that is, how

⁹ It is impossible within the constraints of this article to expound on the operation of the dialectika as exegeted by Slavoj Žižek in (Žižek 2014, 117–156).

we are present in the multi-ontological, multi-species, de-anthropized cyber-physical world.

5 From *umwelt* to *Lebenswelt*: The Case of Japan's Society 5.0

In the section preceding our detailed exposition of Hegelian phenomenology, I quoted Verbeek, and averred that a nuanced conceptualization of the robosphere as the universe of meaning-making, the *umwelt*, may be most useful within the context of our understanding of HRI in social robotics. Besides being a useful philosophical abstraction of the *umwelt*, it can be demonstrated that the notion of a robosphere is an appropriate descriptor of a tangible globalized socio-technological space in which the interface between human beings and social robots is forming itself into some kind of a polity, a social system, and a mode of social existence (a *Lebenswelt*). In Hegelian terms, the robosphere, therefore, is the institutional form of the self-actualization of the rational mutual recognition between the human subject and the robot-object. According to Liu et al., as presented by Gladden [12]:

When human beings (or social robots or AIs) are functionally integrated into a cyber-physical system (CPS) at the social, cognitive, and physical levels, it becomes a ‘cyber-physical-social system’ (CPSS) whose members may engage in ‘cyber-physical-social behaviours’ within cyber-physical spaces. Through their interactions with one another, the members of a CPSS may give rise to ‘cyber-physical social networks’ whose topologies follow the members’ social connections. [12]

The robosphere, thus, is another name for a “cyber-physical-social system” (CPSS). The existence of the robosphere as the tangible reality of having robots around our social space, which, in turn, triggers the socio-philosophical dynamics explicated here is, of course, dependent on a country's ICT infrastructure and innovation capacities. The optimal functioning of a socially-responsive robot requires advanced ICT infrastructure such as fifth generation (5G) connectivity and the promise of 6G. Within the 4G paradigm, Japan has distinguished itself as the gold-standard and bellwether of innovation in robotic technologies. A near-perfect robosphere is articulated in Jennifer Robertson's *Robo Sapiens Japonicus: Robots, Gender, Family, and the Japanese Nation* [35] where the social-structural as well the socio-philosophical questions stemming from a cyber-physical social system are starkly demonstrated.

As countries around the globe are racing to produce national strategies on science, technology and innovation (STI) in the light of the socio-industrial revolution wrought

by artificial intelligence [48], the Government of Japan's strategy, the *Fifth Science and Technology Basic Plan* [13] is widely lauded even by UNESCO as the most systematic and ambitious. Japan's Plan has monumentally posited a futuristic hybridized “Society 5.0”. In introducing Yasushi Sato's article on progress with the implementation of this strategy, the UNESCO website states that “Japan's new blueprint for a super-smart society, Society 5.0, is a more far-reaching concept than the Fourth Industrial Revolution, for it envisions completely transforming the Japanese way of life by blurring the frontier between cyberspace and the physical space”.¹⁰

The hallmark of this Society 5.0 will be a cybernetic social formation that fully assimilates inanimate artificial agents into a human-machines *Lebenswelt*. In his commentary that critically theorizes around this STI strategy of Japan with the prism of his post-humanist philosophy, Gladden [12] observes that:

It appears that Society 5.0 will differ from Society 4.0 largely by welcoming into itself a bewildering array of highly sophisticated social and emotional robots, embodied AI, nanorobotic swarms, artificial life, self-organizing and self-directing computer networks, artificial agents manifesting themselves within virtual worlds, and other artificial types of intelligent cyber-physical social actors.

In this ultimate cyber-physical world, the co-evolution of humans and robots into the robosphere is consummated in an attainment of *robo-sapien*. This could be mechanically cyborgized humans, or humans with a posthuman consciousness that deems social-artificial agents as a seamless extension of their lived-reality. Specifically, in respect of social robotics, in Gladden's estimation, this will be an era of autonomous and fully interactive humanoidic agents:

Unlike the types of robots found in our contemporary Society 4.0, the robots of Society 5.0 will not simply serve as passive tools that require elaborate programming and wait to receive instructions from their human operators; rather, the robots, AI, and other automated systems and devices of Society 5.0 will demonstrate an increasing degree of autonomy—proactively gathering data from the environment, making decisions, and acting in order to provide beneficial services to human beings. [12]

According to Sato in his UNESCO article, and as additionally interpreted by Gladden [12], this march towards this socio-technoaltric Society 5.0 is viewed as the key intervention at solving Japan's national crisis of declining birth rates and a hyper-ageing population. Mass robotiza-

¹⁰ <https://en.unesco.org/news/japan-pushing-ahead-society-50-overcome-chronic-social-challenges> [Accessed 2020–09–20].

tion of the labour process is celebrated as a solution to this national demographic crisis. Robots are replacing a depleting human labour force, whilst keeping Japanese society ethnically homogeneous by obviating the need for foreign migrant workers.¹¹ This drive for robotization as a bulwark against reliance on foreign labour adds a cognate dimension to my earlier discussion on the social intentionality that brings robots into being. The *Fifth Science and Technology Basic Plan* is a collective-nationalist or geopolitical intentionality for the construction of the robosphere. A new social formation (relations of production, in Marxian terms) is brought into existence. This is elicited in Soto's article with these words:

Japan is facing some tough problems but the government and business leaders see the concept of Society 5.0 as being a way to overcome these. They reason that Japan might then be in a position to share its own experience with the rest of the world, given that other countries may encounter similar problems sooner or later. Already, Japan is not the only high-income country facing an ageing population and sluggish demographic growth, while struggling to compete in the new digital economy.¹²

Whilst the political intentionality of Japan demonstrates just one of possible ethical challenges the robosphere as the conceptualization of the social structuring of life with robots can unveil, there is a slew of questions around legal rights that arise within such an integrated human–robot social polity. Are systems in place to enforce demands of social justice on robots in the ultimate cyber-physical society? [51]. Conversely, for example, will sex without mutual consent with a robot that is conceived as being endowed with authentic social being be assessed as rape, punishable in law? [43]. These questions, as a demonstrative sample, show that the disciplining of the robosphere as an approximation of a functional social ecology of human–robot life is important, at least, for pedagogical reasons. A categorical notion of the robosphere allows for a systematic focus on the investigation of the normative quality of this hybridized social system, and of the asymmetries possible within it [3, 46].

6 Conclusion

Utilizing conceptual tools derived from phenomenology and “new materialism”, I have endeavoured a theoretic account of robotic sociality, that is, how robots become members

of a cyber-physical social network that is cohabited with sapient humans. In hypothesizing this genitive modality of the social existence of robots, two novel constructs have been introduced and justified, namely, the humanoidic, and the robosphere. With the aid of elements of the philosophy of Hegel, and latest work on object-oriented philosophies of Latour and the Postphenomenology movement, I abstracted the robosphere as a meaning-making domain of social-cognitive interlocution between a robot and its human-relation or companion, the institutional self-actualization of Hegel's *Das Geist* in the arena of HRI. The situation of robots as *social* robots, I have argued, is a result of an ontologizing event which accords social ontology and agency (in the Latourian sense) to these socially interactive artefacts. To dramatize the historical reality of the robosphere, the envisioning of the emerging proliferation of robots as anticipated in Japan's *5th Science and Technology Basic Plan* has been offered as a case in point. Towards my conclusion I reverted to buttress my proposed theory by delving into Hegel's phenomenology of self-consciousness. This brought us to the highlight that in recognizing these robots that we have situated within our social space, we have not only exposed our own ontology for augmentation into robotic social beings, but have thus opened our self-consciousness for completion. In Sartrean terms, my postulation elaborates a theory for an authentic existence with social robots.

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Declarations

Conflict of interest The author declares that no conflict of interest exists.

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References

1. Bartneck C, Belpaeme T, Eyssel F, Takayuki K, Keijsers M, Šabanović S (2020) Human-robot interaction: an introduction. Cambridge University Press, Cambridge
2. Berghofer P (2019) Husserl's noetics: towards a phenomenological epistemology. *J Br Soc Phenomenol* 50(2):120–138

¹¹ <https://www.cnn.com/2020/09/18/asia/japanese-centenarians-sclintl/index.html> [Accessed 2020–09–21].

¹² <https://en.unesco.org/news/japan-pushing-ahead-society-50-overcome-chronic-social-challenges> [Accessed 2020–09–21].

3. Coeckelbergh M, Loh J, Funk M, Seibt J, Nørskov M (2018) Envisioning Robots in Society: Power, Politics, and Public Space. In: Proceedings of Robophilosophy 2018, Vienna, February 14–17, 2018. Robophilosophy/TRANSOR
4. Coeckelbergh M (2018) Why care about robots? empathy, moral standing, and the language of suffering. *Kairos J Philos Sci* 20:141–158
5. Colombano S (2003) Robosphere: self-sustaining robotic ecologies as precursors to human planetary exploration. *Am Inst Aeronaut Astronaut*. <https://doi.org/10.2514/6.2003-6278>
6. Dudley-Rowley M, Colombano S (2004) The robosphere: the conceptual expansion of the human factors. *Am Inst Aeronaut Astronaut*. <https://doi.org/10.2514/6.2004-5842>
7. Duffy BR, Zawieska K (2012) Suspension of disbelief in social robotics. In: The 21st IEEE international symposium on robot and human interactive communication, Paris, pp 484–489. <https://doi.org/10.1109/ROMAN.2012.6343798>
8. Doumouchel P, Damiano L (2016) Living with robots (trans: Bevoise M). Cambridge: Harvard University
9. Fanon F (2008) Black skin, white masks. (trans: Markmann CL). Sidmouth: Pluto Press. (Original published 1952)
10. Frischmann B, Selinger E (2018) Re-engineering humanity. Cambridge University Press, New York
11. Fron C, Korn A (2019) A short history of the perception of robots and automata from antiquity to modern times. In: Korn A (ed) Social robotics: technological, societal and ethical aspects of human-robot interaction. Springer, Cham, pp 1–12
12. Gladden ME (2019) Who will be the members of Society 5.0? towards an anthropology of technologically posthumanized future societies. *Soc Sci* 8(148):1500. <https://doi.org/10.3390/socsci8050148>
13. Government of Japan (2016). The 5th science and technology basic plan. <https://www8.cao.go.jp/cstp/english/basic/5thbasicplan.pdf>. Accessed 24 Nov 2019
14. Harman G (2009) Prince of networks: bruno latour and metaphysics. Re.Press, Melbourne
15. Heidegger M (1962) Being and time (tans: Macquarie J and Robinson E) 7th Edn. Oxford: Blackwell. (Original published 1927)
16. Heidegger M (1987) An introduction to metaphysics (trans: Manheim R). New Haven: Yale University Press. (Originally published 1956)
17. Hegel GWF (1977). Hegel's phenomenology of spirit (trans: Miller AV). Oxford: Oxford University Press. (Original published 1807)
18. Hegel GWF (1984) Lectures in the philosophy of religion, Vol. 1. (trans: Hodgson PC). Los Angeles: University of California Press. (Original published 1831)
19. Hegel GWF (1997) Lectures in the philosophy of history: introduction. In: Eze EC (ed) Race and the enlightenment: a reader. Blackwell Publishing, Oxford, pp 120–149
20. Hegel GWF (1991) Elements of the philosophy of right (trans: Wood AW and Nisbet HB). Cambridge: Cambridge University Press. (Original published 1820)
21. Hegel GWF (2010) The Science of Logic (trans: de Giovanni G). Cambridge: Cambridge University Press. (Original published 1812)
22. Hegel GWF (2017) Phenomenology of spirit (trans: Pinkard T). Cambridge: Cambridge University Press (Original published 1807)
23. Hegel GWF (2017) The philosophy of history (trans: Sibree J, 1956). Toronto: Our Open Media. (Original published 1831). Retrieved from <http://bradleymurray.ca>. Accessed 4 Oct 2020
24. Ihde D (2003) If phenomenology is an albatross, is postphenomenology possible? In: Ihde D, Selinger E (eds) Chasing technoscience: matrix for materiality. Indiana University Press, Bloomington, pp 131–144
25. Juchniewicz N (2014) The possibility of technology in the philosophy of hegel. *Hegel-Jahrbuch* 2014(1):240–245. <https://doi.org/10.1515/hgjb-2014-0140>
26. Korn A (ed) (2019) Social robotics: technological, societal and ethical aspects of human-robot interaction. Springer, Cham
27. Lamola MJ (2020) An ontic–ontological theory for ethics of designing social robots: a case of Black African women and humanoids. *Ethics Inf Technol*. <https://doi.org/10.1007/s10676-020-09529-z>
28. Landgrebe J, Smith B (2019) There is no Artificial General Intelligence. arXiv: Artificial Intelligence. <https://arxiv.org/abs/1906.05833>
29. Latour B (1988) Irreductions. In: Latour B, Sheridan A, Law J (eds) The Pasteurization of France. Harvard University Press, Cambridge, pp 153–238
30. Mokhtar T (2019) Designing social robots at scales beyond the humanoid. In: Korn A (ed) Social robotics: technological, societal and ethical aspects of human-robot interaction. Springer, Cham, pp 13–35
31. Moravec H (1999) Robot: mere machine to transcendent mind. Oxford University Press, New York
32. Nørskov M, Nørskov S (2020) Social robots and recognition. *Philos Technol* 33(1):5–8. <https://doi.org/10.1007/s13347-019-00353-y>
33. Pollini A (2009) A theoretical perspective on social agency. *AI & Soc* 24(2):165–171
34. Redding P (2020) Georg Wilhelm Friedrich Hegel. In: Zalta EN (Ed) The Stanford Encyclopedia of Philosophy (spring 2020 Edition). <https://plato.stanford.edu/archives/spr2020/entries/hegel/>
35. Robertson J (2017) Robo sapiens japonicus: robots, gender, family, and the japanese nation. University of California Press, Oakland
36. Romesin HM, Bunnell P (1998) Biosphere, homosphere and robosphere, what does it have to do with business. https://issuu.com/gfbertini/docs/biosphere__homosphere__and__robosphere_-_living_sys. Accessed 03 June 2020
37. Russon J (2011) Subjectivity and objectivity in Hegel's *Science of Logic*. In: Bauer M, Wood ME (eds) Person, being & history. The Catholic University of America Press, Washington D.C, pp 125–139
38. Russon J (2011) Self and other in Hegel's phenomenology of spirit. *J Indian Counc Philos Res* 18(4):1–18
39. Sartre J-P (1970) Intentionality: a fundamental idea of Husserl's phenomenology. (trans: Fell JP), *J Br Soc Phenomenol* 1(2): 4–5. (Original published 1939)
40. Sartre J-P (1985) *Critique of dialectical reason* (trans: Sheridan-Smith A). Verso. (Original published 1960)
41. Sartre J-P (2003) Being and nothingness: an essay on phenomenological ontology (trans: Barnes HE). London: Routledge. (Original published 1943)
42. Sartre J-P (2007) Existentialism is a humanism (trans: Macomber C). New Haven: Yale University Press
43. Sharkey N, Weisberghe A, Robbins S, Hancock E (2017) Our sexual future with robots: a foundation for responsible robotics consultation report. Global Institute for Justice, The Hague
44. Strasser A (2017) Social cognition and artificial agents. In: Müller VC (ed) Philosophy and theory of artificial intelligence. Springer, Berlin, pp 106–114
45. Sonesson G (2015) Phenomenology meets semiotics: two not so very strange bedfellows at the end of their cinderella sleep. *Metodo Int Stud Phenomenol Philos* 3(1):41–62
46. Sparrow R (2020) Robotics has a race problem. *Sci Technol Human Values* 45(3):538–560. <https://doi.org/10.1177/0162243919862862>
47. Turkle S (2011) Alone together: why we expect more from technology and less from each other. Basic Books, New York

48. United Nations Educational, Scientific and Cultural Organization (2015) UNESCO Science Report: Towards 2030. Paris: UNESCO Publishing
49. Verbeek P-P (2005) What things do: philosophical reflections on technology, agency and design. Penn State Press, Philadelphia
50. Verbeek P-P (2005) Artefacts and attachment: a postscript philosophy of mediation. In: Harbers H (ed) Inside the politics of technology: agency and normativity in the co-production of technology and society. Amsterdam University Press, Amsterdam
51. Wallach W, Allen C (2008) Moral machines: teaching robots right from wrong. Oxford University Press, Oxford
52. Wareham C (2013) On the moral equality of artificial agents. In R. Luppigini (Ed), *Moral, ethical, and social dilemmas in the age of technology: theories and practice*. Hershey: Information Science Reference, pp 70–78
53. Zawieska K (2015) Deception and manipulation in social robotics. In: Conference: workshop the emerging policy and ethics of human-robot interaction at the 10th ACM/IEEE international conference on human-robot interaction (HRI2015), Portland, Oregon, USA
54. Žižek S (2014) Absolute recoil: towards a new foundation of dialectical materialism. Verso, London

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