Towards a Narrative Framework for HRI Research

Jesse de Pagter
Institute for Management Science
TU Wien
Vienna, Austria
jesse.de.pagter@tuwien.at

***Abstract*—In this contribution, the rising public and governmental interest in the impact of interactive robots is used as an argument for a stronger focus on narratives in HRI research. First, the concept of the narrative is further developed, while looking into its use in social research. Based on that it is explained how clear connections can be drawn between concept of the narrative and robotic technologies. The contribution then elaborates on the possible role of narrative approaches in HRI research. It entails a focus on developing new methodological trajectories, while it also would add to the range of possible research material. In this context, it is explained how the concept of the narrative can be further embedded in HRI research. Finally, connections are drawn between a narrative approach and existing trends in HRI research.**

***Index Terms*—technological imaginaries, methodology, narrative approach, robot ethics, societal impact**

I. Introduction

The current and potential interactive capabilities of robots are becoming an increasingly prominent topic of concern. Whereas robots and other automata have a long history of capturing the human imagination in both positive and negative ways, the rise of novel generations of robots are causing new kinds of stir [1], [2]. There is a growth in public discourse about robots' impact, often combined with concerns about the development of artificial intelligence (AI) technologies [3], [4]. Moreover, governments have started to explicitly engage with the (potential) interactive capabilities of robots [5]. Even though there are still many types of interactive robots that are not yet ready to be implemented on a large scale, the consequences of their implementation are already highly anticipated.

A good example that illustrates this development can be found in the priorities that both the European Commission and European Parliament have defined in several statements and initiatives on robotic and AI technologies during recent years. Ethical approaches play a central role in this type of considerations about the future of robotics, as they should help to create a framework for developing trustworthy and human-centered robots [6], [7]. In this spirit, the Commission argues for instance for setting up a "regulatory framework to ensure trust in AI systems while promoting the EU's value-based approach" [8, p.9]. Furthermore, there is a strong focus on "fundamental rights such as human dignity and privacy protection" [9, p.2]. In short, apart from the general idea of robotics as an important competitive technology for the future in terms of economic policy-making, the EU is pushing a strategy focused on building trust in robots in combination with an emphasis on ethical, value-based approaches.

I argue that this kind of developments have particular implications for HRI as a field of research. To wit, the activities and commitments mentioned above are leading to increased emphasis on the potential, large-scale societal impacts of robots. Within that context, interaction with robots has come to the attention as a topic that demands paying attention to many ethical, legal and social issues [10], [11]. The increasing attention for such issues is in that regard becoming a constitutive factor in the general perception of (interactive) robots. That is to say, it renders it probable that the activities of HRI as a field of research will increasingly be affected by newly developing public and governmental imaginaries about robots and their potential futures [12], [13]. Based on that, I argue that it would be beneficial to implement a stronger focus on narratives in HRI research. Below, I elaborate on what such a focus would entail and how that would be beneficial. After that, I discuss how it can become embedded in HRI research while also drawing connections to existing trends in HRI.

II. Narratives and Robots

In order to argue for a stronger focus on narratives in HRI research it is useful to first provide a short summary and reflection that is concerned with the general position of narrative approaches in the social sciences and humanities. The notion of the narrative is an important concept in different domains of social research [14]. This is not surprising since narratives constitute a crucial element of human social life: we often think and communicate with the help of stories. As such, narratives help to establish meaning and structure in a world that is otherwise messy and overwhelming [15]. In this context, narratives can be defined as sets of shared meanings and assumptions, organized in plot-like structures. Narratives are thereby to be understood as constructive and constitutive in the development of concepts and ideas. As they become reproduced, narratives provide certain directions, values and purposes, while enabling the configuration into a meaningful whole [16], [17]. At the same time, through their performative effect they stabilize and solidify certain visions and discourses. In short, narratives simultaneously function as a form of understanding as well as means of communication [18].

In social science research the conceptual clarity of the notion has often proven to be useful. That is to say, narratives can

be distinguished as objects of research in order to analyze the way in which certain people, groups, or cultures understand the world around them. For example, with the help of a narrative approach one can scrutinize innovation cultures, public policy developments and so on [19], [20]. Finally, it is important to remark here that arguing for narrative approaches is not necessarily the same as arguing for qualitative research (vs. quantitative research). Even though most narrative research is based on qualitative methods, narrative approaches in the field of computational social science have been rapidly improving during recent years [21], [22].

In the same spirit, narratives as analytical devices can be useful for HRI research, since interactions between robots and humans are influenced by the narratives that become affiliated with robots. In what follows, I distinguish several ways in which narrative approaches could add useful insights when it comes to the phenomenon of human robot interaction. First, robots are increasingly embedded in larger narratives that are becoming increasingly complex. Especially non-fictional narratives around robots, AI-technologies and automation are developing very fast at this moment, which is leading to an increase in buzzwords and hypes surrounding those technologies [23]. Those buzzwords and hypes are likely influencing the way people see, understand and associate with robots. Second, historically robots themselves can be seen as technologies that have a wide range of narratives associated with their appearance. In other words, the very appearance of robots themselves strongly alludes to narrative content. For a long time, robots and other automata have captured the imagination but especially in the last century, the robot has become an important technocultural icon [24], [25]. Examples of central elements in this narrative are for instance the autonomy of robots, their anthropomorphism, their potential danger and so on. Finally, on a broader scale, in our society and culture there is an increasing awareness of the societal impact of newly emerging technologies. In the recent past, emerging technologies rapidly changed the ways in which people understand themselves and the society they live in [26], [27]. Attention for the role of such phenomena of technology-based change and the narratives around it also influence the way emerging technologies like robotics and AI are understood. Insights into such developments can provide insights and directions to interaction research. Thus, from a more pragmatic perspective, increased attention for narratives are likely useful in the quest for establishing familiarity and trust in robots on a macrosocietal scale, whereas a lack of attention for such narratives can severely hamper that process.

III. Distinguishing Narrative Approaches for HRI

A focus on narratives in the spirit of the descriptions above would have several consequences for HRI research. Most of all regarding the methodological focus but also in terms of what can be considered as reliable and useful research material. HRI generally has a strong reputation for the development of frameworks that establish and validate measures for the analysis of human-robot interactions. The notion of the narrative as described above is in many cases not a good fit for such research frameworks. First and foremost, the results from those frameworks are often expected to provide other kinds of knowledge. Narrative approaches generally entail a hermeneutic understanding of the empirical material. Whereas hermeneutic understandings are certainly present in HRI research, they are often not mainstream and certainly do not match well with the quantitative psychological laboratory studies that are the standard in HRI research. Furthermore, they often simply do not fit with what more technically orientated fields within HRI consider useful knowledge in the quest for the improvement of the interaction between robots and humans. Therefore, narrative approaches come with a range of difficult methodological choices that need to be discussed and motivated. In what follows, I attempt to do this by focusing on three different ways of applying the notion of narratives and narrative approaches in HRI research.

A. Reflection: Narratives as instruments of immersion

Most HRI research maintains a rather strong focus on characteristics. This means that research is mostly revolving around user characteristics (e.g. age, gender, robot familiarity) as well as on robot characteristics (e.g. anthropomorphic features, communication cues, interactive skills, etc.) [28]. Narratives, in such a context, can be used to make certain scenarios appear more realistic. In other words, HRI researchers would develop a specific story around a robot and use this story to make the participant be more immersed in the use case. Furthermore, closer to actual implementation, narratives are deployed to put specific robots in the market.

This type of engagement with narratives is not very different from what can be considered mainstream HRI research. In fact, in many ways this is already done in many laboratory settings, albeit that the notion of the narrative is often not explicitly mentioned. There are however several examples of HRI research where it is mentioned and used in such a way [29]–[31]. Using the notion of the narrative in this case, should assume a certain reflectiveness about the narratives that are contructed and deployed to make the experience more immersive. HRI has an important responsibility in this regard, especially because of the fact that those narratives can start to function as important tools that aid the implementation process of robots.

B. Analysis: Narratives as carriers of attitudes

The paragraph above shows how narratives about and around robots, can be used to influence and change human interaction with robots. Apart from using them as such in order to make experimental conditions appear more realistic, the narratives that users associate with robots can also be analyzed. Narratives are regularly studied in a qualitative manner in order to understand specific experiences. In this context, narratives are simply providing the content of what the researcher is looking for and can be gathered through interviews, focus groups and other tools from qualitative research.

Within HRI, there are several examples of approaches that share similarities with what is described above. There are several examples of studies that analyze the narratives that humans project onto robots within a context of HRI research [32], [33]. Such studies are often focused on understanding issues like emotional attachment to technology or topics related to trust, with the explicit goal to understand how for instance cultural narratives influence user expectations, experiences and decisions. Nevertheless, it must be stated once more that these types of studies likely need some more time in order to be established as a mainstream approach in HRI research.

C. Configuration: (Meta)narratives as processes behind the negotiation of sociotechnical potential

It has already been explained how narratives constitute a way to legitimate, understand, and explain. They should simultaneously be appreciated and criticized as such. Analyzing and describing the way in which the robotics narrative develops on a macro-societal scale and the way it is related to other (meta)narratives is therefore increasingly important. The concept of the metanarrative can be useful here. Without getting into the details and discussions on the roots of this concept in the analysis of postmodernity, metanarratives can be defined as the narratives that establish and legitimate large-scale ideas about our society and its development [34]. It is interesting to remark in this context that robotics and automation can increasingly become classified as becoming a technological metanarrative [35]. Therefore it is important to invest in the construction of new narratives about robots that can help to develop a more balanced metanarrative around robots. This is normally a task that is taken up by the Humanities, but the mission of HRI here would mainly be to engage in this debate with its findings and engage in discussions with different epistemic communities, such as historians of technology, philosophers of technology, science and technology studies researchers, and other cultural theorists focused on technology. Successful metanarratives in a sociotechnical domain can therefore be used to understand actual technological developments while also discussing the way their speculative elements can be used to engage and discuss new, inclusive futures with robots [36].

IV. Conclusion and outlook

The main point of this position paper is to provide a contextual framework that can help to create a debate on epistemic and methodological challenges for the future of HRI research. Important to note here is that the goal of this paper is certainly not to develop a completely new approach to HRI; rather it aims to provide a nuanced and embedded perspective on developments within HRI research. A useful way to further embed the narrative approach could therefore be to draw connections to larger trends in HRI. Currently most people would agree that HCI and HRI are in what is often called 'the third wave' [37], [38]. Deliberations about a 'fourth wave' have started to develop, albeit mostly in the margin. Whereas third wave research is exactly involved with recurring topics such as the notion of human-centred technology, it is interesting here to bring up the idea that a fourth wave could bring about a stronger focus on politics, values and ethics [37], [39]. The notion of a fourth wave, which pushes for institutional change, might fit very well to the challenges this paper has aimed to tackle.

Acknowledgment

Funded by the TU Wien Doctorate College TrustRobots and the CoMeMak-project (FWF Project Number 871459)

References

[1] A. Gasparetto, "Robots in History: Legends and Prototypes from Ancient Times to the Industrial Revolution," in *Explorations in the History of Machines and Mechanisms*, ser. History of Mechanism and Machine Science, C. López-Cajún and M. Ceccarelli, Eds. Cham: Springer International Publishing, 2016, pp. 39–49.

[2] R. R. Murphy, "Robots have grasped and manipulated the imagination since 1839," *Science Robotics*, vol. 6, no. 54, May 2021.

[3] S. Operto, "Evaluating public opinion towards robots: A mixed-method approach," *Paladyn, Journal of Behavioral Robotics*, vol. 10, no. 1, pp. 286–297, Jan. 2019.

[4] B. Zhang and A. Dafoe, "Artificial Intelligence: American Attitudes and Trends," Social Science Research Network, Rochester, NY, SSRN Scholarly Paper ID 3312874, Jan. 2019.

[5] A. Jobin, M. Ienca, and E. Vayena, "The global landscape of AI ethics guidelines," *Nature Machine Intelligence*, vol. 1, no. 9, pp. 389–399, Sep. 2019.

[6] European Parliament, "RESOLUTION on a framework of ethical aspects of artificial intelligence, robotics and related technologies," Oct. 2020.

[7] European Commission, "PROPOSAL FOR A REGULATION of the European Parliament and the Council laying down harmonised rules on Artificial Intelligence (Artificial Intelligence Act) and amending certain Union legislative acts," Apr. 2021.

[8] ——, "COMMUNICATION Fostering a European approach to Artificial Intelligence," Apr. 2021.

[9] ——, "WHITE PAPER On Artificial Intelligence - A European approach to excellence and trust," Feb. 2020.

[10] A. F. T. Winfield and M. Jirotka, "Ethical governance is essential to building trust in robotics and artificial intelligence systems," *Philosophical transactions*, vol. 376, no. 2133, pp. 1–13, Nov. 2018.

[11] E. Fosch-Villaronga, C. Lutz, and A. Tamò-Larrieux, "Gathering Expert Opinions for Social Robots' Ethical, Legal, and Societal Concerns: Findings from Four International Workshops," *International Journal of Social Robotics*, vol. 12, no. 2, pp. 441–458, May 2020.

[12] E. Fosch-Villaronga and M. Heldeweg, ""Regulation, I presume?" said the robot – Towards an iterative regulatory process for robot governance," *Computer Law & Security Review*, vol. 34, no. 6, pp. 1258–1277, Dec. 2018.

[13] K. Konrad and K. Böhle, "Socio-technical futures and the governance of innovation processes—An introduction to the special issue," *Futures*, vol. 109, pp. 101–107, May 2019.

[14] C. Nash, *Narrative in Culture: The Uses of Storytelling in the Sciences, Philosophy, and Literature*. London; New York: Routledge, 1994.

[15] B. Czarniawska, *Narratives in Social Science Research*, ser. Introducing Qualitative Methods. London ; Thousand Oaks, Calif: Sage Publications, 2004.

[16] W. R. Fisher, "Narration as a human communication paradigm: The case of public moral argument," *Communication Monographs*, vol. 51, no. 1, pp. 1–22, Mar. 1984.

[17] ——, *Human Communication as Narration: Toward a Philosophy of Reason, Value, and Action*, ser. Studies in Rhetoric/Communication. Columbia, S.C: University of South Carolina Press, 1987.

[18] J. J. Deuten and A. Rip, "Narrative Infrastructure in Product Creation Processes," *Organization*, vol. 7, no. 1, pp. 69–93, Feb. 2000.

[19] M. D. Jones, E. A. Shanahan, and M. K. McBeth, Eds., *The Science of Stories. Applications of the Narrative Policy Framework in Public Policy Analysis*. New York: Palgrave Macmillan US, 2014.

[20] L. Vesnic-Alujevic, M. Breitegger, and Â. G. Pereira, "What smart grids tell about innovation narratives in the European Union: Hopes, imaginaries and policy," *Energy Research & Social Science*, vol. 12, pp. 16–26, Feb. 2016.

[21] I. Mani, *Computational Modeling of Narrative*. Morgan & Claypool Publishers, 2013.

[22] M. W. Sjoding and V. X. Liu, "Can You Read Me Now? Unlocking Narrative Data with Natural Language Processing," *Annals of the American Thoracic Society*, vol. 13, no. 9, pp. 1443–1445, Sep. 2016.

[23] T. Heffernan, *Cyborg Futures: Cross-Disciplinary Perspectives on Artificial Intelligence and Robotics*. Berlin: Springer, 2019.

[24] R. M. Geraci, *Apocalyptic AI: Visions of Heaven in Robotics, Artificial Intelligence, and Virtual Reality*. New York: Oxford University Press, 2010.

[25] S. Cave and K. Dihal, "Ancient dreams of intelligent machines: 3,000 years of robots," *Nature*, vol. 559, no. 7715, pp. 473–475, Jul. 2018.

[26] H. Kwon and Y. Park, "Exploring Social Impact of Emerging Technologies from Futuristic Data," *International Journal of Industrial and Manufacturing Engineering*, vol. 9, no. 3, p. 4, 2015.

[27] I. Ulnicane, W. Knight, T. Leach, B. C. Stahl, and W.-G. Wanjiku, "Framing governance for a contested emerging technology:insights from AI policy," *Policy and Society*, vol. 40, no. 2, pp. 158–177, Apr. 2021.

[28] C. L. Bethel and R. R. Murphy, "Review of Human Studies Methods in HRI and Recommendations," *International Journal of Social Robotics*, vol. 2, no. 4, pp. 347–359, Dec. 2010.

[29] M. A. Goodrich, J. W. Crandall, M. Oudah, and N. Mathema, "Using Narrative to Enable Longitudinal Human-Robot Interactions," in *Proceedings of the 13th International Conference on Human-Robot Interaction. Presented at the Workshop on Longitudinal Human–Robot Teaming*. Chicago: ACM, 2018, p. 8.

[30] D. S. Syrdal, K. Dautenhahn, K. L. Koay, and W. C. Ho, "Views from Within a Narrative: Evaluating Long-Term Human–Robot Interaction in a Naturalistic Environment Using Open-Ended Scenarios," *Cognitive Computation*, vol. 6, no. 4, pp. 741–759, Dec. 2014.

[31] K. L. Koay, D. S. Syrdal, K. Dautenhahn, and M. L. Walters, "A narrative approach to human-robot interaction prototyping for companion robots," *Paladyn, Journal of Behavioral Robotics*, vol. 11, no. 1, pp. 66–85, Jan. 2020.

[32] J. Carpenter, *Culture and Human-Robot Interaction in Militarized Spaces: A War Story*. Routledge, Feb. 2016.

[33] A. Weiss and K. Spiel, "Robots beyond Science Fiction: Mutual learning in human–robot interaction on the way to participatory approaches," *AI & SOCIETY*, Apr. 2021.

[34] J.-F. Lyotard, *The Postmodern Condition: A Report on Knowledge*, ser. Theory and History of Literature. Minneapolis: University of Minnesota Press, 1984, no. v. 10.

[35] R. A. Jones, "What makes a robot 'social'?" *Social Studies of Science*, vol. 47, no. 4, pp. 556–579, Aug. 2017.

[36] D. Cressman, "Contingency and Potential: Reconsidering a Dialectical Philosophy of Technology," *Techné: Research in Philosophy and Technology*, vol. 24, no. 1&2, pp. 1–20, 2020.

[37] S. Ashby, J. Hanna, S. Matos, C. Nash, and A. Faria, "Fourth-Wave HCI Meets the 21st Century Manifesto," in *Proceedings of the Halfway to the Future Symposium 2019*, ser. HTTF 2019. New York, NY, USA: Association for Computing Machinery, Nov. 2019, pp. 1–11.

[38] S. Bødker, "Third-wave HCI, 10 years later—participation and sharing," *Interactions*, vol. 22, no. 5, pp. 24–31, Aug. 2015.

[39] E. Blevis, K. Chow, I. Koskinen, S. Poggenpohl, and C. Tsin, "Billions of interaction designers," *Interactions*, vol. 21, no. 6, pp. 34–41, Oct. 2014.