Robot Gestalts in Staged Performances

— Poster Abstract —

Henning Christiansen[1] and Mads Hobye[1] and Anja Mølle Lindelof[2]

Computer Science[1] & Performance Design,[2] Roskilde University, Denmark
henning@ruc.dk, hobye@ruc.dk, lindelof.dk

Art often reflects on universal issues, projecting it into its own time, as well as commenting on new inventions and ideas. Thus, and not surprisingly, robots and robot technology as it penetrate present day society, have also started their invasion into literature, film and now also performative art, which is the setting for the present research. Artefacts with robot-like characteristics have appeared long before computers and electronic robot control were invented, in many different shapes, e.g., as musical automata in the 17th century (see, e.g., the essay [4]). We are interested in both investigating and promoting the rich and titillating potential for using robots in staged performances, which has become even greater with the relative ease with which a functioning robot now can be tinkered together from affordable components. Compared with other art forms such as literature and film, scenic performances offers a direct and incomparable presence and also challenges. Robots have appeared in several recent theatre and dance performances; for example, *"Robot !"* from 2013 by Blanca Li Dance Company stages different real robots and human performers mimicking robots in various ways (see [3] for more information about this and other performances with robots).

While other researchers, e.g., [9], have categorized staged robots from a technical point of view, we are interested in understanding robotic gestalts in scenic, performative contexts. Our research goals include to understand how robot gestalts can be expressive in dramaturgically interesting ways and utilized artistically in staged performances. In [3], we suggest an ontological framework to characterize central properties of such gestalts, intended as a research tool as well as guidelines to inspire the development of new performances.

We shall avoid here discussing in detail the issue of what makes a certain scenic object or actor be experienced as a robot, but we expect it must include a minimum of either "techno look" (say, like an industrial robot or a costume being a replica of a comic series robot) and/or apparent autonomy. This is one important aspect of its gestalt, another is its ways of making itself expressive. Humanoid robots can refer to eye contact, speech, familiar gesticulations as well as overall movements. The plastic-doll-like NAO robot [7], as an example, has LED lights where one would expect eyes, and turning the LEDs briefly off and on again, is immediately perceived as blinking, which greatly enhances the robot as a believable character.

For non-humanoid robots, the collection of expressive instruments seems less, and movements and timing become even more essential. Signalling fear may be done by hiding or "nervous" shaking, and being offended by going away or turning (what is experienced as) its back to another actor. Expressive movements

of totally abstract shapes, as one extreme in scenic robots, have been studied recently [1,8]; for example, [5,6] have used machine learning to extract such movements from human performers and transfer them to the robots.

Our own experiments and analyses[1] introduce and focus on the class of *FDO robots,* the acronym standing for *familiar domestic objects*. The gestalt of an FDO naturally includes the audience's expectations to and experiences with the particular object. Our current study object is our animated version of the iconic shape of the classical Danish Nilfisk vacuum cleaner (by no means resembling modern consumer robot vacuum cleaners), which has been around since the 1920s or so; see Fig. 1.

Fig. 1. Nilfisk vacuum cleaner as an FDO; notice arrangement of wheels, two fixed behind and caster wheel at the front.

Expectations for this FDO may include homely settings, acts of cleaning and people such as house maids or a stressed single parent trying to keep the house clean at late evening. Futhermore, it has a characteristic way of moving, a.k.a. *movement constraints*, induced by the positioning of its wheels, and the normal way of dragging it by the hose (attached at the front) or pushing it by hand using the handle on top: typically in rounded curves and more or less straight lines. On the other hand, it has difficulties rotating around itself and would normally

[1] See [2] for our research agenda and first experiences.

not do so. Obeying as well as occasionally breaking the expectations can be utilized dramaturgically. Obedience of movement constraints may emphasize a safe and cosy atmosphere, breaking them may create a creepy feeling or associate to a change in the narrative (say, in an Ibsen-like play when the repressions swept under the carpet for years soon will begin to emerge). There will also be a breaking of constraints and shift in the narrative, when the vacuum cleaner after having been used by a person in the usual way for cleaning, suddenly begins to move and take its own initiatives.

Currently, our robots are instructed in a totally deterministic scripting language intended for multiple, synchronized robots. The scripting language is intended to be stage director friendly in the sense that it should be freed from irrelevant measures, coordinates and millisecond timings, and be as close as possible to the experienced dramaturgic reality as possible. As part of this, it "knows" the movement constraints of the particular robot (and is adaptable for new FDOs), so (unless otherwise specified) an instruction to move from A to B will automatically create a route that obeys the constraints; for the Nilfisk FDO, it typically consists of two circle segments connected by a straight line.

Scripts are developed iteratively within an online simulator that is also used as an interface for controlling the performance involving the physical robots. Plans for possible future work include creating robot scripts by moving small robot models on a smart table or registering actors' movements of the stage, as ways to provide an even more director-friendly approach. As part of this research, we investigate this dramaturgical, creative space, by organizing workshops for our students, inviting them to direct scenes for one or two robots and a human actor. Furthermore, we want to investigate ways of including interaction and autonomy in the scripting language, while maintaining its conceptual simplicity.

The poster reports our recent progress in the project, and we demonstrate our performing robots.

References

1. S. Bianchini, F. Levillain, A. Menicacci, E. Quinz, and E. Zibetti. Towards behavioral objects: A twofold approach for a system of notation to design and implement behaviors in non-anthropomorphic robotic artifacts. In J. Laumond and N. Abe, editors, *Dance Notations and Robot Motion, 1st Workshop of the Anthropomorphic Motion Factory, at LAAS-CNRS, Toulouse, France, 13-14 November, 2014*, volume 111 of *Springer Tracts in Advanced Robotics*, pages 1–24. Springer, 2014.
2. H. Christiansen, A. Lindelof, and M. Hobye. Breathing life into familiar domestic objects. In *Proceedings of the 27th IEEE International Symposium on Robot and Human Interactive Communication, Nanjing, China, August 27-31, 2018*, pages 589–594, United States, 2018. IEEE.
3. H. Christiansen and A. M. Lindelof. Robots on stage. *In preparation*, 2019.
4. A. Engberg-Pedersen. The sense of tact: Hoffmann, Maezel, and mechanical music. *The Germanic Review*, 2019. To appear.
5. P. Gemeinboeck and R. Saunders. Movement matters: How a robot becomes body. In M. Gillies and K. Niehaus, editors, *Proceedings of the 4th International Conference*

on Movement Computing, London, United Kingdom, June 28-30, 2017, pages 8:1–8:8. ACM, 2017.

6. P. Gemeinboeck and R. Saunders. Human-robot kinesthetics: Mediating kinesthetic experience for designing affective non-humanlike social robots. In *Proceedings of the 27th IEEE International Symposium on Robot and Human Interactive Communication, Nanjing, China, August 27–31, 2018*, pages 589–594, United States, 2018. IEEE.
7. D. Gouaillier, V. Hugel, P. Blazevic, C. Kilner, J. Monceaux, P. Lafourcade, B. Marnier, J. Serre, and B. Maisonnier. The NAO humanoid: a combination of performance and affordability. *CoRR*, abs/0807.3223, 2008.
8. F. Levillain, E. Zibetti, and S. Lefort. Interacting with non-anthropomorphic robotic artworks and interpreting their behaviour. *I. J. Social Robotics*, 9(1):141–161, 2017.
9. D. V. Lu. Ontology of robot theatre. In *Proc. ICRA Workshop on Robotics and Performing Arts: Reciprocal Influences*, 2012. Not printed; available on author's homepage http://wustl.probablydavid.com/publications/ontology.pdf.