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Composed epistemologies

A case from computer music research

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Computer science (or should we say *computer sciences*) is a complex field which is very often inscribed into larger disciplinary assemblages. In such interdisciplinary fields, computer sciences inherently have to cohabit with other disciplines (e.g. design, mechanics, humanities, biology, etc.), each one coming with its idiosyncratic epistemology and methodologies. Our own field, computer music research – which mixes approaches such as digital signal processing, acoustics, design or humanities (to name a few), and often implies collaborations with composers, performers, technicians and researchers from other disciplines – is exemplary of such an interdisciplinary assemblage. Additionally, it seems that these collaborations between disciplines are very often articulated around a common experimental platform (Rheinberger 2011) – built around software – that evolves according to the research objectives and results. For example, for several years we have developed a framework, CoMo (Matuszewski et al. 2018; Matuszewski 2020), for collaborative prototyping of gesture / sound mappings shared on multiple mobile terminals. The platform has been developed across several ANR and EU projects and used in several research projects (Peyre 2022; Voillot 2022), as well as in music and dance productions¹. From the beginning, the platform has thus evolved in rapid cycles of research, developments and small-scale productions phases. This process made us reflect on and reconsider the commonly accepted point of view that technological development would be a consequence of the primary research questions. Interestingly, in our case, we observed a more complex situation: the development of the experimental platform re-oriented some of the research questions (e.g., by raising new questions about its appropriation or adequacy), or introduced new research questions on its own (e.g. how the platform should evolve to stay an experimental system and not to become, to quote Rheinberger, "the simple demonstration of a phenomenon"). While this complex interleaving "between epistemic and technical things" (to use the words of Rheinberger) has been studied and formalized (Latour 1996; Pestre 2006), we think that we are still missing a structured and actionable epistemology that would help us, researchers, to define our specific "style of scientific reasoning" (Coutellec 2015) and to enable the sharing of such iterative processes as valid knowledge.

To approach this question, we propose to develop an epistemological perspective – that purposely leave aside the question of the ontology of science and of specific methodologies – which focuses on the activity of research practitioners. We believe it can be described to a large extent by considering two positionalities we call the *observer* and *maker* standpoints². The articulation of these two standpoints, which is to a great extent transversal to disciplines, indeed allows us to recognize that researchers' activities very often oscillate between these positions over time, or considering different aspects of a given research project. Nevertheless, we think these two positions, while being complementary, still mobilize

¹ <https://apps.ismm.ircam.fr/como>

² We propose these terms as a working hypothesis for opening discussion, they have been chosen for their rather broad meaning, and to deliberately avoid dualities such as science / design, positivism / constructivism, etc.

different kinds of knowledge, and imply different *régimes de vérité* (Leclerc 2001; Guerrier 2020) as well as different methodological, ethical and transmission procedures.

First, let's consider the *observer* standpoint, which is the most considered by epistemology (Descartes 1637; Kuhn 1972; Feyerabend 1979; Le Moigne 2012). This approach is to a large extent defined by the central role given to "scientific methodology", which supposedly produces valid knowledge "mechanically". In most disciplines, part of the method is to minimize, as much as possible, the impact of the researcher (or of the research apparatus) on the behavior of the observed object. Once consolidated, the produced knowledge is then transmitted through traditional forms of education (one teacher, many students).

From the *maker* standpoint, the question of minimizing impact on the object becomes completely irrelevant, as the whole point of the researcher activity is *to have an action*, be it mediated by an object, on the surrounding world. Therefore, the researcher shouldn't hide behind a posture such as "the produced object is neutral"³ (a hammer has been made to hit things strongly, be it a nail or a head), which deeply re-questions the relation between ethics and methodology. Interestingly, it also allows us to consider objects that can hardly be approached from the *observer* position, that set limits and constraints by its methodological construction. Finally, the *maker's* standpoint also has consequences on the nature of produced knowledge, which can be associated with forms of "learning by doing", *know-hows* or patterns (Alexander 1964). As a consequence, the developed knowledge is maybe more difficult to share through traditional means, such as publication channels, and implies a transmission by "*compagnonnage*" (one teacher, one or very few students)⁴.

In summary, we consider artistic research projects (Frayling 1993; Schwab 2012) conducted in the context of computer sciences as an interesting methodological basis for revisiting such epistemological questions. While such approaches are less known and sometimes criticized for not being rigorous enough, we propose to examine them as exemplary cases of the *maker* standpoint. Indeed, they allow to create complex socio-technical settings which have the potential to mobilize and articulate questions and methodologies from different disciplines into a single project, while being relatively protected (due to the artistic goal) from undesirable side effects on nature and society. As such, we think they provide an interesting experimental platform (and educational playground) to further develop multidisciplinary epistemologies and methodologies.

As temporary concluding remarks, we would like to state that strengthening knowledge produced from the *maker* standpoint – by recognizing and discussing practices that might not yet be considered as producing *knowledge* using standardized criteria – could help to better delimitate and to tackle some issues of undone computer science. Additionally, we believe our approach also raises a number of interesting questions. For example, is the traditional article format suited for publishing and sharing such work (Edwards et al. 2019)⁵? Which consequences on what is considered as valid knowledge? Could these questions be generalized to the computer sciences field? Outside computer sciences?

³ Which bizarrely still seems to be a common axiom, the "Value Neutrality Thesis", in some STS trends.

⁴ We would like to point here that in university curriculum, such a transmission model mostly, if not only, appears at the PhD level.

⁵ The Journal of Artistic Research, *JAR* (<https://jar-online.net/en/front-page>) also provides an interesting attempt in this direction.

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Biographies

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Benjamin Matuszewski, Ph.D. in Aesthetics, Sciences and Technologies of the Arts, studied music and musicology before working several years as a developer in the media industry. Since 2014, he is a researcher and developer in the Sound Music Movement Interaction Team at IRCAM, where he conducts transdisciplinary research between engineering, music, design, and human-computer interaction on distributed and interactive music systems based on Web technologies. He also regularly collaborates on artistic projects.

Frédéric Bevilacqua

Frédéric Bevilacqua is the head of the Sound Music Movement Interaction team at IRCAM in Paris, in the joint research lab Science & Technology for Music and Sound – IRCAM – CNRS – Sorbonne Université. His research concerns the interaction between movement and sound, and the development of gesture-based interactive systems.

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