From Fiction to Function: Imagining New Instruments Through Design Workshops

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Abstract

This paper introduces a set of workshops held with expert musicians to imagine novel musical instruments through design fiction. The workshops were based on the Magic Machine workshops developed by Kristina Andersen, in which participants crafted non-functional prototypes of instruments they would want to use in their own performance practice. Through in-situ activities and post-workshop thematic analysis, a set of design specifications were developed that can be applied to the design of new digital musical instruments intended for use in real-world artistic practice. In addition to generating tangible elements for design, the theories and methods utilized, based in human-computer interaction and human-centered design, are offered as a possible model for merging imaginative idea generation with functional design outputs.

Digital musical instrument (DMI) design is a broad and interdisciplinary field (Miranda and Wanderley 2006). Designers engage in the development of new instruments

workshop methodology.

Probatio

Probatio is a system developed by Calegario et al. (2017) that is comprised of a set of physical modules and accompanying methodology for exploring ideas and developing proof-of-concept DMI prototypes. It is meant to address a few important issues that arise in DMI design: for one, it provides functional constraints to limit the endless possibilities and increased complexity that arises from the separated user input and sound production components of DMIs, which can lead to "creative paralysis" (Magnusson 2010). For another, it can help speed up and eliminate bottlenecks for iterative design, facilitating rapid design and evaluation cycles. The Probatio hardware consists of several control blocks, each featuring a different type of input control (ie., buttons, slider, crank, etc.), and different bases and structural supports that can accommodate variable configurations of the control blocks. The hardware is engineered so that the blocks attach magnetically and electrical connections are made automatically. Control signals are then mapped to sound synthesis software, making the prototype instantly playable as soon as one or more blocks are connected. An example Probatio prototype is shown in Figure 1a.

The methods that guide the use of the Probatio toolkit are based on Calegario's concept of *instrumental inheritance* in which aspects of existing instruments such as physical structures, playing techniques and specific types of input controls can be explored in different combinations and configurations, yielding entirely new instruments. A morphological chart (Cross 2000), shown in Figure 1b, assists the designer in this process, presenting different postures and controls that can be constructed with the Probatio hardware.
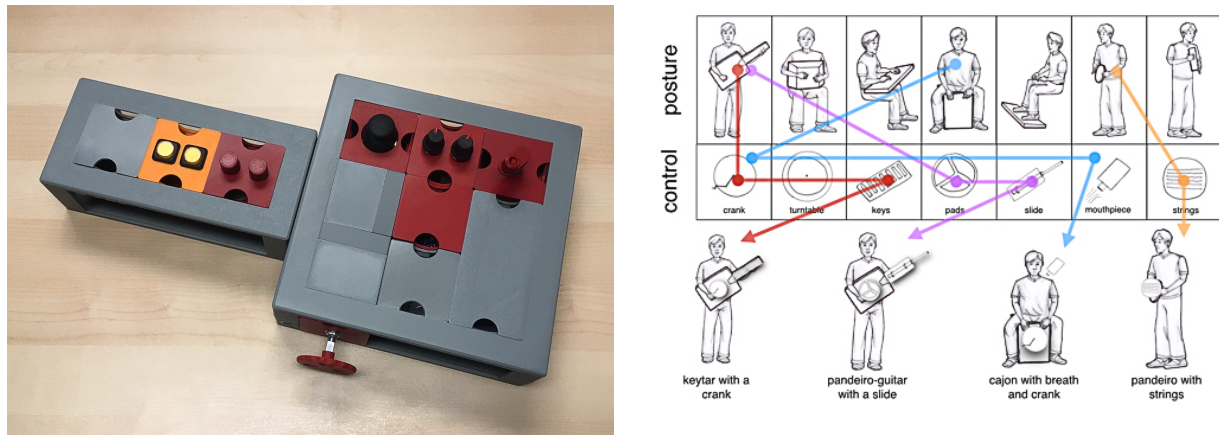
(a) A prototype constructed with a Probatio base, structural support and several control modules.

(b) Morphological chart suggesting new prototypes by combining features of existing instruments. Drawings by Giordano Cabral.

Figure 1. The Probatio toolkit, version 1.0, by Calegario et al. (2020).

Magic machines and design fiction

Another compelling approach to idea generation and prototyping for DMI design comes with "Magic Machine" workshops developed by Andersen (2017). The workshops "make use of the notion of technology as a 'magical unknown' as the starting point for a range of workshop techniques that begin with material exploration" (Blythe et al. 2016, p. 4971). In them, participants are prompted to make non-functional low-fi prototypes out of generic crafting materials like cardboard, wood, string, and glue. Once finished, they present their creations, demonstrating their use in imagined scenarios.

The Magic Machine workshops have some basis in design fiction, where concepts and problems can be explored through the development of imaginary scenarios and "fantasy prototypes" (Sterling 2009). Importantly, the artefacts that are generated (the non-functional prototypes) are not overly meaningful in and of themselves, and the ultimate aim is not solve any given problem. Rather, the processes of creating and engaging with the "magical unknown" serves "to give temporary body to concerns and questions [and] to consider the potential reality of a world in which such a thing might