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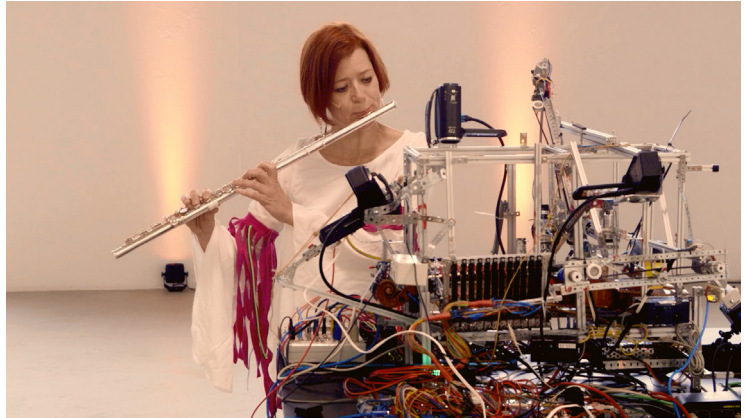
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## Approaches for Flute, Alto Flute and Interactive Violin Automaton

**Keywords:** Interactive, Automaton, Distancing, Violin, Flute

Even before the Corona Pandemic became known, I had the idea for an interactive piece with my violin automaton. One of the parameters for the communication was the distance of the player to the apparatus. Striking coincidence with social distancing and loneliness during lockdown. The title of the work has a double meaning: musical and physical approach of the flautist to the automaton.

On the one hand, the interactive system with the violin automaton represents a flexible improvisation system for the flutist. On the other hand, it is an enigmatic labyrinth in which the performer moves. The flutist assumes a responsibility for controlling the machine; in addition to making sense of her improvisation, the sound of the flute. Soloist Ms Karina Erhard was involved in the process of composition and technical optimization for months and provided valuable contributions. The piece is dedicated to her. The use of technology is rather playful and does not compare to robotics. The automaton allows extended sounds and rhythms by means of three bows, vibrato, percussion on the strings and ponticello. New sounds emerge from conflict rhythms between vibrato and tremolo. The offered video shows with many close-ups the interactions of the duo partners.

## Prehistory

*Approaches* is an interactive piece for flute and my self-constructed violin automaton. I have been performing with the automaton in galleries and on stages since 2012. Mostly by controlling the automaton from stored MIDI data, i.e. fixed media performances. Less often as formula improvisation in real time. Again and again instrumentalists approached me, who wanted to interact with this machine musically. This is how *Approaches* came into being as the first fully elaborated work with a flutist as a duo partner.

## Compose to Improvise

As is not unusual in creative processes, I not only composed, but also made parallel changes to the automaton. I aimed at the possibility of improvisation for the soloist. In general, one can prepare algorithms for interactions for this purpose. It would be more attractive if these were not static. However, I did not want to prescribe a time sequence (cues), but leave it to the soloist which of the prepared algorithms she chooses. This selection is done by approaching the sound sculpture from six different directions. The generated sensor signal selects the algorithm, additionally the measured distance is used in the algorithm (together with the flute signal). On the one hand, the interactive system with the violin automaton represents a flexible improvisation system in which the flutist can navigate. On the other hand, it is an enigmatic labyrinth in which the performer moves in order to reach musical “exits”.

## Additional Challenges for the Flutist

The flute playing is addressed to two receivers: the listener - as usual - and the machine. The flautist also takes responsibility for its response - far away from AI. In this configuration, the flute has a dual role: it controls the machine, but its playing should also function musically as a duet. There is a description of the reaction for the six movements, i.e. a score. The mostly very direct - but not trivial - reactions of the machine have led to considerable learning curves. Developing this requires difficult learning with surprises. The learning effects are the result of testing the reaction algorithms by playful improvisation of the flautist with the system. In parallel, the system was refined. This simultaneity in learning has demands not known in traditional music.

There you will find a stable and refined concept of traditional instruments and art of playing, which has been stabilized over the years.

## System Considerations

The technical game involves the step-by-step testing of the coupled system from many parts: G2M Pitch2MIDI module, the NI Reaktor panels, infrared distance sensors, the digital2CV converters for the fingers and bow motors. Conversely, the analog Control Voltage of the Infrared Sensors are converted back to MIDI by the Doepefer module. Not to forget the in-ear monitoring and head microphone transmitter for the flautist. Over many months, the builder and composer - also with the support of the flutist - refined control and hardware. My use of technology is rather playful and does not compare to industrial robotics. A mechanical-acoustic sound generator brings many limitations and challenges to the implementation. Even artifacts of the actuator are implemented musically: the strings are also played percussively. New sounds are also created with conflict rhythms between (frequency~) vibrato and (bow~) tremolo.

As “interactive music without loudspeakers” the concept stands in an exciting own development strand of sound art and visualization.

## Self-Understanding

With the violin automaton, every viewer finds his or her own approach, there are many of them: Do you want to see a parody of classical virtuosity or a protest against sweet string sound? The technical structure of the Automaton also has an improvisational character; after all, it is a work in progress that is constantly evolving. So the appropriation of different technologies and arts by a single artist? This contrasts with the modern industrial division of labour for software, firmware, system architecture, model making, 3D printing, rapid prototyping, mechatronics, quality management, production engineering, etc. What is sought is not the universal genius, but a coherently chosen combination of basic skills in various fields: Authoring technology, self-employment, musical instrument making. Not to forget craftsmanship and material procurement. A great fortune for the project is the fact that I can holistically control and optimize all technical components of the machine.