MACHINE MUSIC THROUGH THE EARS OF THE REPAIRMAN

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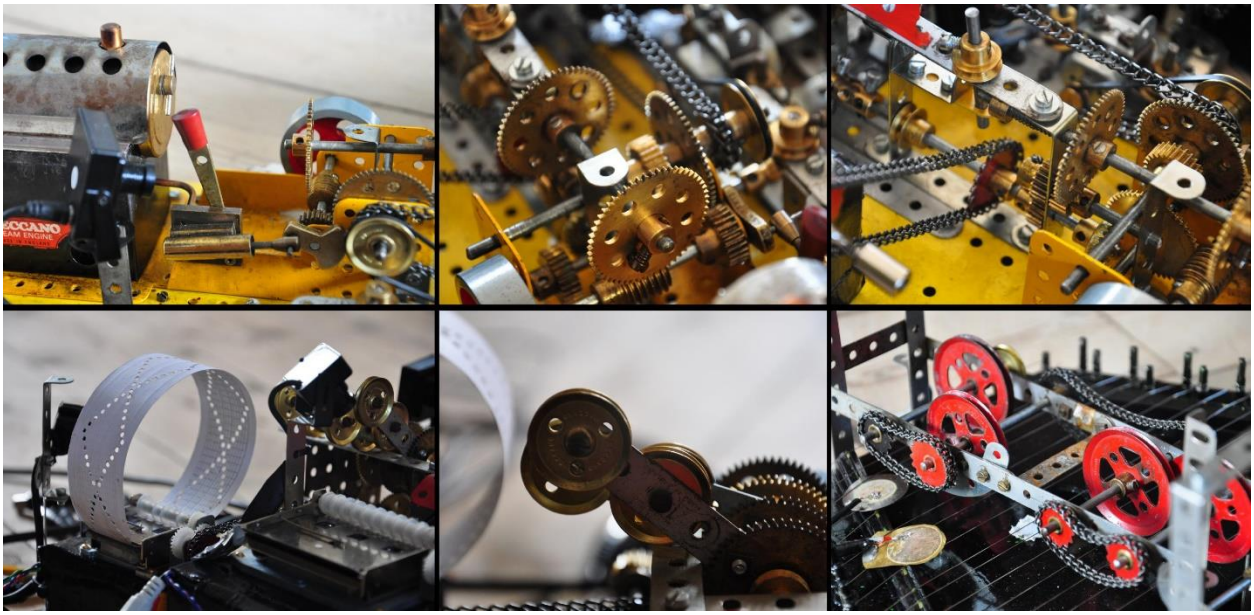
With its starting point in the homebuilt mechanical instrument *Steam Machine Music,* this paper will make a media archaeological examination of automatic musical instruments as experienced through the ears of the repairman. This will propose an alternative historical understanding of the relationship between musical content and its execution.



Steam Machine Music (2010) by Morten Riis, mechanical musical instrument. Copyright by author.

In this paper I will take on the role of the repairman. Both in terms of describing my musical performance *Steam Machine Music*, but also in relation of unfold an alternative history of automatic musical instruments that would give a tentative explanation of what kind of a role malfunction plays in the development of machine music. How can this history of the malfunctioning machine be used to give a broader, more diverse understanding of the way we tell the story of technology driven music.

Steam Machine Music is an automatic mechanical musical instrument built from vintage Meccano parts, and powered by a small steam engine. Taking on the role of the repairman in relation to this instruments performance practice would include taking care of issues such as thickness of the perforated paper, tension of the chains, steam pressure, maintaining power and energy level, oiling the cogwheels and dealing with the constant danger that the whole mechanism would jam. These construction and functionality related questions have been a constant challenge in the process of building and performing with this mechanical instrument. The instability of the entire mechanism is extremely noticeable, and displays and reflects the physicality of the real machine to an extreme degree. Everything is imminently

about to go wrong, a cogwheel that jams, a screw that loosens itself, a chain falling of, water running out, the loss of steam pressure, gas running out. One could state that this is physical mechanical glitch music, but in contrast to its post–digital counterpart, *Steam Machine Music* questions the whole practice and conceptualizing of machine music in a historical perspective that points to the fact that machines always have been malfunctioning, they have always broke down, there has always been a real physical mechanism that challenged the predetermined functionality of the machine. It has just somehow been forgotten or overlooked in our symbolic and deterministic focus of technology.

This traditional interpretation of machine music often regards technology in a symbolic sense that places the machine in a context where it is regarded as something that fulfills a predetermined task based on instructions mostly existing in a symbolic form such as code (text), notes or other symbolic representations of a desired functionality. In the attempt to frame these fundamental elements of electronic music, I ascribe to a media archaeological method, in which I will propose a different understanding of today's electronic music by making an archaeological examination of mechanical musical instruments. This is done by examining this history through the ears of the repairman, and listening to the voice of the machine itself opposed to the traditional 'musical' melodic output. In the history of the mechanical instruments the notion of 'machine sound' is as good as absent, but listening to these machines today and investigating alternative sources, it is evident that these machines are indeed not a silent mediator of a symbolic musical representation.

"Automatic instruments are documents," [1] as Fuller claims, but what sort of documents? The traditional musicological study of these mechanical instruments focuses on the distribution of musical repertory through a study of the tune list associated with the instruments, [1] and examining the various performing styles, melodic ornamentation and tempi. [2] As this musical data is regarded an authentic source to the musical performance practice of the time, nothing is mentioned about the performance practice of the mechanical instrument itself. The traditional method of analysing mechanical instruments is by examining the symbolic data inherent in the cylinders and perforated punch cards. These musical documents merely function as a symbolic database of past melodic and rhythmical general musical tendencies, but by fine–tuning the archaeological gaze towards the physical mechanism of the machine, it becomes evident that these mechanical instruments can tell us much more than the preferred tempi and tonalities of past popular tunes.

The following excavation will take a closer look at one of the most popular mechanical musical instrument of the 18th and 19th century, the cylinder music box, in an attempt to point towards an understanding that mechanical noise was an inherent part of the auditory experience of the mechanical musical instrument.

The Malfunctioning Cylinder Music Box

The cylinder music box is one of the, if not the, most popular mechanical musical instrument through the last three centuries, and its mass production has its birthplace in the western part of Switzerland in the 1790s were thousands and thousands were produced. [3] The music boxes come in a vast variation of sizes, shapes and designs, but the mechanism that produces the musical sound has maintained, with little variation, the same fundamental appearance and functionality: The tuned teeth in a steel music comb are plucked by metal pins arranged in the form of a musical composition on a revolving metal cylinder, driven by a mainspring. To power the cyclical musical box one or two spring motors were used with a key, a lever or a winding handle would wind. The energy of the spring is then transmitted to the

revolving cylinder by the use of a gear train mechanism. Special attention should be paid to a mechanism called the governor, which is a series of gears usually in connection to a form of a fan. This fan uses the air resistance to provide an effective way of regulating the speed of the cylinder, making it revolve at a constant tempo. [3]

Sources tell us that the cylinder music boxes had several unintended noises and errors that where typical and recurring phenomena in the daily use of these instruments. Noises and rattles that any musical box during the course of time will develop. [4] These mechanical noises are described as a grating noise due to the badly adjustment of the dampers that should dampen the comb. [5] The pins of the cylinder will also produce a harsh disagreeable sound if not properly oiled. [3] Furthermore if a cylinder pin comes in contact with a tooth on the comb, while it is still vibrating from a previous pin, a raspy, buzzing, harsh sound will be heard. [3] Also the effect of atmospheric conditions on the exact parts of the mechanism or the result of long use, led to tiny changes, which noticeably affected the performance. [6] Additionally one could mention that repairing broken pins on the cylinder, and broken teeth on the comb were a daily part of the music box repairman's routine. [4] Also at times it may be found that one of the wings of the air–brake mechanism (governor) on the endless screw is loose and will not stay in the exact position necessary for the movement to run at the correct speed. [5]

The *Mechanical Music Digest* archives [7] are an insightful source to the malfunctioning mechanical musical instrument. Hundreds of forum post from dedicated collectors and repairmen give an intensive insight into the world of these old instruments. Among other things the archive points towards some of the most common errors of the music box that is described as non–musical noises from the governor mechanism mechanical noise from the drive wheel together with buzzing sounds from the lid and the soundboard of the music box that sympathetically evolves into strong tones of the mechanical mechanism points towards the fragile malfunctioning reality of the music box.

A most detailed account for the malfunctioning music box is additionally found in C. H. Jacot: *How To Repair Musical Boxes – Practical Instructions to Watchmakers With Complete Illustrated Catalogue of Material*, third edition 1890 reprinted in. [8] In this popular repair guide (first two editions promptly sold out) we find accounts for how the repairman must insure that comb dampers are properly adjusted "otherwise the box will give certain disagreeable, whistling sounds, which greatly impair the effect of the music." [8] Also the repairman should be careful not to place the comb to close to the cylinder, which would result in the sound of the box will be harsh, and also remember that every screw must be fasten as firmly as possible in order to avoid rattling sounds. [8] Regular oiling of the cylinder pins and the rest of the mechanism in the musical box is required to prevent wear and screeching noises. [8] But the most dreadful scenario for the repairman is when the music box is said to "run". This phenomenon occurs when the cylinder is accidentally disconnected from the fly–wheel governor while the mainspring is still wound which results in the cylinder suddenly whirls with lightning speed resulting in parts breaking off, bending and breaking pins of the cylinder and teeth of the comb. Accordingly hundreds of boxes are ruined by this accident every year. [8]

These accounts of the malfunctioning tendencies found in the music boxes, clearly indicates that this mechanical instrument is not to be treated solely in a symbolic deterministic way.

Recordings of Mechanical Instruments

The actual sound of the automatic instrument can, besides experiencing the instruments live, be accessed through audio recordings. These recordings [9] are clearly auditory documents that tell the story of how 'unwanted' noises from the mechanism becomes very audible, and illustrate how mechanical noise and motor sounds become an integrated part of auditory experience of the mechanical instruments. Accompanying these recordings are liner notes that states "Every one of these instruments has a turbulent life behind it, and if this sometimes manifests itself in creaking, groaning or other authentic noises, this in no way dims the excitement of the acoustic experience." [9]

It is interesting to notice the use of a phrase such as "authentic noises" in this context, emphasising that the machine reveals its true self when it breaks or malfunctions. The authenticity is somehow connected to the failing machine, a machine that breaks down is somehow more true than a machine that functions perfectly accordingly to the anticipated functionality.

Constant Speed of the Music Box – Introducing Speed Regulation

Speed–regulating stands as one of the most important factors of the mechanical instrument, and at the same time the most difficult to ensure for the repairman. [6] Without regular revolving of the cylinder "the music would be worthless" as Kircher writes, quote from. [6]

The governor control mechanism used to regulate the speed of the music box has a long history that originate in the constant quest for more and more exact ordering of time. A quest that in many ways can be balanced with that of the symbolic deterministic ordering of the machine, thus more and more accurate timing ushers a stronger anticipation towards an exact comprehension of the machines functionality.

The self–regulating mechanism of the governor has of course a long and complex history, but in this context it is relevant to introduce the concept of 'resonant control'. This category of timekeeping uses the theory of an oscillating mechanism or material to ensure precise clock rate. These resonant elements come in a wide variety of forms, mechanical or electrical, where the gravity pendulum discovered by Galileo in 1583 starts the epoch of the resonant control. Later the development of electronic oscillator clocks and the quartz crystal resonator, invented in 1921, ensured even more precise timekeeping. [10] The quartz crystal was later used in computers to generate a steady and reliable clock frequency in CPU's. This steady clock is the basis on which all calculations are made; if the frequency becomes unstable it can have catastrophic consequences for the functionality of the digital system. [11]

The development of a more and more precise ordering of time has a profound impact on the way we construct our lives and routines, as Mumford states with the introduction of the "modern" mechanical clock in the 13th century, the machine changed forever modern civilization. [12] These clocks that first appeared in the European monasteries, placed a mechanical ordering of the twelve temporal hours of the day, but it also had a more profound meaning, namely as synchronizing the actions of men, and the bells of the clock tower almost defined urban existence. [12] Furthermore it is evidently that "The clock, not the steam–engine, is the key–machine of the modern industrial age," [12] and to elaborate on this statement it is the speed regulation, or the governor mechanism, that is the key mechanical concept in the ensuring of equal regulation of the machines functionality, thus creating and developing the sym-

bolic deterministic order of the machine. These regulating principles propose the possibility and development of the standardizing modern life. The accurate clock thus being "a new kind of power–machine, in which the source of power and the transmission were of such a nature, as to ensure the even flow of energy throughout the works and to make possible regular production and a standardized product." [12] In that way the notion of exact timing can be regarded as the foundation of the symbolic ordering.

Breakdown

The statement, "The only totally authentic medium is the functioning automatophone," [1] perfectly frames the traditional notion of how machine music has, and is regarded in a broad cultural context. But what of the malfunctioning automatophone? Is that not an authentic source too? By listening to the errors of the auditory history, by taking on the role of the mechanic one could reveal an inner hidden logic of the machine, and get closer to a more diverse and complex understanding of the machine. This notion that the machine reveals its logic when it breaks down is claimed by Benjamin [13] may in this context be regarded as a subscription to a real or physical ordering of the machine, which focuses on the malfunctions and irregularities, complementary to the symbolic notion of predetermined functionality. This predetermination relates to Wittgenstein's [14] account of the machine as symbol in which our comprehension of the predetermined movements in the machine as symbol is governed by the grammar of the language. It is included in the discourse surrounding the machine, more specific the use of certain words such as *have* and *must*, as seen in relation to the machines functionality. These linguistic constructions that are used to describe the machine, are maintaining the illusion of the predetermined actions contained in the machine, thus forcing us towards a symbolic comprehension of the machine, maintained by the discourse that surrounds it. And if we consider the components of the machine as figurative or symbolic representations, the movements of the machine will be no more relevant than the movement of the piece of paper it is drawn upon, thus completely disregarding the physical aspect of the machine.

This paper has very briefly introduced to the concept of machine music through the ears of the repairman. A story of automatic music in which the focus lies on the malfunction and irregularities of technology in contrast to the traditional history of technology that usually focuses on the benefits of new technological breakthroughs. With the history of failure many new possibilities present themselves in relation to account for the way we use and understand digital technology today. New possibilities that start with a breakdown.

References and Notes:

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