The Language of Music. A comparative survey of the evolution of musical instruments and notation systems

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Music is inherent in human nature. Every culture, however primitive, possesses unique musical manifestations. It is an innate form of human communication, sharing most characteristics with natural languages. A simile could be drawn between music and speech. As a matter of fact, the sixteen design features of human language formulated by Charles F. Hockett and Stuart A. Altmann [1] hold true for the language of music. This also proves that the production of sounds has an expressive power comparable to that of verbal codes of communication. Besides, vocal performances can make use of human languages, thus enriching meaning.

Despite Spanish scholar Isidore of Seville's claim that sounds cannot be written down [2], the development of notation systems has gone hand in hand with the appearance of literate civilisations and the increasing complexity of musical instruments and compositions.

Apart from the human voice (considered to be the first instrument), archaeological evidence suggests that the earliest instruments were rattles, drums and flutes. Until relatively recently, music production relied exclusively upon orality. Several causes have led to the introduction of music notation, and the sine qua non condition appears to be the previous development of literacy, representing a step beyond "standard" literacy. An increase of the complexity of music instrument appears to play an important role that should not be overlooked.

The first writing system (cuneiform) emerged in Sumeria around 3500 B.C. [3], no wonder the earliest known musical notation was found in the ancient Mesopotamian city of Nippur (modern Iraq) [4], which dates back to around 2000 B.C.. At the same time, Sumerian instruments (such as harps and lyres) had achieved an important degree of sophistication. Over the years, different cultures have given rise to different kinds of music notation, such as the quqin tablature already present in Tang Dynasty China, and the Greek letter pitch notation used in the Delphic Hymns (around the 2nd century B.C).

Among the advantages of using written notations is the fact that written records guarantee the persistence of music, avoiding its disappearance or further changes caused by orality, providing every single work with a fixed form. Furthermore, it is a learning aid for those mastering the particular notation used (to a degree, the presence of an instructor is not needed).

Staff notation has its roots in the neumatic notation used for Gregorian Chant in Mediaeval Europe [5]. If initially neumes had no lines, lines were progressively added to indicate pitch in a more precise way. For instance, Hucbald (c.840-930) introduced an improvement where two-lines were used to separate fifths, while Guido D'Arezzo (c. 991-1033), considered by many the father of staff notation, proposed a tetragram. The five-line staff we use today was adopted in 16th century France.

This type of notation is particularly appropriate for the so-called common practice music (also referred to as classical music), that spans from the 17th to the early 20th century. However, it has transcended both historical and geographical boundaries, being the most

widely used nowadays for all kinds of music. Alternate systems have survived mainly as a means of notating traditional music.

The 20th century saw the appearance of analog synthesizers as well as electric instruments, such as the theremin or the electric guitar [6], extending the possibilities for musical creation.

Indeed, thanks to synthesis, sound is no longer constrained by the physics of vibrating bodies, thus opening new directions for composers as well as designers of musical interfaces to explore. This has become especially evident since the advent of digital technology. Different timbres and instruments can be freely combined. At the same time, new approaches to modeling the language of music in formal ways have been fostered [7]. That is, music can be represented parametrically.

Instrument communication and control protocols such as MIDI (Musical Instrument Digital Interface) [8] or OSC (Open Sound Control) [9] are now widely used standards. In formats such as Standard MIDI File, music is structured as a series of tracks containing several events, in a way that it can be played back by a computer or a compatible instrument. The popularity of sequencing has increased significantly in the last few decades, to the point that expressive sequencing allows for the interchangeability between live performers and automated systems.

Unfortunately, most music composition applications do not go beyond piano roll or staff notation, which represents an important constraint.

Efforts towards new compositional environments are leading to graphic tools and languages such as MAX/MSP, Pure Data [10], and innovative multimedia interfaces, as is the case of the Virtual Score Project [11]. Analogously, the design of novel electronic musical interfaces has become a field of growing interest [12]. By using the term musical interface, we put emphasis on the broadening of the concept of instrument. New interfaces have changed the way we understand music composition and performance. The magic behind this new notion resides on the ease of implementation. Designing a controller is only bound by the imagination, and possible mappings between controller events and sound patterns are virtually endless.

This article deals with two aspects of music notation: firstly, the concept of music as a human language and musical notation as the “written form” for the language of music; secondly, the close relationship between the evolution of musical instruments and the different notation systems throughout human history, with a special emphasis on the latest developments. In addition, possible future lines of exploration are presented.

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