

## **Methodologies for Expressiveness Modelling of and for Music Performance** *Giovanni De Poli*

In this review paper, De Poli presents a thorough overview of the methodologies utilized in the modeling of music performance. He starts with a clear presentation of the basic issues involved in performance modeling. The discussion then turns to how musical information is represented in modeling, and finally, to the main strategies used in model development.

De Poli, taking nothing for granted, begins with a basic discussion of the forms and functions of models. In science, models serve both a descriptive and predictive role. A similar duality of roles exists in performance modeling, where models can either be used to explain performance practice or to generate expressive performances. Whereas science traditionally employs mathematical models, De Poli points out that in the realm of music performance, models can be considered as information-processing models which process three layers of information: 1. *physical information* that can be measured, such as timing or dynamics; 2. *symbolic information* such as the score; and 3. *expressive information* which is related to the emotional content of the music.

The problem then becomes one of how to represent these different types of information. De Poli notes that much of the physical information can be represented by numbers and is measurable through the use of MIDI instruments or the examination of recordings. However, there are many different ways one can measure such information, and differences in definitions of parameters often lead to confusion. With regard to symbolic information, the score is usually represented as a list of time events. Little has been done, however, to standardize a method of representing musical structure. The author also mentions that musical parameters can be represented as values of discrete time events, such as notes or structural units, or as functions of continuous time, as in the intensity curve of a crescendo.

Most studies of expressiveness focus on the systematic deviations from musical notation imparted by the performer for the sake of expression. The author notes that in speaking of deviation, we must define the reference from which we are deviating. Normally, the score is used as the reference. In the author's opinion, using a neutral, unexpressive performance of the piece as a reference often provides better results for judging how listeners evaluate expressiveness. This makes sense, since even a neutral performance will deviate somewhat from the score. Since this deviation theoretical has no expressive function, we should disregard it, and use neutral performances as our reference.

As mentioned above, performance models can be divided into two broad groups: those for understanding, and those for synthesis. Models for understanding have several different forms: 1. analysis by measurements, where analysis aims at recognizing regularities in deviation patterns in recorded human performances; 2. analysis by synthesis, where results from analysis by measurements are codified into a system of performance rules used to generate performances to be analyzed by listeners; 3. machine learning, where data algorithms scour large data sets for novel relationships without prior hypotheses; 4. case-based reasoning, where new problems are solved by examining similar previously solved problems; and 5. expression recognition models, where models attempt to extract and recognize expression in performances.

The findings of the above analysis models are often used for synthesis models of music. In several cases, rule-based expression systems were created from the findings of analysis models. Such models often attempt to "humanize" a synthesized performance by adding

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expressive deviation from the score. In addition, De Poli points out that modeling expression is useful for creating interactive performances in which the user can control the expressive parameters of a performance through a variety of interfaces.

Overall, De Poli presents a thorough, well-organized, and well-written review of modeling for expressive music performance. He takes little for granted, and explains the most basic concepts clearly and concisely. Too often, it is easy to become so immersed in a problem that the complexity clouds the goal that one is trying to achieve. De Poli's no-nonsense explanation of the purposes and forms of expressive performance modeling offers a refreshing perspective on a sometimes overwhelmingly complex task. I found his discussion of novel human-computer interfaces and their relation to music performance to be fascinating. It would be interesting to pursue further research into novel ways for people to interact with – and experience – expressive content in music.