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Toward a Virtual Composer Assistant

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Abstract

The topic addressed here is the role of emotions in music creation. This work presents research that is expected to become a precursor for the development of a software that will have the capacity to generate musical compositions at a human aesthetic level, and will serve as an intelligent creative assistant to a composer. The goal in this study is to develop a general cognitive model of music creation based on a semantic cognitive map of musical sounds, such as chords and their combinations. To achieve this goal, the basic theory of music needs to be analyzed first, and models of emotional perception of music need to be connected to it. Then, an empirical approach is undertaken to construct a semantic map, containing combinations of chords, allocated based on their emotional assessments. This semantic map will be further used as the central element in the creative assistant. Several options were explored in this study as a means of construction of the semantic maps. Preliminary results reported here provide an insight into an understanding of the principles of the future composer assistant. This emergent technology is scalable and potentially expandable to other domains of digital arts, including fine art and virtual dance.

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1 Introduction

It is known that the theory of music is to a certain extent connected with the theory of algorithms, i.e. it can be argued that the process of creation of music is algorithmic and obeys laws of logic [1-3]. However, on the other hand, it seems obvious that music is intimately related with emotional feelings, and therefore the process of aesthetic music creation must be impossible without an intuitive emotional component and personal feelings of the composer to the work that he creates.

The present work makes an attempt at resolving this apparent contradiction. The main task here is to develop a general model and an approach that would later allow us to design a creative assistant to the composer. This assistant should be implemented as a software agent: a *Cobot*, interacting with the

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composer via peripheral devices of a computer. The notion of a Cobot is different from an autonomous agent in that it is an extension of the human mind-body rather than an independent partner.

The task for this Cobot could be, e.g., to continue a started melody, or to create a suitable accompaniment to a given melody, using facts of music theory stored in it, together with a certain algorithm of music creation, while at the same time reacting to the emotional part of its interaction with the human composer. The central task in designing such a system is finding a solution to the problem of how to determine and store in memory the emotional assessment of music elements. We select an approach based on a weak semantic map [13]. Elements of this map are yet to be determined – see below. When selecting these elements, we need to take into account that each of them must have a definite emotional assessment by itself, in the general context of a given tonality. Therefore, this work is focused on the development of a semantic map of music, based on both theoretical and empirical data. The concept of the Cobot-assistant is described in Section 4.

2 Materials and methods

2.1 Theoretical Background

We start by recalling the basic theory of music, specifically, the theory of music creation and the notion of harmony [1,2]. The latter can be related to the notion of a language, "words" in which are patterns of simultaneous combinations* of tones. In this sense, an element of harmony is a chord, which is a combination of at least three sounds. Chords, however, are only a part of harmony. The general concept of harmony has an empirical nature and refers to the logical construction of sounds - combinations of tones – that do not create an "incorrect" sound or dissonant. Thus, not every combination of sounds is harmonic.

We shall regard elements of harmony as elements of a semantic map, the coordinates of which measure aesthetic feelings associated with these elements. Therefore, non-harmonic sounds do not belong to the map. One of our goals here is to characterize this map.

This consideration refers to the concept of harmonic sensation, since in reality the entire theory of musical perception is based precisely on the personal feelings of the composer and the listeners. The concept of harmonic sensation seems too subjective to be relied upon in an algorithm used to create music. Therefore, this is one of the biggest difficulties for us here - to determine, what kind of sensations this or that combination of musical elements, for example, chords, will produce. This determination can be done empirically – by polling a number of subjects, who listen to elements of harmony.

The theory of harmony leads to the following conclusions [1]:

1. A harmonious sensation arises not only with simultaneous sounding, but also with the sound of a series of tones;
2. Specific and total harmonic sensation occurs in the presence of a minimum of three colors, and tertian interval in this sense plays an important role;
3. The combination of two tones does not at all generate a sense of the chord or is perceived as an incomplete chord;
4. The second interval does not have the property of creating a chord sense. As an integral part, it complements the chord, acquiring a harmonic meaning, but in a separate form it does not give a presentation about the necessary addition. Most often, the second interval sounds dissonant and finally spoils the musical perception;
5. A dissonant combination can also cause a harmonious sensation.

* In general, by the term "combination" here we refer to a spatio-temporal pattern of sounds, with "space" being the pitch.