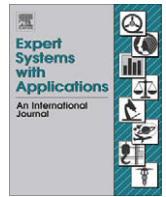




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Inmamusys: Intelligent multiagent music system

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ABSTRACT

Music generation is a complex task even for human beings. This paper describes a two level competitive/collaborative multiagent approach for autonomous, non-deterministic, computer music composition. Our aim is to build a high modular system that composes music on its own by using Experts Systems technology and rule-based systems principles. To do that, rules issued from musical knowledge are used and emotional inputs from the users are introduced. In fact, users are not allowed to directly control the composition process. Two main goals are sought after: investigating relationships between computers and emotions and how the latter can be represented into the former, and developing a framework for music composition that can be useful for future experiments. The system has been successfully tested by asking several people to match compositions with suggested emotions.

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1. Introduction

Surely music is one of the most difficult human disciplines. It requires creativity, specific knowledge and eventually, some manual abilities. It is commonly said that music is something humans do, but something we do not understand. There are several mechanisms involved in music and unfortunately, many of them are still unknown. Others are so complex that we cannot manage them with actual computer tools.

On the other hand, Computer Science has suffered a huge evolution in just a small period of time. However, despite all the great applications and problems solved during the last decades, there are many problems that computers are unable to deal with nowadays.

Among others, we can point fuzzy representation of abstract concepts and, in general, dealing with feelings and emotions. In fact, cognitive processes involving reasoning, knowledge and experience are hardly represented in a computer and are actual hot-spots for Artificial Intelligence.

Music is a good example of applied AI related with those topics. It has been demonstrated that music composition is a hard task even for humans, so using machines appears as a very interesting and fascinating area of research. AI techniques are going to be applied to the musical domain with the aim of understanding human musical abilities. Because there are so many challenges to deal with, a bottom-up approximation is required for solving all of them in a modular way.

The paper is organized as follows. In Section 2, we examine some previous works done in the field. Section 3 deals with the

architecture of the proposed system. In Section 4, we discuss design and implementation of system components. Section 5 presents an evaluation method and summarizes some users' impressions about the output; and in the last section, future work to be done is presented and discussed.

2. Background

Since first computers were developed many people have tried to apply them to musical tasks.

There are two main classes in which computer music projects could be classified: analysis and composition. The first one consists on extracting information from the music itself (or the associated data) in order to learn some rules, or go to a model that describes the concrete examples. Because this is not the main field of this paper, so we are not going to go further. However, [Anagnostopoulou and Westermann \(1997\)](#), and [Balaban \(1996\)](#) could be reviewed for more information.

Composition is about generating new music from the rules. In fact, is doing the process in the other way: 'from rules to music' instead of 'from music to rules'. According to [Pearce, Meredith, and Wiggins \(2002\)](#), the final objective of most of the compositional prototypes is to demonstrate that standard musical techniques could be handled by computer programming, and also to validate generative music theories.

Initial approaches in algorithmic composition consist on randomly selecting notes (mainly pitch and rhythm) with some constraints in order to generate compositions. This vision produced limited results but was a great point of departure for later works.

Experts system has been widely used to compose music. Rules concerning pitch, duration and volume have tried to apprise the

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