CO-ALGEBRAIC MODELING AS AN ADEQUATE MEANS FOR THE REPRESENTATION, RENDERING AND DISCUSSION OF TRANSCENDENTALLY DEFINED AESTHETIC OBJECTS

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Background

Employing modern techniques and technologies of computer-aided data processing in the field of musical analysis and theory essentially has two pre-requisites: (1) There has to be some flexible means of constructing digital, ie. mathematically founded models of the corpus in question, and (2) there must be an open architecture which allows the attachment of arbitrarily defined data to the corpus or to its sub-structures.

Aims

Ideally, any theorist, psychologist, poet, musical scientist, conductor, teacher etc. should be able to annotate (in principle) arbitrary contents to any single "musical event", and to define arbitrary new relations and groupings among events.

Only their domain expertise should be the measure, not the internal algebraic structures of the meta-model.

In practice it turns out that most of the existing representation systems for musical corpora, from academic as well as from industrial origin, do not ideally suit this task.

There are two fundamental deficiencies:

1) The basic meta-model for events (eg. some fixed set of "event parameters" and their domains) is hard-coded in the kernel, without the possibility of transparent extension or exchange. This severely limits expressiveness, esp. in case of avant-garde music using non-standard notations.

2) Partially defined objects can not be treated, so quotient algebras have to be used for modeling eg. pitch-classes without an octave or durations without any pitch. These quotient algebras are only known to the human user, and not integratable into the semantics of the system.

Main Contribution

Our analysis of the nature of the cultural phenomenon "musical score" revealed the necessity of mixing algebraic and co-algebraic data structures.

In our paper we present a constructive approach for explicitely modeling the co-algebraic relations, and make them first-order resident for the language architecture.

This yields

ISBN: 3-931852-66-0
ISSN: 1617-6847

1) maximum flexibility in the definition of basic parameter structures and possible relations of events,

2) “automatic” polymorphism of evaluation rules,

3) and easy embedding of function-valued parameters.

The latter is needed for two powerful abstractions:

(a) definition of dynamic and context-sensitive calculation rules as data, and (b) exchangeability of interpretations, versions and evaluation results without the need to physically duplicate the constant parts of the corpus.

The mathematical theory is presented and the issues of language design are discussed using concrete examples of application.

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