Computer Models of Musical Creativity?

Computer Models of Musical Creativity, David Cope, 2005, MIT Press

Attracting academic and media interest alike, David Cope's music generation software is showcased in this 2005 publication. The main focus of this attention has been the Experiments in Musical Intelligence system (EMI). EMI uses "recombinance" to generate new musical output from training examples: splitting music up into fragments then recombining them in stylistically appropriate ways (Chapter 4). Using detailed examples, Cope demonstrates how EMI uses recombinance to produce music in the style of particular composers, dealing with several musical issues such as balancing local note choices with global musical structure and identifying note patterns favoured by certain composers as stylistic "signatures".

EMI provides content for Chapter 4 only and is superceded by a new integrated suite of programs presented in Chapters 9-11, but seems to be the program Cope continually refers to when he does any reflection on his work. Cope admits that EMI "was never meant to model musical creativity"; one wonders why EMI appears so frequently in a book about modelling musical creativity.

Cope presents many other programs, placing source code for these on his website. Two programs to note are the Sorceror program (Chapter 5), which identifies re-occurring patterns in a collection of music, giving evidence for influence and links between composers, and a `spider' program called Serendipity (Chapter 8) that retrieves MIDI files from an online search that uses criteria determined by musical needs and other restrictions (e.g. the file must originate from a .edu domain). Strangely for a book on models of musical creativity, Cope generally does not discuss how his programs contribute to creativity. He acknowledges that "[n]one of the processes I have described thus far represent creativity" (p. 287).

A major contribution of this work is the SPEAC encoding for musical structure (Chapter 7). The initials in SPEAC stand for Statement, Preparation, Extension, Antecedent and Consequent. SPEAC categorises how musical fragments construct the overall structure of a piece of music. Cope describes SPEAC, gives examples and describes how SPEAC is relevant to computer composition as well as analysis, linking to computational musical creativity.

Cope continually states his definition of creativity, to guide his approach to modelling this ambiguous and complex concept. Creativity, according to Cope, is the "initialization of connections between two or more multifaceted things, ideas, or phenomena hitherto not otherwise considered actively connected" (p. 26 and elsewhere). This definition is not derived through a deep knowledge of creativity literature; Cope often shows ignorance of much of this literature. For example, Cope's assertion that "[m]ost books that deal with creativity in serious ways provide descriptions of the contributions of the human biological system. Axons, dendrites, ... and so on" (p. 7) may somewhat confuse Boden, Sternberg, Dartnall, Bringsford and Ferrucci, to name but a few significant contributors to the creativity literature that spring to mind instantly. Cope is however consistent in using this definition, though he sometimes throws in other definitions - which are never discussed or justified, just stated as fact (e.g. p. 79).

Cope often fails to engage with research in the areas that he is writing about reports upon, and in some cases shows complete unawareness or misinterpretation of the literature. For example, Cope shows very little awareness of current research topics in music informatics such as probabilistic methods of dealing with uncertainty rather than fuzzy logic (p. 73), expressive performance of music by computers (p. 112), beat tracking (p. 117) or machine learning in music (pp. 181-182, 203). Instead of trying to re-invent the wheel, Cope would have been well advised to consult, say, the proceedings of ISMIR (the leading conference for music information retrieval), which would highlight for him the latest advances in research areas like these and save him some considerable time, no doubt. Instead, Cope tries to deal with these issues on his own, with little success.

Clearly Cope does not engage with computer music research: for example he makes the somewhat laughable allusion that at a key conference for computer music research (ICMC), the audience was "confused and dislocated" by the music played by his systems, "since they had no previous comparable

experience" (p. 87). Cope is dismissive of the concept of computer musicians, laptop musicians, electro-acoustic music, and such like (p. 344).

Although Cope presents himself as a composer who has a firm grasp of computer science, and presents technical overviews according to this standpoint, he shows some non-trivial factual misunderstandings. In particular, Cope's take on neural networks (especially p. 69) and confusion about recursion (p. 307) should not have passed the MIT press peer review process. Chapter 9 sees one particularly amusing example: Cope describes "association networks" which he claims to have devised in the 1990s: databases of nodes, connected together with weights on the connections. In other words: graphs, which have been around rather longer than since the 1990s but which Cope appears completely oblivious to, apart from a token reference in an earlier chapter (p. 79).

Cope seems to be on more familiar territory with musicological matters. He presents musical analyses such as in Chapter 4 with simple and detailed explanations with appropriate examples. Still, though, there are some discrepancies of note. The most significant is Cope's use of EMI program to derive a Beethoven-style symphony from a database of previous Beethoven compositions, ignoring sketches for an unfinished symphony by Beethoven and musicological reconstructions of these sketches. This would cause musicologists some concern: Beethoven's style changed considerably over his lifetime.

In principle the structure of this book seems reasonable: contextualise the work, survey previous work leading up to the end product, then present the end product. However the reader is left waiting until Chapter 10 before they finally see any details of the musical model of creativity. It is not as if Cope has been building up to this model; on the contrary, in the nearly 300 preceding pages, Cope meanders from model to model, and from issue to issue, sometimes seemingly at random, with no apparent direction or construction of a growing body of supporting evidence to contextualise the end model. This book often comes across as a collection of individual papers, each written for a different audience and with a different style, together with an editorial introduction and conclusion chapter, with few links or comparisons made across different chapters until the final section.

Although each chapter is introduced with an illustrative anecdote, it is rare to see any chapter conclusions. Rather than assist the reader by summarising what was in that chapter and recapping the major points, Cope moves on without any reflection on what has been said, nor looking ahead. Along with his convoluted, variable and often opinionated writing style used, jumping from point to point and getting trapped in circular or irrelevant arguments (e.g. p. 21-22, 80-81), this makes the task of reading this book more difficult than it need be, at least for this reader.

This book is worth (selectively) reading, if you are interested in Music Informatics and you are armed with a good grip of fundamental basics in computer science and AI (this last point is a given for the readership of AISB, of course). As well as the programs and techniques highlighted above, Cope also gives (somewhat unintentionally) a deeply personal account of his reactions to negative criticism. Be prepared, however, to wade through confused narratives, hyperbole, discrepancies, factual errors and inconsistencies, as you read.