

# 10 Intelligent Music Composition

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## 10.1 Introduction

Automatic music composition is an enchanting field of research, inspiring both researchers and musicians. The implementation of systems that perform this task, incorporates an algorithmic part which makes decisions on which notes/sounds will be heard, when they will be heard, for how long and how loud. The intriguing part of automatic composition is the process of formulating such algorithms, in such a manner that the composed music is not too simple or too complex. Referring to the terms “simple” and “complex,” someone may find her/himself sort of words when speaking about music. Nevertheless, almost everyone can more easily express an opinion about the complexity of a certain music excerpt. This fact raises the question of how we may be sure that an automatic composition system composes too simple or too complex music. Additionally, how may we be able to compare the compositional capabilities of two such systems? Is there an objective criterion to characterize how “pleasant” is the music produced by such a machine?

These questions among others have led the research community toward a direction to construct systems that have inherited some kind of *intelligence*, which allows them to construct music with a pleasant blend of simplicity and complexity. Specifically, these machines incorporate an intelligent algorithm, which is commonly able to create mathematical objects that may vary from numeric values to abstract string sequences. The underlying intelligence of these algorithms forges the aforementioned objects in a manner that they either produce present rich and complex structure or comply with certain target characteristics defined by humans. These objects could then simply be mapped to the sonic domain and produce subjectively pleasant music, or adjust the parameters of music composition systems and lead the composition process to certain stylistic and sesthetic directions. This chapter presents several theoretic and technical aspects of such systems and proposes their categorization according to their intelligence and the way that this

# Swarm Intelligence And Bio Inspired Computation 10

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**Penousal Machado, Juan Romero, Gary  
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## **Swarm Intelligence And Bio Inspired Computation 10 Intelligent Music Composition:**

**Swarm Intelligence and Bio-Inspired Computation** Maximos A. Kaliakatsos-Papakostas, Andreas Floros, Michael N. Vrahatis, 2013-05-16 Automatic music composition has blossomed with the introduction of intelligent methodologies in computer science. Thereby many methodologies for automatic music composition have been or could be described as intelligent but what exactly is it that makes them intelligent. Furthermore is there any categorization of intelligent music composition IMC methodologies that is both consistent and descriptive. This chapter aims to provide some insights on what IMC methodologies are through proposing and analyzing a detailed categorization of them. Toward this perspective methodologies that incorporate bioinspired intelligent algorithms such as cellular automata, L systems, genetic algorithms, swarm intelligence among others as well as their combinations are considered and briefly reviewed. At the same time a consistent categorization of these methodologies is proposed taking into account the utilization of their intelligent algorithm in accordance to their overall compositional aims. To this end three main categories can be defined: the unsupervised, the supervised and the interactive IMC methodologies.

**Swarm Intelligence and Bio-Inspired Computation** Xin-She Yang, Zhihua Cui, Renbin Xiao, Amir Hossein Gandomi, Mehmet Karamanoglu, 2013-05-16 Swarm Intelligence and bio inspired computation have become increasing popular in the last two decades. Bio inspired algorithms such as ant colony algorithms, bat algorithms, bee algorithms, firefly algorithms, cuckoo search and particle swarm optimization have been applied in almost every area of science and engineering with a dramatic increase of number of relevant publications. This book reviews the latest developments in swarm intelligence and bio inspired computation from both the theory and application side, providing a complete resource that analyzes and discusses the latest and future trends in research directions. It can help new researchers to carry out timely research and inspire readers to develop new algorithms. With its impressive breadth and depth this book will be useful for advanced undergraduate students, PhD students and lecturers in computer science, engineering and science as well as researchers and engineers. Focuses on the introduction and analysis of key algorithms. Includes case studies for real world applications. Contains a balance of theory and applications so readers who are interested in either algorithm or applications will all benefit from this timely book.

**Artificial Intelligence and the Arts** Penousal Machado, Juan Romero, Gary Greenfield, 2021-10-13 Emotions, creativity, aesthetics, artistic behavior, divergent thoughts and curiosity are both fundamental to the human experience and instrumental in the development of human centered artificial intelligence systems that can relate, communicate and understand human motivations, desires and needs. In this book the editors put forward two core propositions: creative artistic behavior is one of the key challenges of artificial intelligence research and computer assisted creativity and human centered artificial intelligence systems are the driving forces for research in this area. The invited chapters examine computational creativity and more specifically systems that exhibit artistic behavior or can improve humans' creative and artistic abilities. The authors synthesize and reflect on current trends, identify

core challenges and opportunities and present novel contributions and applications in domains such as the visual arts music 3D environments and games The book will be valuable for researchers creatives and others engaged with the relationship between artificial intelligence and the arts *Evolutionary and Biologically Inspired Music, Sound, Art and Design* Colin Johnson,Adrian Carballal,João Correia,2015-03-14 This book constitutes the refereed proceedings of the 4th International Conference on Biologically Inspired Music Sound Art and Design EvoMUSART 2015 held in Copenhagen Denmark in April 2015 co located with the Evo 2015 events EuroGP EvoCOP and Evo Applications The 23 revised full papers presented were carefully reviewed and selected from 43 submissions They cover a wide range of topics and application areas including generative approaches to music graphics game content and narrative music information retrieval computational aesthetics the mechanics of interactive evolutionary computation and the art theory of evolutionary computation

**Evolutionary and Biologically Inspired Music, Sound, Art and Design** Penousal Machado,James McDermott,Adrian Carballal,2013-03-14

This book constitutes the refereed proceedings of the Second International Conference on Biologically Inspired Music Sound Art and Design EvoMUSART 2013 held in Vienna Austria in March 2013 colocated with the Evo 2013 events EuroGP EvoCOP EvoBIO and EvoApplications The 11 revised full papers and 5 poster papers presented were carefully reviewed and selected from 36 submissions They cover a wide range of topics and application areas including generative approaches to music graphics game content and narrative robot gait creation music information retrieval computational aesthetics the mechanics of interactive evolutionary computation and the art theory of evolutionary computation

[Handbook of Artificial Intelligence for Music](#) Eduardo Reck Miranda,2021-07-02 This book presents comprehensive coverage of the latest advances in research

into enabling machines to listen to and compose new music It includes chapters introducing what we know about human musical intelligence and on how this knowledge can be simulated with AI The development of interactive musical robots and emerging new approaches to AI based musical creativity are also introduced including brain computer music interfaces bio processors and quantum computing Artificial Intelligence AI technology permeates the music industry from management systems for recording studios to recommendation systems for online commercialization of music through the Internet Yet whereas AI for online music distribution is well advanced this book focuses on a largely unexplored application AI for creating the actual musical content

**Computational Intelligence in Music, Sound, Art and Design** João Correia,Vic Ciesielski,Antonios Liapis,2017-04-03 This book constitutes the refereed proceedings of the 6th International Conference on

Evolutionary Computation in Combinatorial Optimization EvoMUSART 2017 held in Amsterdam The Netherlands in April 2017 co located with the Evo 2017 events EuroGP EvoCOP and EvoApplications The 24 revised full papers presented were carefully reviewed and selected from 29 submissions The papers cover a wide range of topics and application areas including generative approaches to music graphics game content and narrative music information retrieval computational aesthetics the mechanics of interactive evolutionary computation computer aided design and the art theory of evolutionary computation

**Evolutionary Computer Music** Eduardo R. Miranda, John Al Biles, 2007-10-12 Musicians perhaps more than any other class of artists have always been acutely aware of the scientific developments of their time. From the discovery almost three thousand years ago of the direct relationship between the pitch of a note and the length of a string or pipe to the latest computer models of human musical cognition and intelligence musicians have always looked to science to provide new and challenging ways to study and compose music. With the great scientific advances being made in the field of evolutionary biology from new insights into the origins of humans and other species to complete mappings of the genes that control our growth and development a new approach to the study of music is emerging the evolutionary computation approach. This book features chapters on the interplay between Evolutionary Computation and Music by leading pioneers in the field.

*Sequential Decision-Making in Musical Intelligence* Elad Liebman, 2019-10-01 Over the past 60 years artificial intelligence has grown from an academic field of research to a ubiquitous array of tools used in everyday technology. Despite its many recent successes certain meaningful facets of computational intelligence have yet to be thoroughly explored such as a wide array of complex mental tasks that humans carry out easily yet are difficult for computers to mimic. A prime example of a domain in which human intelligence thrives but machine understanding is still fairly limited is music. Over recent decades many researchers have used computational tools to perform tasks like genre identification music summarization music database querying and melodic segmentation. While these are all useful algorithmic solutions we are still a long way from constructing complete music agents able to mimic at least partially the complexity with which humans approach music. One key aspect that hasn't been sufficiently studied is that of sequential decision making in musical intelligence. Addressing this gap the book focuses on two aspects of musical intelligence music recommendation and multi agent interaction in the context of music. Though motivated primarily by music related tasks and focusing largely on people's musical preferences the work presented in this book also establishes that insights from music specific case studies can also be applicable in other concrete social domains such as content recommendation. Showing the generality of insights from musical data in other contexts provides evidence for the utility of music domains as testbeds for the development of general artificial intelligence techniques. Ultimately this thesis demonstrates the overall value of taking a sequential decision making approach in settings previously unexplored from this perspective.

Experiments in Musical Intelligence David Cope, 1996 *Computational Intelligence in Music, Sound, Art and Design* Anikó Ekárt, Antonios Liapis, María Luz Castro Pena, 2019-03-27 This book constitutes the refereed proceedings of the 8th International Conference on Evolutionary Computation in Combinatorial Optimization EvoMUSART 2019 held in Leipzig Germany in April 2019 co-located with the Evo 2019 events EuroGP, EvoCOP and EvoApplications. The 16 revised full papers presented were carefully reviewed and selected from 24 submissions. The papers cover a wide range of topics and application areas including visual art and music generation analysis and interpretation sound synthesis architecture video poetry design and other creative tasks.

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