DOWNLOAD PDF INTRODUCTION TO MATERIALS AND STRUCTURE OF MUSIC

Chapter 1 : Introduction to Post-Tonal Music Analysis -Robert Kelley, Ph.D.

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In the origin of human life on Earth, the Stone Age, people used only natural materials, like stone, clay, skins, and wood. When people found copper and how to make it harder by alloying, the Bronze Age started about BC. The use of iron and steel, a stronger material that gave advantage in wars started at about BC. The next big step was the discovery of a cheap process to make steel around , which enabled the railroads and the building of the modern infrastructure of the industrial world. The combination of physics, chemistry, and the focus on the relationship between the properties of a material and its microstructure is the domain of Materials Science. The development of this science allowed designing materials and provided a knowledge base for the engineering applications Materials Engineering. At the atomic level: Gives different properties for graphite than diamond both forms of carbon. At the microscopic level: Gives different optical properties to transparent vs. Properties are the way the material responds to the environment. For instance, the mechanical, electrical and magnetic properties are the responses to mechanical, electrical and magnetic forces, respectively. Other important properties are thermal transmission of heat, heat capacity , optical absorption, transmission and scattering of light , and the chemical stability in contact with the environment like corrosion resistance. Processing of materials is the application of heat heat treatment , mechanical forces, etc. To be able to select a material for a given use based on considerations of cost and performance. To understand the limits of materials and the change of their properties with use. To be able to create a new material that will have some desirable properties. All engineering disciplines need to know about materials. Even the most "immaterial", like software or system engineering depend on the development of new materials, which in turn alter the economics, like software-hardware trade-offs. Increasing applications of system engineering are in materials manufacturing industrial engineering and complex environmental systems. One could classify them according to structure, or properties, or use. The one that we will use is according to the way the atoms are bound together: Metals are usually strong, conduct electricity and heat well and are opaque to light shiny if polished. Their electrical properties depend extremely strongly on minute proportions of contaminants. They are opaque to visible light but transparent to the infrared. They are usually combinations of metals or semiconductors with oxygen, nitrogen or carbon oxides, nitrides, and carbides. Other properties vary greatly. Other categories are not based on bonding. A particular microstructure identifies composites, made of different materials in intimate contact example: Biomaterials can be any type of material that is biocompatible and used, for instance, to replace human body parts. Examples are titanium alloys for supersonic airplanes, magnetic alloys for computer disks, special ceramics for the heat shield of the space shuttle, etc. Hypersonic flight requires materials that are light, strong and resist high temperatures. Optical communications require optical fibers that absorb light negligibly.

DOWNLOAD PDF INTRODUCTION TO MATERIALS AND STRUCTURE OF MUSIC

Chapter 2 : - Introduction to materials and structure of music by William Christ

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Introduction[edit] Different materials have different properties. Think of the difference between the engine of a car and its wheels; the metal in a wire and its insulator. All these objects can only be made out of materials that have properties suited to their application. Materials science is the study of the properties of materials. It focuses on the factors that make one material different from another. Understandably, there are many such factors, some obvious and some subtle. Examples of these factors might include elemental composition, arrangement, bonding, impurities, surface structure, length scale and so on. Today, materials science is a multidisciplinary subject. It draws upon just about every field of science and engineering, providing insights for other researchers to use in their field. This book is aimed at those studying materials science at the undergraduate level in university whether as their major field or as a single module of a related engineering course. Materials science is an interdisciplinary field involving the properties of matter and its applications to various areas of science and engineering. It includes elements of applied physics and chemistry, as well as chemical, mechanical, civil and electrical engineering. With significant media attention to nanoscience and nanotechnology in the recent years, materials science has been propelled to the forefront at many universities, sometimes controversially. The choice material of a given era is often its defining point: Materials science is one of the oldest forms of engineering and applied science. Modern materials science evolved directly from metallurgy, which itself evolved from mining. A major breakthrough in the understanding of materials occurred in the late 19th century, when Willard Gibbs demonstrated that thermodynamic properties relating to atomic structure in various phases are related to the physical properties of the material. Important elements of modern materials science are a product of the space race: Materials science has driven, and been driven by, the development of revolutionary technologies such as plastics, semiconductors, and biomaterials. Before the s and in some cases decades after , many materials science departments were named metallurgy departments, from a 19th and early 20th century emphasis on metals. The field has since broadened to include every class of materials, including: In materials science, rather than haphazardly looking for and discovering materials and exploiting their properties, one instead aims to understand materials fundamentally so that new materials with the desired properties can be created. The basis of all materials science involves relating the desired properties and relative performance of a material in a certain application to the structure of the atoms and phases in that material through characterization. The major determinants of the structure of a material and thus of its properties are its constituent chemical elements and the way in which it has been processed into its final form. An old adage in materials science says: The manufacture of a perfect crystal of a material is physically impossible. Instead materials scientists manipulate the defects in crystalline materials such as precipitates, grain boundaries Hall-Petch relationship , interstitial atoms, vacancies or substitutional atoms, creating a material with the desired properties. Not all materials have a regular crystal structure. Polymers display varying degrees of crystallinity. Glasses, some ceramics, and many natural materials are amorphous, not possessing any long-range order in their atomic arrangements. These materials are much harder to engineer than crystalline materials. Polymers are a mixed case, and their study commonly combines elements of chemical and statistical thermodynamics to give thermodynamical, rather than mechanical descriptions of physical properties. In addition to industrial interest, materials science has gradually developed into a field which provides tests for condensed matter or solid state theories. New physics emerges because of the diverse new material properties needed to be explained. Radical materials advances can drive the creation of new products or even new industries, but stable industries also employ materials scientists to make incremental improvements and troubleshoot issues with currently used materials. Industrial applications of materials science include materials design, cost-benefit tradeoffs in industrial production of materials, processing techniques casting, rolling, welding, ion implantation, crystal growth, thin-film deposition, sintering, glassblowing, etc. Thus, the extraction and purification techniques employed in the extraction of iron in the blast furnace will have an impact of the quality of steel that may be produced. The overlap between physics and materials science has led to the offshoot field of materials physics, which is concerned with the physical properties of materials. The approach is generally more macroscopic and applied than in condensed matter physics. See the important publications in materials physics for more details on this field of study. Alloys of metals is an important and significant part of materials science. Of all the metallic alloys in use today, the alloys of iron steel, stainless steel, cast iron, tool steel, alloy steels make up the largest proportion both by quantity and commercial value. Iron alloyed with various weight percentages of carbon gives low, mid and high carbon steels. For the steels, the hardness and tensile strength of the steel is directly related to the amount of carbon present, while increasing carbon levels lead to lower ductility and toughness. The addition of silicon and graphitization will produce cast irons although some cast irons are made precisely with no graphitization. Other significant metallic alloys are those of aluminium, titanium, copper and magnesium. The alloys of aluminium, titanium and magnesium are also known and valued for their high strength to weight ratios and, in the case of magnesium, their ability to provide electromagnetic shielding. These materials find special applications where high strength-weight ratios are desired aero-space industry. Other than metals, polymers and ceramics are also an important part of material science. Polymers are the raw materials the resins used to make what we commonly call plastics. Plastics are actually the final product after many polymers and additives have been processed and shaped into a final shape and form. Polymers that have been around and are in current widespread use include polyethylene, polypropylene, polyvinyl-chloride, polystyrene, nylons, polyesters, acrylics, polyurethane, polycarbonates. Plastics are generally classified as "commodity", "specialty" and "engineering" plastics. PVC is a commodity plastic, it is widely used, low cost and annual quantities are huge. It lends itself to an incredible array of applications, from faux leather to electrical insulation to cabling to packaging and vessels. Its fabrication and processing are simple and well-established. The versatility of PVC is due to the wide range of additives that it accepts. Additives in polymer science refers to the chemicals and compounds added to the polymer base to modify its physical and material properties. Engineering plastics are valued for their superior strengths and other special material properties. They are usually not used for disposable applications, unlike commodity plastics. Specialty plastics are really the materials with unique characteristics, such as ultrahigh strength, electrical conductivity, electro-florescence, high thermal stability, etc. It should be noted here that the dividing line between the various types of plastics is not based on material but rather their properties and applications. For instance, polypropylene PP is a cheap, slippery polymer commonly used to make disposable shopping bags and trash bags. Another application of material science in industry is the making of composite materials. Composite materials are structured materials composed of at least two different macroscopic phases. An example would be steel-reinforced concrete. Also, take a look at the plastic casing of your telly set, cell-phone:

Chapter 3 : BBC - GCSE Bitesize: Structure

Introduction to materials and structure of music by Christ, William. Jan 01, Fair. pb as sown.

Thus, it will be easier to understand music and the physics that accompany it up to whatever level suits your needs. Music history and the physics of sound are included for students who wish to expand their knowledge beyond that of learning a single instrument. Anyone wishing to write music using music notation software is well-advised to understand what we humans hear and why we hear it the way we do. Music theory is a lot like grammar. Languages are invented for the purpose of communicating. Most of the time we communicate with others, while there are times when we communicate with ourselves. Mozart and only a very rare group of other people were able to keep everything organized in their heads. Most people need to keep a notebook to remind them of what they have learned. And a course such as this relies upon everyone being "on the same page," if we are going to learn together, which is the best way to learn. While this course will benefit the lone learner, learning with others is often a better approach, and that can be done online -- and for free. DRM What is music? Music is a general melody of sounds that unify the mind and soul. Not even language differences can stop music from reaching out to our selected audience. Even before recorded history, people created music, whether through drumming, singing or chanting. Some of our strongest emotions may be brought on by listening to a piece of music. In this modern age, we hear music around us almost all of our waking hours, in one form or another: Most of us listen to recorded music or go to performances regularly, and some of us play a musical instrument. In earlier time modern audio recording technology, music was available only in the presence of a musician, or to those who played an instrument or sang. Musical concepts[edit] A basic definition of music in the Western World is the chronological organisation of sounds; that is, making certain sounds at certain times, which make melodic, rhythmic and harmonic sense. The first, most basic concept, is keeping the sounds "in time". This leads us to some of the first few musical concepts: Rhythm is essentially repeated patterns of long or short, stressed or unstressed sounds or silences which fit into the main beat. Duration is the length of notes or sounds or silences which facilitate the rhythm. Music is also the relationship between sound and silence. Duration and rhythm apply to silence in the same manner as they apply to sound. One way to look at how we perceive music is as horizontal and vertical patterns. We hear melodies as a horizontal pattern. The notes and silences are heard one after the other over a period of time. We hear chords groups of notes played simultaneously in a vertical pattern. A mixture of one or all of these: Rhythm[edit] Rhythm is the most basic concept of music. In all cultures worldwide, the most simple and basic forms of music are purely rhythms. A rhythm is a pulse; a repetition of sounds in a pattern. Simple rhythms can be recognized straight away. Tapping rhythmically at a drum constitutes tapping it at timed intervals in a pattern. This is where four pulses come one after the other, with the first of each four being given emphasis known as an accent. Say the words "one, two, three, four, one, two, three, four Now each time you say "one", say it slightly louder: You have just been saying the words "one", "two", "three" and "four" in 4.

Chapter 4 : Introduction to music - Wikiversity

Materials and Structure of Music, Volume II William B. Christ. out of 5 stars 1. Hardcover. 40 offers from $ Next. Customers who bought this item also bought.

Semiconductor device processing and thin films. To teach students the elementary relationships between structure, properties, processing and performance of materials that are essential for understanding the role of materials in the design of engineering systems. To introduce students to the various classes of materials metals, ceramics, polymers, semiconductors, composites and their fundamental chemical and structural nature. To illustrate application of thermodynamics through phase diagrams and kinetics through diffusion to the design of materials and their properties. To introduce students to the functional properties of materials and the roles that microstructure, defects, and environment play in typical engineering applications. To introduce students to manufacturing methods for engineering materials. To stimulate student interest in and appreciation of Materials Science and Engineering by critical examination of engineering case studies. Using concepts of inter-atomic bonding, be able to predict fundamental physical properties of different classes of materials. For a particular crystal structure, determine the crystallographic directions and planes, and the linear and planar atomic densities. Related plastic deformation and cold work to strength of metals. From fracture toughness, mechanical strength and loading configuration of a material component, calculate the maximum tolerable flaw size within a practical safety factor. Given a binary phase diagram and a particular alloy composition at a given temperature, determine the phases expected to be present, and calculate their compositions and the volume fraction of each phase. For a binary eutectic phase diagram, determine the microstructures expected for various alloy compositions cooled from the melt at different cooling rates. Using the concept of a TTT diagram, determine the heat treatment of a eutectoid steel required to produce a specified strength, hardness and ductility. Demonstrate knowledge of the relation between semiconductor conductivity and band gap energy states. Demonstrate ability to relate structure of polymers to properties and processing methods. Demonstrate relationship of composite properties to the properties of constituents. Demonstrate ability to predict corrosion behavior of materials. Be able to assess appropriate manufacturing methods for diverse items from various materials. In-class closed-book exams and quizzes test outcomes for individual students. Weekly problem sets test outcomes under less time pressure and with allowable student collaboration. Weekly discussion sections for student-instructor interaction on learning. End-of-term written evaluations by students allow instructor to improve the next offering of the course.

Chapter 5 : Chapter Introduction

Materials And Structures Of Music Workbook Volume Ii Twitpic, dear twitpic community thank you for all the wonderful photos you have taken over the years we have now placed twitpic in an archived state.

The numbering is arbitrary in that 0 could just as easily be assigned to A-flat as it is to C. However, the use of integers 0 â€” 11 is not arbitrary, as it makes the mod arithmetic that is characteristic of the mod group possible and applicable to the musical scale. Forte assumed two additional types of equivalence related to collections: Transpositional equivalence Inversional equivalence Transpositional equivalence has also been in place in tonal theory. In other words, an F-major triad and an A-major triad are highly related in sound, and thus equivalent at some level. The operation of addition mod on the pitch classes in the set corresponds to transposition of the chord or melody represented by the set. Inversional equivalence is the most problematic of all of the equivalence assumptions made so far. If the collection is flipped upside down, it retains the same interval content as before, however the chord also can sound somewhat different. For example, if a major triad is inverted, it becomes a minor triad. There is equivalence because they both contain one perfect fifth fourth , one major third minor sixth , and one minor third major sixth. However, in most musical contexts they are distinguished because of their difference in sound rather than their equivalence. So in the case of inversional equivalence, the equivalence will be assumed for the purposes of identifying pc sets by their equivalence classes , but it may often be more useful to distinguish between a sonority and its inversion. The number of possible combinations without equivalence classes is astronomical. All members of any equivalence class can be reduced to this prime form by a single method. One can determine the set class of any collection of pitch classes using the Set Analyzer Applet. The technique for determining the equivalence class of a pc set without the use of the Set Analyzer is to follow the technique given below, and then look up the result in the table. Procecure for finding Normal Form from Straus, see Bibliography: Excluding doublings, write the pitch classes ascending within an octave. There will be as many different ways of doing this as there are pitch classes in the set, since an ordering can begin on any of the pitch classes in the set. Choose the ordering that has the smallest interval from first to last from the lowest to highest. If there is a tie under Rule 2, choose the ordering that is most packed to the left. To determine which is most packed to the left, compare the intervals between the first and second-to-last notes. If there is still a tie, compare the intervals between the first and third-to-last notes, and so on. If the application of Rule 3 still results in a tie, then choose the ordering beginning with the pitch class represented by the smallest integer. So we select [C , F, A] as the normal form since its first pitch class is 1, which is lower than 5 or 9. Procedure for finding Prime Form from Straus: Put the set into normal form see above. Transpose the set so that the first element is 0. Invert the set and repeat steps 1 and 2. Compare the results of step 2 and step 3; whichever is more packed to the left is the prime form. Some important terms and concepts in atonal theory that are not explicitly mentioned above are briefly defined in the Post-Functional Theory Terminology glossary. The analysis of music based on parsing melodies and chords into these small collections of pitch classes is useful in non-functional music where no serial process is involved, and also it can be useful in analyzing the construction of a particular tone row and the atonal results of its use in a complex work. The next section of this brief tutorial describes the history, function, and structure of the tone row. The Twelve-Tone Method One of the most dominating ideas in twentieth century music has been the development of techniques for systematic ordering of musical events. The row, or series, must contain all twelve pitch-classes of the chromatic scale in a specific and predetermined order with no repetitions of any one pitch-class. The total number of row forms, or permutations, is forty-eight and can be represented concisely in a form of chart called a matrix. Consistently atonal treatment of the row requires that no notes be doubled at the octave, tonal melodic or harmonic elements intervals are to be avoided, and no note should be sustained to the point where it becomes a focal pitch. In order to maintain uniformity of musical material one must make exclusive use of one series per composition. The four possible row forms are given by the four directions in which one can read the row notes off of the matrix for a given row. It is important to remember that a tone row is an ordered set of pcs, while a pitch class set is unordered. Prime Form First, the prime form of the row not to be confused with prime form of a pc set is read from the matrix from left to right. As there are 12 possible transpositions of the row, there are twelve left-to-right rows as opposed to columns in the matrix. The transpositions of the prime form of the row are labelled with the letter P and the pc number of the first pc in the row form P0, P3, etc. Inversion Inversion is the operation of turning the melody contour upside down, as if across a horizontal line of symmetry. The inversion forms are called by the letter I followed by the number of the first pitch class I3, I8, etc. Retrograde The retrograde, or backward form of the row, is the third possible manipulation that can be used in serial composition. Since it is simply the reverse of the prime form, it is most conveniently found in a matrix by reading the desired transposition of the prime form backwards from right to left. Because there is a one-to-one correspondence between the prime forms and the retrograde forms that are their backwards-renditions, the retrograde forms are labelled with an R and the number of the pc that ends the row form R3, etc. This is so that R0 is always the retrograde of P0 and not some other row form. Retrograde-Inversion The final operation that can be performed on a tone row is retrograde inversion. As this upside down and backwards presentation of a tone row is simply the inversion form in reverse, it is found on the matrix by reading the desired transposition of the inversion form backwards from bottom to top. Once again the retrograde-inversion transpositions will be labelled with RI plus the pc number that ends the row form RI3, etc. Thus RI0 is always the reverse of I0. To see how a matrix looks and functions, please try the Matrix Generator applet. To see a complete list of rows used in the works of Schoenberg, Webern, and Berg, see jlondon carleton. Next, some of the more advanced concepts with relation to serial music will be briefly summarized. Advanced Twelve-tone Techniques The twelve-tone technique quickly gave rise to several further developments of the system that help to promote consistency in atonal music. Combinatoriality The first of these advanced techniques of twelve-tone composition, hexachordal combinatoriality, was first used by Schoenberg, although the specific terminology and the full extent of its possible uses were only adopted later by serial composer Milton Babbitt. The Set Analyzer , when the first six notes of P0 and I5 are entered, will analyze them as literal complements. This is accomplished by using intervallic similarity within the row with the intention of making two or more of the row forms identical. To see this in action, try entering the chromatic scale 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, T, E into the Matrix Generator , and see how this reduces the number of unique row forms. An ancillary side-effect of this technique is that invariant rows are also combinatorial. Series with Fewer than Twelve Tones Many who tried twelve-tone composition also experimented with applying the technique to sets of fewer than twelve tones. When Russian composer Igor Stravinsky began to compose using the twelve-tone technique in the early s, some of his pieces successfully displayed serialism with fewer than twelve pitch-classes. This technique allows all 12 transpositions of the row forms to be seen, even if analytically extraneous pitch classes appear in the matrix. Many other more recent composers have experimented with serial technique within an extended not always harmonically functional tonal language. Carrying the Serial Process into All Other Parameters of the Music Serialism, as defined as a musical trend encompassing more organizing principles than the twelve-tone system alone, came into full force around in association with the Darmstadt International Summer Course for New Music in Germany. The process of serializing musical elements other than pitch involves the selection of twelve or however many elements are in the series used in the piece rhythmic values, dynamic levels, types of attacks, etc. The row orderings are then followed in adding all of these parameters to the music. The complexity and algorithmic precision of such composition techniques led composers to try allowing computers to carry out the compositional process once the series has been selected. Contour Analysis Post-tonal music that eschews tonal functionality certainly demands more of its audience because of the relative difficulty in perceiving harmonic relations without tonal function. Often listeners are forced at least before intensively studying a work to attend to more primitive meaning-creating structures that exist in music, based on perameters independent of harmony, diatonicism, intervallic size, and tonal content. These features of the music, including rhythm, motive, shape, and gesture, are often associated with the relative height of pitches regardless of pitch class or intervallic content. The techniques of contour analysis are designed to offer insights into the non-pitch-specific aspects of all music, both tonal and post-functional. CSEGs and contour class Equivalence Contour analysis thus ignores the exact notes and intervals of the musical material, instead attending to which notes are higher and lower. A contour segment CSEG , is a numeric representation of the relative heights the notes in any melody or melodic fragment. It is an ordered collection, with as many elements as there are notes n , each numbered from lowest to highest beginning with 0 according to the height of the note within the segment. This shows the motivic unity between these two melodic fragments, while ignoring their differences. The two pc sets and have different but similar interval vectors. Like twelve-tone rows, these ordered collections can be inverted, retrograded, and retrograde-inverted and still retain their motivic identity. However, it also abstracts the general shape of longer melodic segments before determining the prime form. The process by which longer melodies can be reduced to simpler contours was introduced by Robert Morris. The first and last c-pitches are never reduced out, and the process is recursive, repruning the CSEG until it can be reduced no further all c-pitches are maxima or minima. A useful example of the application of contour analysis is given by Joseph Straus.

Chapter 6 : Song Structure Examples

Introduction to Materials. This section will provide a basic introduction to materials and material fabrication processing. It is important that NDT personnel have some background in material science for a couple of reasons.

Chapter 7 : An Introduction to Materials Studio

It should be noted that music based on text (songs, opera, etc.) is only partly governed by these principles of musical form: the structure of the text (or the drama, in the case of opera) will determine many formal decisions in these genres.

Chapter 8 : Introduction to Musical Composition | Music and Theater Arts | MIT OpenCourseWare

You don't need to be a musician to understand the basic elements of music. Anyone who appreciates music will benefit from learning how to identify music's building blocks. Music may be soft or loud, slow or fast, and regular or irregular in tempoâ€”all of these are evidence of a performer.

Chapter 9 : William Ennis Thomson - Wikipedia

William Ennis Thomson (born) is an American music educator at the collegiate level, music theorist, composer, former Music School Dean and Professor at the Thornton School of Music, University of Southern California from to