Genre and Music Information Retrieval

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Introduction

Genre has been called the most popular music description (Aucouturier & Pachet, 2006, p. 83, Pachet & Cazaly, 2000, p. 2, Holt, 2007, p. 19), recognizable within 250 milliseconds of listening (Gjerdingen & Perrott, 2008, p. 98), and the governing factor in the layout of music stores (Holt, 2007, p. 28) and structure of music corporations (Negus, 1999, p. 47-50). Despite the universality of genre as a form of description, there are maddening contradictions and glaring biases involved in defining *musical genre*.

Genre as a musical category has existed for centuries. Though, as Christopher Dawes discusses in his M.A. Thesis, in the 18th and 19th centuries, it was primarily

> a formal (i.e. 'sonata'), instrumentational (i.e. 'string quartet') or applicational (i.e. 'dance music', *tafelmusik*, etc.) system of locating compositions in established structures of Western music (2008, p. 12).

A paradigmatic shift in the meaning of genre took place in the 20th century, transitioning from an emphasis on typology to an emphasis on aesthetic experience, "drawing context and consumer into an equation that previously had involved only the composer, the composition, and their forebears" (ibid., p. 13). Over the last century, genre has been swept up by the music industry, used as a marketing mechanism and as a framework for radio "formats," inserting its own ideology and biases into the genre formula.

Today, the challenge of identifying and explaining *musical genre* has gained interest in the academic community, while in the private sector, corporations have developed strategies and technologies to gather information on music and music listeners. A number of current strategies strive to provide online music recommendations for

consumers, using large databases, consisting of descriptive "tags" for artists and their works. Representations of these descriptions are a common sight on websites today, be it Amazon, YouTube, or Last.fm. Called 'tag clouds,' they have become common throughout the web and created the ability to view genre usage by different groups of people, as can be seen in figure 1 (in this case, the entire Last.fm usership).

These technologies and others have expanded the use and proliferation of *musical genre*. Contemporary definitions of genre emphasize the social interaction (Fabbri 1982, 1999; Frith 1996; Negus, 1999; Holt, 2007) at the same time that "social network sites" have blossomed in the era of "Web 2.0." Valuable insights from these technologies can perhaps be gained about the formation, evolution, definition, and visibility of *musical genre*.

This paper will introduce a number of important considerations in the analysis and definition of *musical genre*, including conventions, distinctions and the role of the culture industries. The second part of the paper will focus on music information retrieval (MIR), a new field, which attempts to organize music in the "information" and "digital" age for consumers and music lovers. A final discussion will draw together the two topics, presenting some daunting challenges to both and posing questions about the future of music "experts," the trustworthiness of mass tastes, and the burgeoning ability to accommodate individual tastes.

Figure 1: Last.fm tag cloud of all genre tags (Celma, 2008)

3rd wave ska 60s pop 77 style punk 80s 80s hair metal 80s hardcore 80s metal 80s Pop 80s rock 8bit 90s pop 90s Rock abstract hip-hop Acid acid house acid jazz Adult Alternative adult contemporary afrobeat Aggrotech album rock alt country alt rock Alt-country alt-rock alternative Alternative and punk alternative country alternative dance alternative metal alternative pop alternative pop-rock alternative rap alternative rock ambient ambient black metal ambient pop Ambient Techno American Punk anarcho punk angura kei anti-folk antifolk apocalyptic folk arena rock art punk art rock art-rock artcore atmospheric ambient atmospheric black metal Atmospheric metal Avant-Garde Avant-Garde Jazz Avant-garde Metal Avant-Prog Avantgarde Metal baroque baroque pop bass batcave battle metal beatdown beats bebop Belgian music Big Band big beat bitpop black death metal black metal black music black y pagan metal Blackened Death Metal bluegrass blues blues rock blues-rock bop Bossa Nova brazilian rock breakbeat breakcore brit pop brit rock Brit-pop british folk british invasion British Metal British Punk british rock britpop Britrock Broken Beat brutal brutal death Brutal Death Metal C-pop cabaret cello rock celtic celtic metal celtic punk celtic rock chamber pop chanson Chicago Blues chick rock chiptune Christian Hardcore christian metal Christian Metalcore christian rock classic Classic Blues classic country classic jazz classic metal Classic Punk classic rock Classical classique club club-dance college rock Comedy Rock Contemporary contemporary christian contemporary classical contemporary jazz contemporary rnb cool jazz country country rock country-rock cpop crack rock steady crazy Crunk Crust crust punk Cyber Metal cybergrind cyberpunk d-beat dance dance punk dance rock dance-pop dance-punk dark dark ambient dark cabaret dark electro dark folk Dark metal dark wave darkwave death death doom Death Doom Metal death metal death punk death rock death-doom metal death-grind death-thrash metal deathcore deathgrind deathrock deep ambient deep house delta blues depressive black metal depressive rock desert rock detroit techno deutschpunk Deutschrap Deutschrock digital hardcore Dirty South Disco dnb Doom doom metal downbeat downtempo dream pop dreampop Drill n Bass drone drone doom drone metal Drum and bass Drum n Bass dub dubstep east coast rap Eastern Europe Rock ebm electro Electro Pop electro-industrial electro-pop Electro-Rock Electroclash Electrojazz electronic electronic dub Electronic Pop electronic rock electronica electropop electropunk elektro emo Emo rock emo violence emocore epic black metal epic metal euro trance eurobeat eurodance Europop experimental metal Experimental Rock experimental techno Extreme Metal Extreme Power Metal fado fantasy fantasy metal Female fronted metal finnish metal finnish rock Flamenco folk folk and viking metal Folk Black Metal folk metal folk noir folk punk folk rock folk-punk folk-rock folktronica freak folk free jazz french house french pop French Rock frenchcore funeral doom funeral doom metal funk funk metal Funk Rock Fusion future pop futurepop G-funk gangsta Gangsta Rap Garage Punk Garage Rock geek rock German hip hop german hip-hop german hiphop German metal German Metalcore german rock Girl Rock glam Glam Metal glam rock glitch goa Goa Trance goregrind gospel goth goth metal goth rock gothenburg metal Gothic Gothic Doom Metal Gothic Metal Gothic Rock Grime Grind grindcore groove groove metal Grunge guitar rock gypsy punk hair metal happy hardcore Hard Bop hard rock Hard Trance hardcore Hardcore and Metalcore hardcore punk hardcore rap hardrock hardstyle Harsh EBM heavy metal heavy rock hip hop Hip-Hop hip-hop and rap hiphop horror punk Horrorcore House idm indie indie electronic indie folk Indie Hip Hop indie pop indie rap indie rock indie-pop Indie-Rock indiepop Indietronic indietronica industrial industrial black metal Industrial Death Metal industrial jungle pussy punk industrial metal industrial rock instrumental hip-hop instrumental metal instrumental rock Irish Folk Irish Punk italian pop J-Indie J-music j-pop J-rock j-urban jam band jangle pop japanese Japanese Indie Japanese pop japanese rock jazz jazz funk jazz fusion Jazz Hop jazz metal jazz piano Jazz Rock jazz vocal jazz-rock jazzy JPop jrock jungle k-pop kills nu-metal ten times over Klassik klezmer Kpop krautrock latin latin jazz Latin Rock liquid funk Lo-Fi lounge Love Metal mallcore martial industrial math math metal math rock mathcore MathMetal melodeath melodic black metal melodic death Melodic Death Metal melodic hardcore melodic metal melodic metalcore Melodic Power Metal melodic punk melodic rock Mendigao thrash metal metalcore microhouse minimal minimal techno minimalism minimalist Mittelalter modern country modern jazz modern metal modern rock motown mpb nederhop neo classical Neo Soul neo-classical neo-classical metal neo-folk Neo-prog Neo-Psychedelia Neo-Soul neoclassic neoclassical neofolk nerdcore neurofunk new age new metal new rave new wave New Wave of British Heavy Metal New Weird America New York Punk new-age ninja tune Nintendocore no wave noise noise pop noise rock noise-rock noisecore nordic metal northern soul norwegian Norwegian Black Metal norwegian metal not emo NOT METAL not rock nouvelle scene francaise nsbm nu jazz Nu Metal nu soul nu-jazz Nu-metal nujazz numetal NWOBHM Oi old school old school death metal Old school Hardcore old school industrial Old School Punk old school rap oldschool hardcore opera opera metal organic ambient oshare kei outlaw country p-funk pagan black metal pagan metal peace punk polish hip-hop polish punk polish rock political punk political rap Polski Hip Hop pop Pop Metal pop punk pop rock Pop-punk Pop-Rock poprock porngrind Post Grunge post hardcore Post punk post rock Post-Black Metal Post-Bop post-emo post-grunge post-hardcore Post-Metal post-punk post-rock postpunk postrock Power metal power pop power violence powernoise powerpop powerviolence prog metal prog rock Prog-Rock Progressive progressive black metal progressive death metal Progressive House Progressive metal progressive power metal Progressive rock progressive trance proto punk proto-punk psy Psychedelia psychedelic psychedelic folk Psychedelic Rock psychedelic trance psychill psychobilly psytrance pub rock punk punk cabaret punk pop Punk Revival punk rock Punk-Pop Punk-Rock punkrock r and b r&b ragga Raggacore rap Rap and Hip Hop Rap and Hip-Hop rap metal rap-metal Rap-Rock rapcore Rave raw black metal real hip hop Real hip-hop real metal real screamo reggae reggae-dub-ska Retro rhythm and blues riot grrl riot grrrl ritual ambient rnb rock Rock and Roll Rock Argentino rock argento rock francais rock n roll rock opera rockabilly rocksteady roots reggae russian alternative russian rock sadcore salsa samba scandinavian metal screamo Semi-Ambient shibuya-kei Shock Rock shoegaze shoegazer sid metal ska ska punk ska-punk skacore skapunk skate punk skatepunk slowcore Sludge sludge metal Smooth Jazz soft rock soul southern rap Southern Rock space age pop Space Ambient space music space rock Spanish Metal spanish pop Spanish Rock speed metal stoner doom stoner metal Stoner Rock Straight Edge straight edge hardcore street punk streetpunk sub pop Suicidal Black Metal suomirock Surf surf rock Swedish Death Metal Swedish Metal Swedish Pop Swedish Punk swing symphonic Symphonic Black Metal symphonic metal symphonic power metal symphonic prog Symphonic Rock synth pop synth rock synth-pop Synth-Rock synthpop tango tech metal technical death Technical Death Metal Technical Metal Technical Thrash Metal techno teen pop terror ebm thrash thrash metal thrashcore Traditional Doom Metal trance trash metal tribal ambient trip hop trip-hop triphop Troll Metal tropicalia true black metal true metal True Norwegian Black Metal true punk turkish rock turntablism twee pop UK hip hop underground underground hip hop underground hip-hop underground rap urban video game video game music viking metal visual kei vocal house vocal jazz vocal trance West Coast Rap wizard rock world world fusion World Music wristslitters

Definitions of Genre

At a basic level, genre is a type of category that refers to a particular kind of music within a distinctive cultural web of production, circulation, and signification. That is to say, genre is not only 'in the music,' but also in the minds and bodies of particular groups of people who share certain conventions. These conventions are created in relation to particular musical texts and artists and the contexts in which they are performed and experienced (Holt, 2007, p.2).

Genre is intrinsically ill-defined and attempts at defining genre precisely have a strong tendency to end up in circular, ungrounded projections of fantasies (Aucouturier & Pachet, 2006, p. 1).

Simon Frith, in his chapter on genre poses two questions music industry representatives would ask of musicians before deciding whether to produce, market and distribute their music: "what does it sound like?" and "who will buy it?" (Frith, 1996, p. 75-76). This roughly fits Dawes' distinction between the older typological definition of genre and the contemporary addition of aesthetics to the meaning of genre. These two questions will guide the discourse of this paper (though, "who will listen to it?" and "what does it mean to people?" might be a better way of asking the second question).

"What does it sound like?"

In the late 1990s, Robert Gjerdingen and David Perrott ran an experiment at Northwestern University to investigate the average person's ability to identify the genre of a song (2008). They used only ten genres, and very small sound clips, ranging from 250-475 ms with a 3000 ms clip as a ceiling. The results showed that participants were able to choose the same genre as chosen by music companies 70% of the time after listening to the 3000 ms clips, and that for the other clips, 50% to 54% agreed with their 3000 ms classification. In their discussion, the authors note that the smaller clips constitute a time interval so short that it is highly unlikely that listeners could discern genre from features such as rhythm, melody or harmony, and yet their recognition rates are well above chance (ibid.).

They suggest that timbre "can be highly indicative of particular genres" (ibid.). However, research into automatic genre classification by Jean-Julien Aucouturier has questioned the link between genre and timbre (Aucouturier & Pachet, 2003). This inquiry uses examples of timbres shared across disparate genres, and genres with multiple timbres. He states that the "correlation between genre classes and timbre similarity can be very poor" (ibid., p. 92).

Aucouturier's negative summation has much to do with the limitations of automatic musical analysis. Timbre, represented by a global frequency of a track, can present obvious distinctions between Classical music and Techno, but can sometimes offer no valuable information for the difference between a Rock song and a Pop song, which use the same instrumentation (ibid., p. 88). He also states

a unique set of features describing timbre is not optimal to classify different

genres: jazz is very well classified when looking only at high frequencies, while

techno needs looking only at bass frequencies (and gets very confused with rock,

say, if high frequencies are included in the feature set) (ibid.).

So even though musical cues, in particular those of specific instruments, can be used as

shortcuts to quick categorization (Gjerdingen & Perrott, 2008, p. 94), exactly what

conventions we are listening for vary from genre to genre and seem to be guided by more

than pure instrument recognition.

In another paper, Aucouturier addresses the relationship between physical audio

signals and everyday musical terms (Aucouturier, 2007). He notes many semantic

dimensions to these terms, referring to them as high-level descriptions. Many abstract

terms are used to describe music in everyday communication. Fabian Holt describes how

we map descriptions from our physical, spatial and temporal mental spaces onto music,

using terms like "cool" and "dark" in the physical realm, "high" and "low" in the spatial

realm, and in the temporal realm, writers often describe how genres are "born," "mature,"

and "die" (Holt, 2007, p. 14). Throughout Aucouturier's paper, he questions the

connection between these symbolic descriptions and observable physical sounds, asking

whether we really *hear* constructs like genre or whether we *know* or *infer* them from non-

musical information (2007, p. 6).

Indeed, there does seem to be an area where the social and sonic meet, are

intertwined, and sometimes impossible to separate in our descriptions of music. We can

build high-level abstractions that rely on shared preconceived notions of particular

aspects of an artist's or song's sonic profile, and then use these abstractions as descriptors

in their own right. When we then label this abstraction as the name of an artist, as is

commonly done in everyday musical communication, the lines between social and sonic

become blurred. Assuming that the communicating partner knows the artist in question, there is still great ambiguity in what a person means. For example, "this sounds like Tom Waits," could refer to his gravelly voice, his eclectic instrumentation, the use of distorted guitar-driven swamp-blues vamps, his dabbling in Eastern European-influenced circus music, his early cabaret and torch song material, his notability and longevity as a singer/songwriter (and all the individual social and sonic associations carried by the phrase) or all of the above.

Cory McKay and Ichiro Fujinaga have discussed how even within a song, different sections could represent different genres in different ways, or how the effect of genres being woven together in one piece could represent another genre unto itself (2006, p. 2). "This sounds like Stairway To Heaven" could refer to the musical texture created by the acoustic guitar and recorders in the introduction, the rhythmic pulse and electrified tonalities at the end of the song, the minor melody, cynical vocals, or the multiple sections emblematic of other rock "anthems" of its era like Lynyrd Skynyrd's "Free Bird" or Queen's "Bohemian Rhapsody."

Culture

Implicit in the post-modern conception of genre is an understanding that music is embedded in culture. "Cultural values, rituals, practices, territories, traditions, and groups of people" are parts of genre identity, necessary to understand the social and historical dimensions ignored by music analysis alone (Holt, 2007, p. 19). Many authors have emphasized this element in their definitions of genre. Steve Neale, coming from a

film perspective, frames genre as a social process, as "systems of orientations, expectations and conventions that circulate between industry, text and subject" (Neale, 1980, p. 19). Franco Fabbri's most recent definition of genre states that it is "a kind of music, as it is acknowledged by a community for any reason or purpose or criteria" (1999, p. 4). Simon Frith describes *genre world* as "the complex interplay of musicians, listeners, and mediating ideologues" involved "in the formation of popular genre-consciousness" (Frith, 1996, p. 88), and Fabian Holt, building off of Neale and Frith uses the term "*genre culture* as a concept for the overall identity of the cultural formations in which a genre is constituted" (2007, p. 19). Holt introduces and defines *collectivities* as the synthesis of "interconnected processes of musical and social specialization… in various kinds of group affiliations" (ibid., p. 21).

Conventions & Expectation

Fabbri was one of the first to propose a theory of popular *musical genre*, originally defining it as "a set of musical events (real or possible) whose course is governed by a definite set of socially accepted rules" (1982, p. 52). He proposed five dimensions of rules, including formal and technical rules, describing musical form and sonic characteristics of genres; semiotic rules, describing the way "meaning" is conveyed; behavioral rules, describing performance rituals; social and ideological rules, referring to the image of the musicians and the relationship of a musical community to the rest of the world; and economical and juridical rules, describing the means of production of a genre (ibid., p. 54-59; Frith, 1996, p. 91-93). Because some genres can

emphasize certain rules over others, he suggested the creation of a matrix "with rows of rules and columns of genres, in which each single element *a i j* would indicate the value of the rule *i* for the genre *j*" (Fabbri, 1982, p. 54).

Negus and Frith (1996, p. 91-93) critique Fabbri's theory for being too rigid, Negus noting "genres are often experienced as dynamic and changing rather than rule-bound and static" (1998, p. 26). Holt, referring to the complexity of "communication and signification" in genre networks, states that "it is impossible to distill this totality into a single theory and model of analysis" (2007, p. 22), but goes on to frame the conventions of genre in terms of codes, shared values and practices (ibid, p. 22-24).

Holt describes two processes involved in the evolution of genre: "They have been *founded* (and *codified*) in . . . 'center collectivities,' and they have changed through *further negotiations*" (ibid., p. 20). Describing the birth of genre, Fabbri states that "transgressions to the rules of other genres" become codified as a new "characteristic group of rules" (1982, p. 60-61). In his final chapter, Negus puts forth his own theory of genre creation drawing on the work of Ruth Finnegan and Ulf Hannerz regarding the creative process and its relationship to genre conventions. Motivation to create can be inspired by a sense of fulfillment from working within the changing conventions of genre, or conversely spurred on by a sense of frustration with these norms (Negus, 1999, 180-181). These same ideas apply to the listening experience, where expectation is derived from musical codes and conventions. Frith makes a similar assertion: "disappointment is likely *both* when [expectations] are not met *and* when they are met all too predictably" (1996, p. 94). These theories explain why some genres never die

(despite claims to the contrary), and how new genres are formed by breaking boundaries and creating different meaning systems.

Exclusivity

Though new genres often share the codes of other genres, the cultural identities underlying them identify as distinct and separate from other genre cultures. Simon Frith says that

> genres initially flourish on a sense of exclusivity; they are as much (if not more) concerned to keep people out as in. The industry aim is to retain the promise of exclusivity, the hint of generic secrets, while making them available to everyone (1996, p. 88).

As mentioned above, music is embedded in culture, and it is not surprising that dynamics between genre cultures would reflect larger cultural dynamics like exclusivity. Paul DiMaggio argues that the arts have been used as major exclusionary tools in the United States for over a century (1987, p. 446). The distinction between "high" and "popular" art accomplished by the establishment of institutions, such as museums and metropolitan orchestras, by the commercial elite quickened and advanced the codification of "ritual and organizational boundaries separating artist from audience, culture from commerce, the tasteful from the tasteless" (ibid.). Bethany Bryson has researched the connection between musical dislike and class, education level, and political attitude, proposing, "individuals use cultural taste to reinforce symbolic boundaries between themselves and categories of people they dislike" (1996, p. 885). She finds a strong

positive association between musical exclusiveness and political intolerance, greater musical tolerance among highly educated people, and remarks that the four most disliked genres overall (rap, heavy metal, country, and gospel) each have a strong association with low education (ibid., p. 895).

Though based in cultural distinctions between genre cultures, the exclusionary forces at work in genre are often articulated through musical differences (whether accurate or not). This is how Pachet and Cazaly designed their taxonomy of *musical genre*, with the notion of exclusivity as a central guiding principle. Aptly named differentialism, "an approach in which the meaning of terms is not given by. . . some objective element of the world, but simply by a description of how the taxon differs from other taxons" (2000, p. 5).

There is a further economic incentive for differentiation and exclusivity as it creates a larger menu of choices for the consumer. Steve Neale argues that

> it is important to stress the financial advantages to the film industry of an aesthetic regime based on regulated difference, contained variety, pre-sold expectations, and the re-use of resources in labour and materials (1990, p.78).

Large music corporations have assimilated this idea into a "portfolio management" strategy of production, where the business is diversified and structured over many different socio-musical distinctions analogous to genre (Negus, 1999, p. 47-50; 1998, p. 360).

Cultural Industry

A central theme of Keith Negus' research into the connections between *musical genre*s and corporate cultures is that "an industry produces culture and culture produces an industry" (Negus, 1999, p. 14). Music companies structure themselves along cultural lines in the form of different divisions (Rock, Latin, R&B), and the people within these divisions, be they A&R staff or executives, are in large part responsible for "shaping the conditions within which particular genre practices and creative techniques come to be adopted" (ibid., p. 24). Negus carefully notes that many others "participate in the making of… 'genre cultures'" (ibid., p. 3), a point that Gjerdingen and Perrott echo in their work, pointing out that "while the music industry may attempt to guide and perhaps control the names of music genres, its efforts often lag behind what is happening 'on the street'" (2008, p. 94). They argue that neither record company nor consumer have a good grasp of the complexity and dynamics of genre (ibid.).

The idea that "industry produces culture" stems from the work of Theodor Adorno and Max Horkheimer (1979; Adorno, 1991; Adorno, 2002), first published in German during the late 1930s and early 1940s, in which they put forth a Marxian critique of the industries that create cultural products such as film and music. Whereas Negus' view is of a reciprocal relationship between society and these industries, Adorno/Horkheimer see a one-sided, exploitative manipulation by industry of society, transforming it into a dangerously docile mass culture, and refashioning art and culture as products. Richard Leppert describes this view in the introduction to his collection of Adorno's essays on music.

> In modernity, culture rendered self-reflexive is culture for sale; culture 'spoken
> of' has regressed to its own advertising, functioning spatially as a terrain for

maximizing economic development and the social structures to achieve it. Once

named, in other words culture is transformed from a process to a product. Culture

becomes business, and as such it requires administration at once to render it 'safe'

for consumption, as so that it will in fact be consumed (Adorno, 2002, p. 45).

Paul DiMaggio in his research into the classification of art, separates ritual classification

from cultural industry classification and breaks down the latter into commercial,

professional, and administrative principles, accounting for the classification strategies of

the music industry, music critics and artists, and the government, respectively.

DiMaggio, in a similar sentiment as Negus, Gjerdingen and Perrott, situates these

classifications as firmly "subordinate to ritual processes," which "operate on the societal

level" and respond "to social-structurally generated consumer demand, whereas the other

processes [culture industry classifications] reflect factors that influence production"

(1987, p. 450).

A key to the commodification of culture in Adorno and Horkheimer's critique

revolves around the standardization and commodification of cultural products. In the

Dialectic of Enlightenment, they state*:*

Culture as a common denominator already contains in embryo that schematization

and process of cataloging and classification which bring culture within the sphere

of administration. And it is precisely the industrialized, the consequent,

subsumption which entirely accords with this notion of culture (Adorno, 1979, p.

131).

Since Adorno and Horkheimer's time, the music industry has grown significantly, and

reorganized itself along social-musical boundaries (Negus, 1999). In the last two

decades, the mechanisms of production and consumption of music have undergone drastic changes, and in the resulting expansion of available music, focus in the academic and corporate sectors has shifted to *musical genre*.

This distinction mentioned above, between typology and aesthetic has been illustrated through two paths of thought on genre: the way it sounds, and what it means to people. Another area where this kind of distinction can be seen is in the basic data strategies of the music information retrieval industry: content-based analysis strategies and collaborative-based strategies.

Music Information Retrieval

Michael Fingerhut has described the development of a new sector of the music industry dubbed music information retrieval (MIR) (2004). MIR is a fairly new multi-disciplinary field drawing on computer science, audio signal processing, music cognition, music analysis, intellectual-property law and the sociology and economics of music (Fingerhut, 2004, p. 6; Music Information Retrieval, 2008). The increased availability of musical contents in digital form, both in storage capabilities and in transmission through networks, and faster methods for processing contents as well as producing "meaning" has created a need for "actions, methods and procedures for recovering stored data to provide information on music" (Fingerhut 2004, p. 2). MIR addresses the same problem one encounters when entering a record shop or video store—a sense of futility given the choices and not knowing where to start—but on a much higher order, with millions of songs available. It is a daunting task, which as Aucouturier and Pampalk note

is a moving target. Our goal is to design algorithms and systems that can simulate and assist human judgements that are inherently subjective, dynamic, contextualized in a society and a personal history, motivated rather than predicted" (Aucouturier. & Pampalk, 2008, p. 6).

The algorithms of MIR are often closely guarded trade secrets, and therefore impossible to analyze in a published account. However, examining what information these companies are collecting can yield important insight into the type of recommendations they are providing.

Collaborative Filtering

The most familiar and widely implemented recommender system, termed "collaborative filtering" by its creators (Resnick, 1997, p.56), dates back to 1992 when the Tapestry project and later, in 1994, the GroupLens project at the University of Minnesota, were developed to filter email and news, utilizing user feedback rather than descriptions of the content (Fox, 2007, p. 11). Collaborative systems compare users' ratings or recommendations of objects instead of characteristics of objects (Burke, 2000, p. 332). User feedback, called relevance feedback, plays a key role in these systems "learning" what a user wants, most often through binary choices like "I like it" and "I don't like it" or ratings scales like "4/5 stars" (Fox, Alexandra 2007, p. 11-12). Questions like how to measure relevance, what level of trust to give to user ratings, and how to treat new unrated items riddle these systems (ibid., p. 14).

Their independence of machine-readable representations of the objects is cited as their greatest strength by Robin Burke, working well "for complex objects such as music and movies where variations in taste are responsible for much of the variation in preferences" (Burke, 2000, p. 333). How these complex objects are connected remains a mystery to the user, as Paul Lamere notices, commenting that "these systems cannot offer any more detailed explanation of why an item was recommended beyond the simplistic 'people who liked artist X, also liked artist Y,'" (2008, p.1). Another common complaint of collaborative systems involves the quality of recommendations for users with complex tastes. The simpler a user's rankings profile, the better the recommendations. As users' profiles reach larger proportions (or if their tastes are too eclectic to begin with), their recommendations can be negatively effected by the diversity of their preferences (Aucouturier & Pachet, 2003, p. 91).

Collaborative filtering works well for someone looking for very popular music, or the "hits," and can be seen in the recommendations on sites like Amazon.com. These are accurate recommendations for the type of listening experience mentioned earlier in this paper where people seek fulfillment within established conventions. Sometimes this type of recommendation can push beyond the limits of "hits."

Chris Anderson gives an example of how a book, *Into Thin Air*, by Jon Krakauer launched the success of a similar book, *Touching the Void,* by Joe Simpson (2005, p. 15-16). Users began positively comparing Simpson's book, which was published a decade before and almost out of print, to Krakauer's book, which was receiving positive press (ibid.). A trend of users buying both books triggered Amazon's software, recommending

Simpson's book to users interested in Krakauer's book (ibid.). Sales of Simpson's book climbed, eventually eclipsing those of Krakauer's book (Anderson, 2005, p. 15).

Anderson coined the term "the long tail" to describe this phenomenon, later writing a book of the same title (2006). Anderson proposes that the future digital entertainment economy will focus on niches rather than "hits" (ibid., p. 16.). In a digital economy, where distribution costs are negligible, a high number of items with mediocre or small sales ratings ("the long tail" of a statistical sales report) will be as enticing to an online distributor as a small number of high selling items (the "head" of the same report), traditionally stocked in "physical" stores like Wal-Mart (ibid., p 19-22).

Though collaborative filtering elucidated a similar product in the example above, it is often limited by the fact that people usually review fairly popular items. The niche items of "the long tail" will remain hidden unless information can be gathered equally and comprehensively on a large number of objects. For this task, one cannot simply trust the masses to annotate all the world's music. Another strategy is needed to confront the challenges posed by this new economy.

Content-based Analysis

Acoustic features of music provide a valuable, objective reference to music recommendation algorithms. Gathering this type of information fits into what Robin Burke calls content-based analysis, as it focuses on descriptions of the object being analyzed (2000, 334). These features are described using "tags," "text-based tokens… that can be used to annotate songs" (Turnball, et. al. 2008, p 1), which are then processed

by an algorithm to determine similarity, distinction and relevance of songs and artists to one another. Many different types of information can be collected about music or a musician, including symbolic, audio, visual and metadata as Inskip notes (Inskip, 2007, p. 2), and the first task in developing a content-based system is the design of the data-model, determining which attributes are important and should be captured by analysts, and additionally, how to organize the data structure.

Taxonomy

Taxonomies are systems of organization, usually in a hierarchical form, providing strong labeling and a structured and fixed vocabulary for categorization (Lamere & Pampalk, 2008, p. 16). In setting up a taxonomy for music information retrieval, many characteristics must be taken into account, including technical descriptors (artist name, title, year of release, etc.) and various musical descriptors (instrumentation, lyrics and genre). This section will only focus on genre taxonomy.

The main factor to consider in setting up genre taxonomy is the nature of the relationships between different levels of the hierarchy. In the world of *musical genre* categorization, terms such as genre, subgenre, and supergenre refer to these relationships between genres, but there are many inconsistencies in the semantic meaning of these links, as well as a lack of consensus among different sources of genre taxonomy. For example, Pachet and Cazaly found only 70 words in common between the combined 1680 genres from three online taxonomies (Amazon.com, AllMusic.com, and MP3.com)

(2000, p. 3). They investigated a number of these ambiguities, a few of which I will address here.

Genealogical links "denote musical evolution" of one genre to another (Pachet & Cazaly, 2000, p. 3). However, many genres have several parent genres, and typical taxonomic hierarchies work in a one parent to multiple child relationship, where a multiple parent to multiple child connection is needed. The authors give the example of Disco, which is categorized under "Pop" on Amazon.com, but which could also be connected to Soul music (ibid.).

Geographical inclusions can be helpful, but can find questionable distinctions, for example, of shared styles across different geographical regions (the authors point to Algerian and Tunisian music) (Pachet & Cazaly, 2000, p. 3). Blues and R&B are replete with examples of geographical confusion. Fontella Bass is known as a Chicago Soul artist, yet her most popular song, "Rescue Me," sounds more like a Detroit Soul (Motown) track. "Mississippi" John Hurt, a Piedmont style guitarist is sometimes categorized as a Delta Blues artist because of his nickname. Northern Soul refers to the area of England where underground dance club deejays would spin rare Detroit Soul records into the wee hours of the morning for dancers and partygoers.

Aggregation refers to the placing together of genres that have nothing in common (ibid.). R&B/Soul>R&B and R&B/Soul >Soul are given as examples by the authors, but unfortunately do not quite prove the point entirely. While it makes sense that Big Mama Thornton's "Hound Dog" bears little resemblance to Smokey Robinson's "A Quiet Storm," determining whether to call Ray Charles or Sam Cooke a Soul or R&B singer seems like a case of splitting hairs. These styles at one time were almost impossible to

distinguish from one another due to their genealogical relationship, and they are perhaps a better example of the evolution of subjective meaning given to genre labels that at one time described the same thing. A better example of aggregation would be the common coupling of Folk and Country into Folk/Country music. Though "folk" is a controversial description, and probably one of the most difficult genres to define, and there are unquestionably artists and songs which crossover between it and country, there is little similarity between the cultures and sounds of Garth Brooks and Ani DiFranco, Merle Haggard and Phil Ochs, or Hank Williams and Pete Seeger.

Repetition usually means that a given term (e.g. "Dance") is polysemic, denoting a higher level and lower level of genre hierarchy (ibid.), e.g. Contemporary Folk as a subgenre of the genre Contemporary Folk as visible in Allmusic's taxonomy (Contemporary Folk, 2008). It is confusing as to what the difference really is between these two, and when one should use the genre label or the subgenre label.

The use of historical period, as in Classical music (Baroque, Classical, Romantic, etc.) refers mostly to chronology, and is debatably a category unto itself, separate from genre (ibid.).

Aucoutourier and Pachet also talk about these "semantic confusions" and their resultant redundancies in taxonomy (2003, p. 84). They and Pachet and Cazaly note, however, that this doesn't impact the human user in an overly negative way, as people can figure out and navigate these taxonomies fairly easily, whereas programmers have a hard time telling software searches how to do the same (ibid.; Pachet and Cazaly, 2000, p. 4).

Once the taxonomy is built, one needs to figure out how the information will be tagged into the database. Burke notes "the type of user profile derived by a content-based recommender depends on the learning method employed" (Burke, 2000, 334). There are two main ways in which content-based data can be gathered (or learned): manually, by humans or automatically, by machines.

Manual Content-Based Analysis

Manual content-based analysis involves a human analyst "tagging" information into a database. This can be accomplished by the average user or provider of MP3s including such information in an MP3 ID3 metadata tag or by professional human analysts tagging the information into a database (Fox, 2007, p. 16). The benefits of human analysis have mostly to do with humans' superior audio perceptual mechanisms and lifetimes of experience with music. The preceding portions of this paper have pointed out some of the complexity involved in music analysis. Entire fields of education are devoted to the study of this complexity, and humans to a large extent, are already programmed to do the task. It is often a matter of aligning personal experience and abilities with a system of analysis and organization.

The main drawbacks to manual content-based analysis are temporal and economic. Training can take many weeks or even months, simply to acclimate people to a given data model and process of analysis, and more complex tasks such as genre classification can require even more time. The actual analysis of songs can vary depending on the data model and song being analyzed from five minutes to an hour per

track. The expenses involved in hiring and maintaining music analysis operations can be

stifling for a company.

> Aucouturier and Pachet citing Weare from Dannenburg et al. note
>
> the manual labeling of a "few hundred-thousand songs" for Microsoft MSN
>
> required musicologists to be brought as full-time employees and took about 30
>
> man-years (2003, p. 2).

In March of 2008, Macrovision, the owner of All Music Guide, announced the end of life

of one of its acquisitions, Moodlogic, "due to [the] intensive operational and

infrastructure resources required to sustain the application" (Moodlogic, 2008).

Moodlogic was one of the first commercial music recommendation services, and used a

manual content-based analysis model. Recently, Pandora, the current leader in manual

content-based analysis and music recommendations, which employs a group of trained

musicological analysts, announced 20 layoffs, reducing its ranks from 140 to 120

(Westergren, 2008), and over the past year another player in this market, Soundflavor,

rolled back its operations department repeatedly through four rounds of layoffs,

ultimately closing its doors in July of 2008.

> Like collaborative filtering systems, content-based systems need information on a

track to recommend or find recommendations for it. There is then an added economic

pressure on the analysts to analyze as many songs as quickly as possible. For example,

analysts at Pandora are paid "on commission," or by the track. This often results in the

employees of these companies strategizing their analysis workload towards certain types

of music, which can be analyzed quicker, and away from complex music that will take

more time. This can result in the music coverage of a database being skewed toward simpler music.

Another issue in this commodification of music analysis resulting from economic pressures is the possibility of imprecise analysis. These companies must set up quality control procedures, requiring more time and expense. If production quotas are a part of the company's policy, the situation for the employee can be confusing, with conflicting expectations presented.

Automatic content-based analysis

These issues, along with the major obstacle of scaling up a database to handle the millions of tracks available, have led some researchers to investigate automatic content-based analysis. In this method, computer software is programmed to extract the musical elements of a track from the audio signal, or by other methods, including data mining from websites referencing artists and music (Aucoutourier & Pachet, 2003, p. 85-91).

Aucouturier and Pachet describe two strategies in automatic analysis: prescriptive and emergent. Prescriptive analysis uses an existing taxonomy and a learning database, treated as objective exemplars, and clusters songs according to this prescribed similarity. The computer tries to find what humans have found similar by analyzing the physical audio signal and comparing it with human categorization. This process still requires human supervision and a learning database of songs analyzed by humans from which to start. It is from this approach that the authors came to the opinion that timbre and genre are not always strongly correlated. This process is also referred to as "autotagging."

The second type of automatic analysis Aucouturier and Pachet propose is called emergent analysis. It is unsupervised, classifying according to similarity relations it finds by mining web documents, including radio programs and track list databases. It does not always line up with human categorization, but after viewing the clusters, the authors found 70% of them had distinguishable similarities.

In Aucouturier's other paper, he presents the idea that 70% may be the glass-ceiling, as no other automatic system has exceeded this level of precision. It is interesting to note that this number coincides with Gjerdingen and Perrott's rate of precision among average college students classifying three-second clips.

Web 2.0

Another option for MIR has arisen in the emergence of what has been dubbed *Web 2.0*. There are varying definitions of Web 2.0, but Tim O'Reilly, president and CEO of O'Reilly Media, has labeled the following as the key components of Web 2.0.

1. Services, not packaged software, with cost-effective scalability

2. Control over unique, hard-to-recreate data sources that get richer as more people use them

3. Trusting users as co-developers

4. Harnessing collective intelligence

5. Leveraging the long tail through customer self-service

6. Software above the level of a single device

7. Lightweight user interfaces, development models, AND business models

(O'Reilly, 2005, p. 5)

Most of these components have to do with using collaborative data. There have been some important outgrowths of the collaborative mindset in Web 2.0, including "social network sites" and collaborative forms of tagging.

Social Network Sites

Danah boyd and Nicole Ellison have written an excellent summary of social network sites (SNSs). They define SNSs as:

web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system (boyd & Ellison, 2007, p. 2).

They are careful to use the word "network" rather than "networking" as the latter implies meeting new people, and the "friends" on these sites tend to be a part of a person's real social network (ibid.). The profiles of these sites usually contain basic demographic information (age, location, gender, etc.), lists of interests and favorites (books, movies, music, etc.), and a short biography section. Users can also upload pictures, movies, and/or music depending on the site (ibid., p. 3).

Social Tagging or *Folksonomy*

Social tagging has emerged as a collaborative feature of many SNSs as well as traditional collaborative filtering sites like Amazon.com. Paul Lamere and Elias Pampalk describe social tags as "the aggregation of individual sets of… short, free text labels applied to content." They have "no structure, no vocabulary limits" and are "typically applied by the generator or the consumer of the item being tagged" (Lamere & Pampalk, 2008, p. 14). Social tags have also been called "*'folksonomy'* [italics mine]– a user-created bottom-up categorical structure development with an emergent thesaurus" (ibid.).

In *folksonomy*, the relationship between tags is nonexistent until users create one by assigning different tags to a single object. This is in contrast to traditional taxonomy where certain relationships are pre-ordained by different hierarchical levels.

Music SNSs like Last.fm rely mainly on these tags. Julian Knowles describes this central aspect of Last.fm as a 'wiki,' "a web content management system that provides all registered users the authority to contribute and edit content" (2007, p.13). Last.fm also uses a service called Audioscrobbler to track what its users are listening to. Last.fm has made these tags accessible to other programmers through an application programming interface (API) publicly available.

It has been used by services like the new Sun Labs Music Explaura site, being developed by Paul Lamere, which fuses many of the strategies mentioned. In a paper describing the technology behind Explaura, Lamere calls the "tag-cloud" of the site an "aura:"

> a set of weighted words and phrases gathered from text mining the web, autotagging based upon content analysis, expert annotation, and social tags from the Audioscrobbler web service (Lamere, 2008, p. 1).

Discussion

A few years ago, music information retrieval and specifically, music SNSs began to get a serious look from the music industry, and in September of 2008, Myspace announced a deal with the four major recording labels (EMI Music, Sony BMG Music Entertainment, Warner Music Group, and Universal Music Group) to stream music for free on their music website, Myspace Music (Kafka, 2008). This development was somewhat of a turnaround for the music industry, which in the last decade has rabidly pursued and prosecuted many players in the industry who attempted similar strategies. Advertising and download revenue from these websites appears to be the economic strategy the record industry is pursuing in order to make up for the lost CD sales revenue of the past decade (Stone, 2008).

An unfortunate reality for many MIR companies is that their success or failure revolves around the whims of the traditional music industry. Because many people only have a vague impression of what music they want to find in a sea of millions of songs, with more music being released than ever before, people want and need to listen to full songs when using MIR technology. MIR needs legal streaming capability for millions of songs which requires the major labels' permission, and music companies need new "long tail" savvy forms of marketing, which the MIR industry promises to provide by connecting people with the music they want.

For the last couple of years, there has been an enormous expansion in the ranks of MIR companies. As of this writing, there is an economic crisis gripping the United

States, and many of these companies will not survive. The two acknowledged leaders in the field, Last.fm and Pandora, have both suffered, each laying off around twenty percent of their staffs. Both have seen their fortunes turn recently regarding issues of music licensing.

Last.fm was acquired by CBS in 2007 (Schonfeld, 2008), and with the clout such a corporation possesses, Last.fm set out to make deals with the music industry. On January 23rd, 2008, Last.fm announced that users could "play full-length tracks and entire albums for free on the Last.fm website," including tracks from all the major labels and thousands of independent artists and labels (Jones, 2008). In the press release, the company described this event as "great for artists and labels, who get paid every time someone streams a song" (ibid.). Then, in June, the Warner Music Group pulled its catalogue from Last.fm's site with no official explanation (Kiss, 2008). Though, news reports cited a "lower share of advertising revenue than comparable services" as the root of the fallout (ibid.). Finally, in December of 2008, it was revealed that CBS was cutting somewhere between 20% and 40% of Last.fm's staff, and the link to their staff page on the site was no longer accessible. Though they don't have to support an extensive manual content-based analysis team, it appears that the advertising revenue model has not born the fruit that either the labels or Last.fm expected.

Pandora is very highly regarded by most people familiar with the MIR sector. Based on a web radio model they have millions of users, and pay per song royalty rate, which adds up to 70% of their operational costs (Whoriskey, 2008). In 2007, the Copyright Royalty Board raised its rates for web radio from .08 cents per song in 2006 to .19 cents per song in 2010, making it nearly impossible for any web radio company to

survive, even one as successful as Pandora (ibid.). It should be noted that traditional radio has no per song rate to pay.

The quandary of this sector brings up important questions about how music will be defined in the 21st century. Pandora and Last.fm are more than radio stations or places to download free music. The processes underlying these observable features are changing the way music is thought about, promoting more interaction between the average listener and the producers and distributors of music. There is undoubtedly a demand for what these companies do, but their futures are very ambiguous. Pandora is fairly unique as the top professional expert human analysis company, and if they fail, it will most likely spell the end of such techniques. Do we need experts, and if so, how can they be employed in an economically feasible way?

Cult of the Amateur

Last.fm's techniques are more economically sustainable, but bring up questions about the level to which the masses should be trusted, and what kind of regulation should there be of data gathered from them? Most importantly for the focus of this paper, how will the process of genre formation and codification change as the SNSs' networks expand in members and connections, while the intimacy of those connections diminishes?.

Andrew Keen argues that our culture is being eroded by the "cult of the amateur," as the "gatekeepers" of culture such as newspapers, magazines, and media companies of all kinds, including the film and music industry, buckle under diminishing sales and

revenues from advertising, which are mostly being lost to Internet related technologies (Keen, 2007, p. 9). Experts find it increasingly difficult to make a living as the Internet promulgates the opinions and research (or lack thereof) of the masses through "blog" and "wiki" cultures. Keen's talk of mass taste overwhelming individual taste, is reminiscent of Adorno, but different in important aspects.   Adorno focuses on how the commodification of music by corporate handlers resulted in the creation of a standardized menu of musical choices for the masses, eroding the individual value placed on music and smothering individual preferences with mass tastes. Keen focuses on how the opinions of many individuals have usurped the position of experts leading to a mass consciousness guided by the "uneducated masses" rather than experts.

It does appear that the experts are in danger, which poses an important consideration in context of Holt's description of *center collectivities* as those "recognized as authorities and experts . . . distinguished . . . from outsiders and the general public . . . . [including] influential fan communities, critics, record producers, and above all artists whose iconic status marks them as 'leading' figures." With the advent of music social network sites, the fan communities are growing larger and more interconnected; everyone has the opportunity to be a critic. Their roles are potentially growing much more influential in Holt's equation, and among their ranks, there will undoubtedly be a larger representation by supposed "outsiders" and the "general public."

In the last section of Fabian Holt's introduction to his monograph, *Genre In Popular Music* (2007), he devotes a page to the interaction between new technologies and genre. He mentions that

> personal and portable technologies of reproduction multiply the possibilities for individualized consumption… [allowing] affluent people [to] have all sorts of opportunities for customizing their music consumption according to their individual tastes and lifestyles, somewhat independently of music collectivities (Holt 2007, p. 28).

Holt limits this type of music consumption to affluent people, but I would argue that this type of individualized consumption will become more common as access to the Internet increases and young, "plugged-in" individuals become a larger piece of music sales. Holt's remarks are mainly a critique of the separation occurring between genre and its localities, with more focus being given to "mass audiences and individualized consumption," weakening "the community basis of genre" (ibid.);

> one cannot see and feel how categories are used in various social context. . . . E-forums of people living in many different places lack the forms of knowledge and sociability that exist among insiders of the same scene (ibid., p. 29).

As noted, it seems that the community of which Holt speaks is changing in definition. The line between outsider and authority is growing blurred to all, but the authorities. He notes that the Internet has not

> eliminated traditional forms of social interaction in genre collectivities… Online discourse can be viewed as an extension of offline discourse, and it is often complementary to the professional mass media… empowered… [and] limited by its relative independence from face-to-face interaction (ibid.).

Holt's emphasis on the need for ethnographic study of the "center collectivities" of genre rings very true, especially in light of the increased influence of factors outside these "centers."

At the same time, however, new technologies are providing opportunities, through objective data on the listening habits and musical opinions of a plethora of people around the world, to gain insights into how the periphery of Holt's "genre collectivities" understand genre. Even if these masses represent a different culture of music, which may or may not be in dissonance with the *center collectivities* of *musical genre*, they are nonetheless reflections of real social connections, as he and boyd and Ellison acknowledge. They may, moreover, encompass a burgeoning nascent culture as Lawrence Lessig, one of the creators of Creative Commons, and author of *Free Culture: The Nature and Future of Creativity*, has stated:

> the Internet has unleashed an extraordinary possibility for many to participate in the process of building and cultivating a culture that reaches far beyond local boundaries (Lessig, 2004, p.9).

Organization

Lambiotte and Ausloos, using information from Last.fm's Audioscrobbler webpage have built three-dimensional "cartographies of music" from the collective listening habits of Last.fm users, generating matrixes showing representations of genre connectedness, the songs and artists that make up a genre, as well as listening trends outside of genre (2005a, 2005b). As they mention in their conclusion, these methods

"present quantitative tools for sociologists and musicologists" for the modeling of "opinion/taste formation" (Lambiotte & Ausloos, 2005a, p. 6).

Negus has noted that music corporations have historically gone to great lengths to collect this type of information and expended vast resources in the reorganization of their business practices to capitalize upon the insights derived from it (1999, p. 53-62). This information, often proprietary and not available to the public, has become increasingly available to the general public, raising the position of their stake in the cultural industry-cultural process equation.

Frith has noted that "genre maps change according to who they're for" (Frith, 1996, p. 77). The "maps" created by the methods of Lambiotte and Ausloos and the "tag clouds" or "auras" common throughout the web, referencing the collaborative feedback and usage of millions of people, have the potential to elucidate the relationships between genres in a way that static taxonomies of the past have been unable to consistently reflect. Aucouturier and Pampalk address this idea by remarking that in the decade since the presentation of Gjerdingen and Perrott's, "Scanning the dial," "the MIR community has made the transition from genres to tags" (2008, p. 8), referring to the evolution from taxonomy to "*folksonomy*."

Conclusion

Distinguishing *musical genre* involves identifying many different social and sonic characteristics. Cultural rules and codes within genre communities and corporate uses of genre labels affect our social conception of genre, and various musical traits such as

timbre, tempo, and harmony become associated with these social constructs. In the late 20th and early 21st centuries, a new economy called "the long tail" has materialized which will potentially provide a market for niche types of music. Meanwhile, the organization of genre has broadened both in depth (through more subgenres) and in width (with the creation of new genres), detailed *musical genre* taxonomies have been developed, and teams of professional music analysts have taken on the task of cataloguing all recorded music.

At the same time, Internet technologies have introduced collaborative review and annotation features, allowing anyone with access to join the musical analysis fray. The efforts of these passionate music listeners on social network sites have produced a new organization for genre called *folksonomy*. This bottom-up alternative to traditional taxonomy can provide valuable insights into what people are listening to and the relationship among and between their listening tastes and the music they listen to.

The confluence of expert opinion and mass opinion and the sonic and the social aspects of music lie at the heart of *musical genre's* current state. Together, the deeper descriptions of specific genre cultures gained through ethnographic study augmented by knowledge of larger listening patterns gathered from social networks can help understand the relationship between the center and periphery of genre cultures and also help elucidate how genre is changing in a world where tastes are diverse. In MIR, cognitive and psychological research into our underlying categorization mechanisms, sociological research into the cultural aspects of genre, and developments in computer science that better mimic these processes will pave the way for organizational structures that better

reflect the complexity of how we perceive music. If the field can survive the economic

ambiguity of such ventures, the future is full of possibilities.

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