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## Moody Blues: The Social Web, Tagging, and Nontextual Discovery Tools for Music

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## **Moody Blues: The Social Web, Tagging, and Non-Textual Discovery Tools for Music**

Gwen Evans and Susannah Cleveland\*

**ABSTRACT.** A common thread in discussions about the Next Generation Catalog is that it should incorporate features beyond the mere textual, one-way presentation of data. At the same time, traditional textual description of music materials often prohibits effective use of the catalog by both specialists and non-specialists alike. Librarians at Bowling Green State University have developed the HueTunes project to explore already established connections between music, color, and emotion, and incorporate those connections into a non-textual discovery tool that could enhance interdisciplinary as well as specialist use of the catalog.

**KEYWORDS.** Color, non-textual description, social tagging, user interfaces

### ***INTRODUCTION***

Music and art library resources share a common problem for user search and discovery in the online catalog. Both disciplines have non-textual objects as the core objects of interest, which are then encased in a wrapper of textual description. This textual description is already once- or even twice-removed; a non-textual object, such as the music notated in a musical score

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or the paintings in an exhibition catalog of art works, has no direct parallel textual equivalent, even if the object has textual elements. In such cases, the surrogate record in the library catalog is much more alien to the object it represents than the usual textual surrogate of a textual object. While digital image databases targeted for the academic market like ArtSTOR and digital music databases like DRAM present a much closer approximation of the objects of interest and allow a less mediated experience of the object, the search experience is still entirely mediated through textual description in traditional metadata fields: maker, title, time period, genre, etc. Are there ways to enhance the search experience in both traditional online catalogs and digital databases to make it easier to find non-textual objects?

Commercial products like the iTunes Store and Amazon.com have begun to create different expectations for music search and retrieval, even beyond the ability to hear a snippet of a musical piece. While its search function is simple, the iTunes Store allows users to browse in a variety of ways, from lists of American Idol contestants to playlists compiled by corporations like Starbucks and Nike. Amazon not only returns results directly related to search terms entered but also includes items purchased by others interested in a given product, recommended alternatives, and tags added by users for further exploration. Moreover, links to Amazon and iTunes in third-party applications such as lastfm, Facebook, blogs, and even OCLC's Open WorldCat ubiquitously integrate the retrieval of this information into daily activities in a way that libraries have never done.

### ***Non-textual Discovery and Web 2.0***

The inefficiency of the traditional OPAC for visual artists and musicians leads to the question of whether non-textual discovery can provide useful solutions. It is clear that the library

catalog and online databases like ArtSTOR and Grove Art Online function better for art historians than for visual artists, who often know what they are looking for only when they (literally) see it, and who often invent (and instruct their students in) strategies for stacks browsing that are more useful to them than catalog searching.<sup>1</sup>

In art, there are a large number of people who are serious and scholarly “consumers” or “patrons” or “audiences” of each kind of object or entity, who typically have a different way of describing and grouping objects than do practitioners. Art history language and categories only partially overlap the language, categories, and objects of interest of the artists, and at certain key junctures, artists talking to art historians, to quote an artist on the topic, “are like chickens talking to ducks.”<sup>2</sup> Meanwhile, in classical music, scholars are frequently practicing musicians (or at least lapsed practicing musicians), though scholars of popular music and non-western music might or might not be proficient in the technicalities of the musical languages they study.

The exclusive dependence on the textual description of music inhibits interdisciplinary searching by non-musician audiences because specialized musical terms and common library descriptors and access points are not necessarily meaningful to them. Searching the collection this way is a serious interdisciplinary, scholarly enterprise in a research environment, and the traditional library catalog is an example of what Brown and Duguid in *The Social Life of Information* call “tunnel design”<sup>3</sup> – for non-textual objects, the catalog and physical arrangement of the library works better for the music scholar or art historian, not parallel, related scholarly users such as graphic designers, artists, cultural historians, or music lovers. Music libraries and music catalogs are usually designed with practitioners – users proficient in reading and making music – in mind, as are most serious music information retrieval systems. While this approach can serve music majors adequately if not ideally, it does little to make allowances for non-

practitioner users. Without assembling a battery of interested parties to catalog the objects differentially and sensitively for each approach or community (which is unlikely to happen, being prohibitively expensive and glacially slow), how can libraries allow for different and simultaneous modes of grouping, regrouping, and discovering these non-textual entities for all of those interested in the arts and music?

### *The Aboutness of Non-Textual Objects*

Elaine Svenonius discusses the problems of “using words to express the aboutness of a work in a wordless medium, like art or music” in her article on subject indexing for nonbook materials.<sup>4</sup> She points out that the aboutness of non-textual objects is symbolically complex and is conveyed in expressive, emotive, and other non-representational forms – what she calls the visual or aural language of the document in question. She concludes that subject indexing often fails these objects (and those searching for them), because “subject indexing works best when a language, verbal, textual, or aural, is used for documentary functions”<sup>5</sup> – and the purpose of aural and visual languages is often not documentary, but playful, emotive, kinetic, symbolic. She urges a search for attributes and access points that encompass more than the subject model of aboutness – although she is still talking about using exclusively textual descriptors for nonbook materials.

While it would certainly be theoretically possible, if not really financially feasible, to go through the MARC records for non-textual objects and add textual entries for non-textual attributes, it would be a classic library response using existing systems and text-based tools. It seems potentially more meaningful to explore non-textual discovery tools that would leverage the emerging social aspects of internet applications – the so-called Web 2.0 or read/write web.

Tim O'Reilly describes Web 2.0 principles as playing, harnessing collective intelligences, trusting the users, and recognizing that user behavior is often not pre-determined.<sup>6</sup> These playful, emotive, non-documentary, kinetic characteristics seem a good match for those attributes described by Svenonius, while the Brown and Duguid book lends support to technologies such as Web or Library 2.0 that make visible what the authors call "the necessary intermediaries" – the social and shared knowledge and work that makes information useful and usable.<sup>7</sup>

Most non-textual music information retrieval systems rely on aural language for aural search and retrieval (such as query by humming) and have broken out of the confines of text. Yet most musical objects, whether in the traditional catalog or in systems like iTunes, are still bound by words. Stephen Abram, Vice President of Innovation at the ILS vendor SirsiDynix, points out that according to Benjamin Bloom's taxonomy of learning styles, only 20% of learners are text-based learners:

. . . yet we're sitting there with our little cohort of friends in the library world who are all text-based learners, trying to build text-based systems and text-based repositories, and text-based Web sites and text-based search engines and saying, "Gee, we just want to go for 20% of learning."<sup>8</sup>

Most library OPACs and applications are built by librarians for librarians, and their portals and tools are aimed at a minority niche of text-based learners, ignoring a wide range of learning or discovery styles which include visual, participatory, and aural. The participatory nature of Web 2.0 application development would ideally result in an inclusiveness of learning styles and modalities, not merely the simple addition of text-based participation by users.

Would multimodal objects like music be more findable using multimodal ways of description, or collocation, or in Web 2.0 parlance, tagging, to enhance user discovery? What

other meaningful ways besides text are there to identify objects in an exploration or discovery system?

### ***Color as a Classification Medium***

Color as a possible classification medium is based on a complicated and exploratory connection between music, color, and emotion. The phenomenon of synaesthesia has led to some of the most fundamental research on the color/sound connection, and a recent resurgence of the scientific community's interest in this topic has led to research that postulates some intriguing possibilities. In the *New Grove Dictionary of Music's* article on "Synaesthesia," Jörg Jewanski defines the phenomenon simply as: "The perception of one mode of sensation aroused by the stimulation of another sense."<sup>9</sup> According to Jewanski, authentic synaesthesia must meet several criteria, including that it must be involuntary, not based on a conscious or rational mapping of color to sound.<sup>10</sup>

In the research of Ward et al., published in the journal *Cortex*, the authors compared a group of music-color synaesthetes to a control group of non-synaesthetes as they assigned colors to musical pieces. They conclude, "Although we were able to find clear differences between the synaesthetes and controls on these tests, in other ways the two groups were remarkably similar."<sup>11</sup> The authors speculate that the cognitive mechanisms that both synaesthetes and control groups use are similar, but "differ in the precision and automaticity between the groups."<sup>12</sup> Synaesthetes are more precise and consistent in mapping color to sound. The authors suggest there is no fundamental difference between the way music-color synaesthetes and non-synaesthetes associate sound with color. This seems to be one of the reasons for the resurgence of interest in synesthesia in the cognitive and perceptual sciences – studying the

precise associations of synaesthetes will tell researchers about the less precise associations of everyday human perception.

Historic accounts of synaesthesia are generally of the more romantic sort. In his 1929 research on color/music associations, Leonid Sabaanev attributes great importance to the linking of music and color and goes so far as to suggest that skills in orchestration can be distinctly linked to a composer's possession of the "colour-ear," or an involuntary color response to association with sound:

A definite connection exists between a composer's talent for colour (orchestral or instrumental in general) and his aptitude for the colour-ear. Those who are organically deficient in colouring (Schumann, Rakhmaninov, Glazunov, Brahms, Myaskovsky, Medtner) usually lack the colour-ear, whereas the great colourists have always been more or less consciously endowed with this faculty.<sup>13</sup>

Aleksandr Scriabin, one of the composers most frequently associated with synaesthesia in popular culture, was one of the subjects of Sabaanev's study. Sabaanev describes Scriabin's process of color associations as a largely rational and not involuntary one, thereby calling into question whether the composer truly experienced synaesthesia in the clinically defined sense.<sup>14</sup> Scriabin nevertheless wished to incorporate aspects of the experience, or at least his understanding of the experience, into his compositions, especially with the use of the *clavier à luce*, or color organ – a non-sounding keyboard instrument that projected colors when the keys were depressed – in his symphonic poem *Prometheus: The Poem of Fire*. Scriabin shared with Nikolay Rimsky-Korsakov a tendency to associate harmonies with colors, though the two composers did not agree on particular correlations.<sup>15</sup> Hugh Macdonald attributes this mutually held inclination to the rise of inter-sensory exploration at the end of the 19th century. As he puts



it:

Attempts to evoke the experience of one sense by an appeal to another were numerous. Musical images in poetry and painting were frequent; Whistler painted nocturnes, Debussy composed images, while the remoter fringe of synaesthetic experiment produced smell-keyboards and colour-organs against a background of limitless scientific optimism. The potential of these cranky machines seemed at least as great as that of type-writers and magic lanterns and other new-fangled fruits of mechanical ingenuity.<sup>16</sup>

Later, Messiaen described his own “colour hearing” and noted that he regularly saw colors that moved with the sound when he read a score or heard music.<sup>17</sup> In an attempt to share this personal perception, he went so far as notating on his score the colors in his mind that corresponded with the chords on the page. While he did not maintain firm color/sound correlations that aligned with those of other composers, he was in agreement with Scriabin's association between certain colors and notes.<sup>18</sup>

In his recent work on cognitive processing of music, *Musicophilia*, Oliver Sacks describes the synaesthetic experiences of contemporary composer Michael Torke and makes a point that Torke's synaesthesia is specifically key related.<sup>19</sup> Key synaesthesia forms a cornerstone of the studies on color/music association. Rita Steblin, in her extensive work *A History of Key Characteristics in the Eighteenth and Early Nineteenth Centuries*, provides a wide array of factors that determine how a listener responds to a particular key, including knowledge of musical literature, musical ability, pitch, and instrumentation.<sup>20</sup> She adds to this list synaesthesia, and in the first Appendix, “Catalogue of Characteristics Imputed to Keys,” she lists, by key, descriptions of each key by composers, critics, and others; many of these

descriptions contain specific color associations.<sup>21</sup> The extent of this particular appendix highlights not only the synaesthetic associations of keys to particular colors but also long-standing associations between mood and key.<sup>22</sup> Such key-color descriptors, combined with the other poetic characteristics ascribed to keys, enhance the perceived link between emotion, music, and color.

### *Linking Color and Emotion*

That both adults and children will consistently identify certain colors with certain emotions can be tentatively demonstrated through psychological and perceptual research, although one has to be careful about cross-cultural conventional and linguistic assignments. Marcel Zentner demonstrated that Swiss three- to four-year-olds are quite consistent in mapping color onto perceived emotional states, as are adults – however, it is clear that the clustering of conventional associations becomes much more marked in adults.<sup>23</sup> In related research with Australian undergraduates, Michael Hemphill also found that adults associated positive emotions with bright colors such as white, pink, red, yellow, blue, purple, and green, and negative emotions with dark colors such as brown, black, and gray.<sup>24</sup>

There is a long tradition of interest in mapping color and emotion and comparing cultural differences and gender differences. Adams and Osgood found that across 23 cultural/language groups for male high school students, in general (in 1973, anyway), “BLACK is bad, strong, and passive; GREY is bad, weak, and passive; WHITE is good and weak; COLOR is good and active; RED is strong and active; YELLOW is weak; and BLUE and GREEN are good.”<sup>25</sup> More recent research from Ou et al. analyzed the results of British and Chinese subjects rating colors on a color-emotion scale, compared their study with previous studies, and concluded that “four

colour emotions, warm-cool, heavy-light, active-passive, and hard-soft, are culture-independent in the following regions, Britain, China, Japan, Thailand, and Hong Kong.”<sup>26</sup>

### ***Linking Emotion and Music***

So from music to color, and color to emotion – how do we link emotion to music? In *Emotion and Meaning in Music*, Leonard Meyer provides one possible connection between the two:

...particular musical devices – melodic figure, harmonic progressions, or rhythmic relationships – become formulas which indicate a culturally codified mood or sentiment. For those who are familiar with them, such signs may be powerful factors in conditioning responses.<sup>27</sup>

In this framework, then, the link between emotion and music is based on extra-musical associations and is grounded in cultural identity and experience.

In her book *Deeper than Reason*, Jenefer Robinson discusses the arguments for and against music expressing or invoking emotion in general, as well as music’s capability to express or invoke specific emotions, and concludes that there is ample evidence from psychological, physiological, and neuroscience research that music consistently evokes and arouses emotion. She refers to the Jazzercise effect,<sup>28</sup> whereby happy music can make us feel happy and restless music can make us feel restless by a process of motor mimicry – a kind of emotional contagion induced by our bodies mimicking the “action” or tempo of the music and thus inducing us to feel those emotions, similar to the well-documented process by which people will unconsciously mimic the facial expressions and postures of the people with whom they converse and begin to feel the same emotions. She concludes that music does not produce specific emotions that have

an object but rather psychological states or moods.<sup>29</sup> Moods are more diffuse, lower in intensity, longer in duration, and more global than emotions – music can induce the physiological changes, motor activity, and action tendencies that produce a mood of happiness, restlessness, sadness, or calm. However, because these states are diffuse, and because experimenters have shown that inducing a mood without an obvious trigger will cause people to search their context for a reason to feel what they are feeling, different specific emotions will be assigned to the same “mood inducing” musical passages or pieces.<sup>30</sup> Cultural context for the meaning of specific kinds of music also influences the assignment of emotion to music.<sup>31</sup>

Taking all of this into account, we have a series of suggestive associations – emotion and music, color and emotion, and a desire to investigate the use of non-textual methods to tag and search non-textual objects, in this case music. It is apparent from Robinson’s research, as well as the research into color and emotion and color-music synaesthetes, that color can only act as a rather diffuse “mood” indicator for musical objects, not as a precise emotion signifier, at least in the general population.

“Search by mood” is already a well-used category on many music websites, and the attempt to make music match moods too precisely seems to create some confusing, not to say amusing, category problems. The reliance on textual descriptions of moods in many cases subverts the purpose of using non-textual concepts to describe non-textual content. Many of these sites are targeted at the advertising, movie, television, and video and photography industries. Often they seem to define “mood” as “mood as felt emotion,” while “atmosphere” and “situation” also frequently get lumped together under the category of mood. Most sites that allow users to tag music with mood, like The Experience Project<sup>32</sup> or last.fm,<sup>33</sup> do not have a visual component; the tagging is purely text based. Many of the “search by mood” sites seem to

rely on some “professional,” behind-the-scenes classification, although evidence of a tightly controlled vocabulary is sparse – and sites like The Experience Project, lastfm, and Pandora<sup>34</sup> that rely on user input for indications of mood or emotion seem to do much better than the classifications proposed by sites such as CD Baby<sup>35</sup> or Audio Network PLC.<sup>36</sup>

At the time of writing, the only site that seems to be using both color and mood as a classificatory tool for music is Musicoverly,<sup>37</sup> although color is tied to genre, not mood. What the site calls mood is represented by a graph with opposed moods of Energetic vs. Calm on the X axis and Dark vs. Positive on the Y axis. There are 18 colors used for genre, arranged along a spectrum, but it is purely an aesthetic arrangement, with no easily graspable linkage between the genre chosen and the color that represents it – clicking in the top far right of the Energetic/Positive Axis brought mostly the blue/green songs from pop and disco; while clicking in the bottom far left representing the intersection of Dark/Calm brought more red and warm colors. Given the results from emotion/color researchers, it seems counterintuitive to assign any Portishead song to the color red because it is labeled “electro,” and Donna Summer’s “Hot Stuff” to a soothing green, the color of disco in the Musicoverly spectrum.<sup>38</sup>

Billed as a discovery tool for new music, ColorOfMySound.com tries to elicit color/music associations from its users rather than providing behind-the-scenes mediated results.<sup>39</sup> In true Web 2.0 fashion, the site uses the factor of “play” to encourage users to explore material that they might not otherwise have known existed. While listening to tracks uploaded by bands, the user has the opportunity to tag an audio clip with a color, input additional comments, and to see how other users have tagged the track. The original prototype project was intended as an informal experiment to explore the idea that non-synaesthetes experience strong

color responses to music, according to their “About” page, although it is unclear what, if anything, the creators intend to do with the data.

The existence of such a wide variety of sites devoted to the color/emotion/music connections lends informal weight to the question: Can color, being an imprecise and diffuse indicator of mood or emotion, actually do a better job of inventively guiding users to discovery in an imprecise and diffuse way?

### *Aesthetic Concerns*

A guiding principle of design frequently disregarded in information retrieval applications is that “Attractive things work better.”<sup>40</sup> Music is an aesthetic experience, and increasingly, research shows that people’s experience of information retrieval and human computer interaction is aesthetically mediated as well. Terri Holtze in “The Web Designer’s Guide to Color Research,” and Gitte Lindgaard in “Aesthetics, Visual Appeal, Usability and User Satisfaction: What Do the User’s Eyes tell the User’s Brain” make the point that color evokes emotional responses from website and computer application users, and that it happens before any assessment of content or organization takes place.<sup>41</sup> Specifically, web and application designers set an emotional tone by their color choices that later influence how users feel about the usability and utility of their site; and emotional satisfaction in turn influences how well people can actually learn to use something. Holtze cites a variety of studies that show that color can affect emotional and cognitive response on a variety of tests, including recognition and recall tests. Don Norman wrote an entire book, *Emotional Design*, showing the effect that aesthetics and emotion have on usability and user experience.<sup>42</sup> Neglecting the role of aesthetics and emotions in favor of cognitive processing models in OPACs or library finding tools means that pleasure

and serendipity is lost from the process of “search and find” in libraries – and it is a loss with functional, usability costs as well as costs to libraries’ social capital and perceived utility. As James Kalbach recommends in his article on the role of emotions in search, “Future best practices should take into account the entire information-seeking experience in both the evaluation and creation of search interfaces.”<sup>43</sup> Creating an aesthetically pleasing search experience, especially for users who are searching for objects that have strong, primary aesthetic associations like music or art objects, could improve findability, learnability, and usability.<sup>44</sup>

### ***Social Tagging and Music Information Retrieval***

There are several sustained and sophisticated ongoing efforts for music information retrieval based on the internal characteristics of the musical object such as query-by-humming, query-by-rhythm, or query-by-melodic- or harmonic-structure, but the potential for integrating social or folksonomic aspects into a library environment is equally intriguing. Such integration might make possible the more rapid development of useful finding tools, as social tagging allows a multiplicity of small communities of users to decide what is significant and what should be grouped together. Many authors have admitted, as Aura Lipincott wrote in her article “Issues in Content-based Music Information Retrieval,” that “the real challenge for MIR systems is the complexity of music analogous to that found in language and the multiple meaning of words. Like language, music has hidden meaning. . . ,” and it is beyond the capacity of MIR systems based on internal content to satisfy fully the needs of music information users.<sup>45</sup>

In a highly suggestive conference proceeding, Jin Ha Lee and J. Stephen Downie analyzed the music information needs and behaviors of various users. In “Survey of Music Information Needs, Uses, and Seeking Behaviours: Preliminary Findings,” the authors describe

the importance of contextual information about music when University of Illinois undergraduates engage in music discovery.<sup>46</sup> The survey respondents were musically skilled; in their self-described characteristics in the survey, 74% could play a musical instrument, and 63% said they could read sheet music with moderate to advanced skill. Yet as the authors note, “extra-musical information” or what the authors call “context metadata” -- information such as artist information, genre information, reviews, and associative uses like ads, movies, and television shows -- was more important to users as a search or browse method than either the traditional bibliographic metadata in the catalog or content metadata within the structure of the music itself. This extra-musical information is precisely the kind of metadata that both the text-bound OPAC and content-based MIR lack.<sup>47</sup> The authors find that since music queries can be multidimensional and difficult to express succinctly, music seekers rely heavily on public knowledge, opinions, and social, collaborative information retrieval – that it is very much a “public and shared process.”<sup>48</sup> They recommend designing frameworks that support the flexible, less precise, exploratory character of music information search, and accommodate the need and desire for contextual metadata.

### ***The HueTunes Project at the University Libraries, Bowling Green State University***

Taking all of these factors into account, we began to see that a Web 2.0 project framed around music, color, and emotion could not only lead to interesting understandings about the interaction of these variables, but also improve the search-and-find-experience of many different audiences. The result has been the HueTunes project, an experiment undertaken by the University Libraries at Bowling Green State University (BGSU) to see if the use of non-textual



social tagging of non-textual objects can enhance the user's search experience in a library environment.

The University Libraries at BGSU include the Music Library and Sound Recordings Archives, one of the largest academic collections of popular music recordings in the world, and the Browne Popular Culture Library, the most comprehensive repository of post-1875 American popular culture in the United States, as well as over 30,000 volumes of print art holdings. Users of the Libraries' collections come from all over the world and vary in their expertise of subject areas from casual to expert.

BGSU, a state-assisted university with approximately 21,000 students, places a strong emphasis on programs in the arts, with approximately 550 music majors and 700 art majors and the associated faculty in the College of Musical Arts and the School of Art. Further, programs in Popular Culture and American Culture Studies draw a wide variety of users outside this core group of majors to the University Libraries' holdings in art and music. The College of Musical Arts, the School of Art, and the University Libraries main buildings form a close triangle on campus, and frequently the students' interests overlap. The interdisciplinary nature of many BGSU programs calls into question age-old practices of cataloging materials that assume that the primary users are subject experts or at least proficient in the common vocabularies of particular disciplines.

Our specific interest in pursuing a project around searching arose from our conversations about the potential for creating a database of record album covers with a graphic design professor at BGSU. He wished to include album covers in his curriculum, but the closed-stack organization of sound recordings in the collection does not lend itself to browsing. The access points that would be useful for this professor and his students were more often related to visual

aspects of the cover and the history of graphic design, not with the musical aspects that are considered to be of paramount interest to the music library's primary users. Discussions about visually oriented users in the Music Library and Sound Recordings Archives led to further speculation about the usefulness of non-textual tagging tools for all users, given the already established scholarly interest in color-music synaesthesia.

HueTunes is a web application designed to gather information on the associations listeners will make between color and music. Do listeners generally agree on what color a particular piece of music is? And if users consistently use the same or similar colors to describe or tag a particular piece of music, could a color search for music be a useful enhancement to library catalogs or music information retrieval systems?

In preliminary discussions about what we might do for a Web 2.0 project, and building on the graphic design professor's dilemma, one of us remembered a compelling information storage and retrieval project from a classmate in Professor Bruce Schatz's class at the University of Illinois. Esther Gillie had noticed that musicians at Eastman's Sibley Music Library often used mood to describe the kind of music they were searching for, and after surveys, classification, and indexing, created a "mood slider" color spectrum so that users could search playlists of music that corresponded to "blue" music.<sup>49</sup> With the rise of Web 2.0 technology and recent interest in folksonomies and social tagging, we were intrigued by the possibilities of letting listeners use color to tag audio clips directly.

After initial discussions about the project's philosophical components, the parameters for HueTunes became clearer. The first step was to create a pilot version to test the viability of the concept and to provide evidence of the project's potential. Jared Contrascrere, a junior computer science major and employee of the library at BGSU, began developing the application using the

library's LAMP platform: a Linux operating system with an Apache web server, with the application being written in MySQL, PHP, and Flash. The pilot incorporated a database of thirty-five songs. In this initial proof of concept, the goal was to show how the tool would function technically – could we design an application that would serve up samples of music, allow the user to tag the music sample with a color, and then store and display the individual and aggregated results?

In the HueTunes pilot, the user enters the site on an animated screen that asks him to choose artistic ability (“Musician,” “Musician & Visual Artist,” “Visual Artist,” etc.), native language, gender, and age, as shown in Figure 1. As demonstrated by Ou et al, Hemphill, and Zenter, people do appear to associate particular colors with particular emotions or moods, whether or not the association is conventional or culturally determined. Because of the uncertainty of the exact provenance for these emotion-color associations, the question about native language acts as a provision for results or clusterings that are influenced by cultural uses of color and mood. These demographic options will likely expand and also query users about whether or not they are synaesthetes, whether they have perfect pitch, etc.

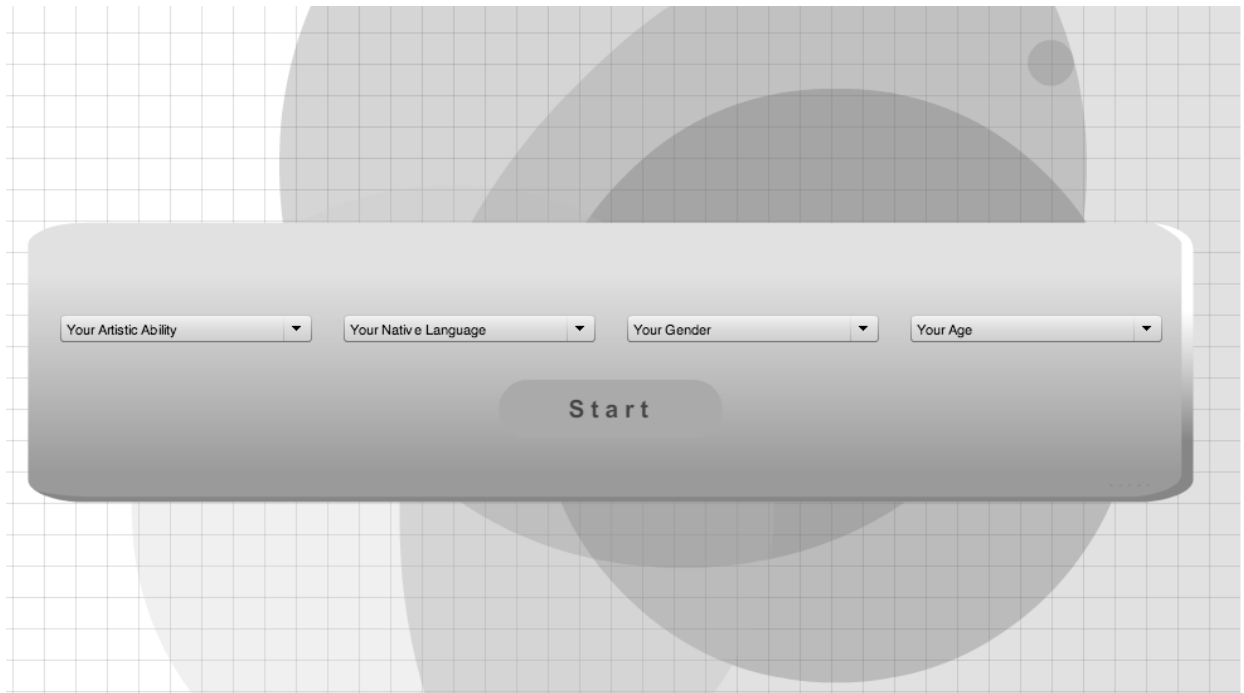


Figure 1. Opening screen of HueTunes

After entering this initial demographic data, the user is then taken to a screen with colored dots arranged over a grid. Simultaneously, a randomly chosen musical selection from the database will play, and the user can click on a color from the grid that correlates most closely to the user's sense of the color of the piece. After selecting and confirming a color, a new piece begins playing, and the cycle continues.

When the user has heard all of the examples or decides he or she is finished with tagging music, he or she can click on the "Done" button and see a list of the songs just sampled as well as a chart showing how other users have tagged the same songs (Figure 2).

|                                  |  |
|----------------------------------|--|
| Songs You Rated:                 |  |
| Orange Crush                     |  |
| Serene Legato                    |  |
| Fast and Aggressive Almost Frant |  |
| Orange Airplane                  |  |
| Meandering W Fluctuating Tenion  |  |

Thank you for participating in HueTunes! The songs that you rated are listed to the left. If you would like to compare your selection to others, just click on the song title.

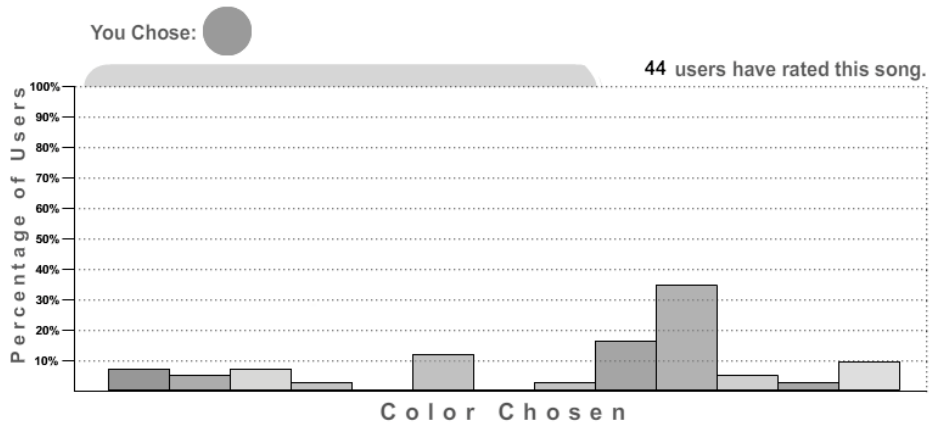


Figure 2. Results screen in HueTunes

We informally showcased the alpha version at the BGSU Annual Arts Extravaganza at BGSU in Fall 2007 in a poster/booth environment, and collected feedback about usability and design from students, faculty, and other passersby. This feedback is being integrated into the development of the beta version of HueTunes in which practical concerns such as methods for data gathering, variables to measure, and ways to balance copyright concerns with content delivery will be considered. As we move into actual data gathering, the relationships between demographic information, language, and color-music preferences will be analyzed to see if patterns emerge that could allow future library patrons to search for something like “yellow” songs and get satisfactory results.

***Research Questions and Future Directions***

There are several research questions to be addressed by gathering and evaluating data with this tool. The first is whether, in fact, people do assign similar colors to the same songs.

Are there extra-musical color associations, akin to Meyer's image connotations, that are shared by individuals in a culture? In the foreseeable future, the research will be focused on finding correlations between different users and their assignment of colors to music, not finding correlations between the colors assigned and the music itself. The analysis of the relationship of color to tonality, timbre, melodic structure, or other internal musical elements is beyond the scope of this project.

If there are detectable patterns in the ways users assign colors, or the way musicians assign colors as a group versus the way visual artists as a group assign them, the next step would be to see if the assigned colors are really representing mood in any detectable way, and for which group. Do culture and language dramatically influence the color tags users assign to music? To turn to the discovery side, will users be able to search for “red” music and be satisfied with results, or will the colors have to be explicitly named as “mood” colors in order to function as an effective finding tool, with the color becoming an aesthetic amplifier and mnemonic device in the interface, working alongside text?

And finally, can HueTunes be compared and contrasted in terms of ease of use and satisfaction with another music discovery tool that uses mood and color, but in very different ways, such as Musicoverly? It would be interesting to analyze user reactions to Musicoverly to see if they quickly catch on to the significance of the “red” group signifying the genre "electro," for example. By the same token, if the visual organization of the HueTunes interface were changed, based on a more linear spectrum rather than grid-based arrangement for example, would results vary? Users at the Arts Extravaganza also indicated a strong desire for a dynamic visual representation of the music as it played and expressed satisfaction with the kinetics of the search interface – that they could “swoop” over the colors as the music was playing. These

preferences lend themselves to further questions about what makes a satisfying and productive search experience.

The long-term application of a HueTunes-like plug-in for the next generation of library catalogs would depend on a symbiotic relationship between listening and tagging. Copyright law presents some obvious barriers to digitizing and making complete songs available via the catalog, but linking to iTunes samples or to content in library-subscribed streaming audio databases presents some tantalizing options for supplying music from within the catalog for users to tag. Searching by color might involve a separate “visual search” pane with a user choosing a color, hearing a sample(s), and then being linked to the bibliographic and item information; or color may be another bit of contextual data supplied on the item record, similar to book covers in bibliographic records.

General professional discussions in a variety of venues such as the futurelib wiki at <http://futurelib.pbwiki.com/>, discussions on the Next Generation Catalogs for Libraries listserv,<sup>50</sup> and a variety of conferences make clear that the Next Generation Catalog should incorporate features beyond the mere textual, one-way presentation of data. Research projects like the Steve.Museum project and Steve Tagger that explore social tagging for works of art are in process for visual objects.<sup>51</sup> The HueTunes project is intended to explore already established connections between music, color, and emotion, and incorporate those connections into a non-textual discovery tool that could enhance interdisciplinary as well as specialist use of the catalog.

## *NOTES*

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1. The literature is sparse but consistent when it comes to the information-seeking habits of studio artists in libraries. See Marcia Bates, “Information Needs and Seeking of Scholars and

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Artists in Relation to Multimedia Materials,”

<http://www.gseis.ucla.edu/faculty/bates/scholars.html> (accessed March 12, 2008); Susan Cobbledick, “The Information-Seeking Behavior of Artists: Exploratory Interviews,” *Library Quarterly* 66, no. 4 (1996): 343; Polly Frank, “Student Artists in the Library: An Investigation of How They Use General Academic Libraries for Their Creative Needs,” *The Journal of Academic Librarianship* 25, no. 6 (1999): 445; Deirdre C. Stam, “Artists and Art Libraries,” *Art Libraries Journal* 20, no. 2 (1995): 21-24; and Philip Pacey, “How Art Students Use Libraries – If They Do,” *Art Libraries Journal* 7, no. 1 (1982): 33-38.

2. Charles Kanwischer, David Gloman, and Katy Schneider, personal communication to Gwen Evans, during a conversation about plein air landscape painting and why a painter might choose to use chrome yellow, say, to create a particular effect in a painting. The answer, in classic “to get to the other side” fashion, is “because I ran out of lead white.” Yet the intentionality and gravitas with which these sorts of decisions can sometimes be analyzed by art historians are often a source of bemusement and amusement for artists.

3. John Seely Brown and Paul Duguid, *The Social Life of Information* (Boston: Harvard Business School Press, 2000), 2.

4. Elaine Svenonius, “Access to Nonbook Materials: The Limits of Subject Indexing for Visual and Aural Languages,” *Journal of the American Society for Information Science* 45, no.8 (1994): 600.

5. Ibid, 605.

6. O'Reilly, Tim. "What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software." O'Reilly Media, Inc.



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<http://www.oreilly.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html> (accessed March 4, 2008).

7. Brown and Duguid, 2.

8. Abram, Stephen. "Information 3.0 -- What's Next?" 10/21/07.

[http://progressive.powerstream.net/002/00173/MembersCouncil\\_October2007/Abram0089.mp3](http://progressive.powerstream.net/002/00173/MembersCouncil_October2007/Abram0089.mp3) (accessed 03/12/08). Talk given to the OCLC Members Council, November 21, 2007, Columbus, OH.

9. Jörg Jewanski, "Synaesthesia," *Grove Music Online*, ed. L. Macy,

<http://www.grovemusic.com> (accessed March 4, 2008).

10. Ibid.

11. Jamie Ward, Brett Huckstep, and Elias Tsakanikos, "Sound-Colour Synaesthesia: To What Extent Does it use Cross-Modal Mechanisms Common to Us All?" *Cortex: A Journal Devoted to the Study of the Nervous System and Behavior* 42, no. 2 (2006): 277.

12. Ibid.

13. Leonid Sabaneev, "The Relation Between Sound and Colour," trans. by S. W. Pring, *Music and Letters* 10 (1929): 266.

14. Ibid., 273.

15. Alfred J. Swan, *Scriabin* (London: The Bodley Head Ltd., 1923; repr., Westport, Connecticut, 1970), 38.

16. Hugh Macdonald, *Skyrabin* (Oxford: Oxford University Press, 1978), 56.

17. Olivier Messiaen, *Music and Color: Conversations with Claude Samuel*, trans. by E. Thomas Glasow (Portland, OR: Amadeus Press, 1994), 40-41, quoted in Nicholas Cook, *Analysing Musical Multimedia* (New York: Oxford University Press, 1998), 30.

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18. Paul Griffiths, *Olivier Messiaen and the Music of Time* (Ithaca, NY: Cornell University Press, 1985), 205.
  19. Oliver Sacks, *Musicophilia* (New York: Alfred A. Kopf, 2007), 168-169.
  20. Rita Steblin, *A History of Key Characteristics in the Eighteenth and Early Nineteenth Centuries*, 2d ed. (Rochester, NY: University of Rochester Press, 2002), 189.
  21. *Ibid.*, 225.
  22. In describing Mozart's choice of D major for the "Haffner" symphony, K. 385, Neal Zaslaw reviews a cornucopia of D major associations by other composers. These descriptors range from "heroic" and "pompous" to "impudent" and "noisy." Such poetic key associations are common and range far beyond rational and impartial assessments of key qualities, as seen from Steblin's research. Neal Zaslaw, *Mozart's Symphonies: Context, Performance Practice, Reception* (New York: Oxford University Press, 1989), 161.
  23. Marcel R. Zentner, "Preferences for Colours and Colour-Emotion Combinations in Early Childhood." *Developmental Science* 4, no. 4 (2001): 389-398.
  24. Michael Hemphill, "A Note on Adults' Color-Emotion Associations," *Journal of Genetic Psychology* 157, no. 3 (1996): 275-280.
  25. Francis M. Adams and Charles E. Osgood, "A Cross-Cultural Study of the Affective Meanings of Color," *Journal of Cross-Cultural Psychology* 4, no. 2 (1973): 148.
  26. Li-Chen Ou, et al., "A Study of Colour Emotion and Colour Preference. Part I: Colour Emotions for Single Colours," *Color Research & Application* 29, no. 3 (2004): 239.
  27. Leonard B. Meyer, *Emotion and Meaning in Music* (Chicago: University of Chicago Press, 1956), 267.

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28. Jenefer Robinson, *Deeper than Reason: Emotion and its Role in Literature, Music, and Art* (Oxford: Oxford University Press, 2005), 392.

29. Ibid, 379-413.

30. Ibid, 401.

31. Ibid, 401-403.

32. The Experience Project, [http://www.experienceproject.com/music\\_search.php](http://www.experienceproject.com/music_search.php) (accessed March 5, 2008). From the home page: "This is a unique search engine for music that allows you to find music matching your mood, thoughts and feelings, or instead type in a song or artist and find out what life experiences people associate with it--in other words, what the song or artist means to others."

33. last.fm: The Social Music Revolution, <http://www.last.fm/> (accessed March 5, 2008). When listening to a song in Last-fm, users have the opportunity to assign free-text tags to the song.

34. Pandora: Radio from the Music Genome Project, <http://pandora.com/> (accessed March 5, 2008). Pandora's user tags are generated from names that users give to the stations they "create," rather than from individual track tagging. Recommendations are generated according to thorough analysis of the "musical qualities" of the tracks by Pandora staff members.

35. CD Baby, <http://cdbaby.com/> (accessed March 5, 2008). CD Baby, an online store for independent musicians to sell their recordings, provides a discovery area called "Flavor: music for your mood or occasion." This section includes such diverse and entertaining categories as "Seedy Circus on the Wrong Side of Town," "The Greatest Music for Kids Even Adults Can Love," "Music to Play when Life Just Sucks," and "To Have Sex To."

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36. Audio Network PLC, [http://www.audiolicense.net/t3\\_atmosphere.asp](http://www.audiolicense.net/t3_atmosphere.asp) (accessed March 5, 2008). Audio Network PLC includes a production music library and a sound effects library, both of which are populated by tracks whose licensing has already been cleared for international film, television, and media markets. One of the "search" strategies is a browse for "Atmospheric Music and Mood Music," in categories apparently established by the site creators. These range from "Background / Wallpaper" to "Hot / Desert / Jungle / Tropical," and currently fifty-one other such categories.

37. Musicoverly: Interactive WebRadio, <http://musicoverly.com/> (accessed March 5, 2008).

38. Ibid. See <http://ul.bgsu.edu/litslabs/?p=125> for color screenshots.

39. ColorOfMySound.com, <http://www.colorofmysound.com/> (accessed March 5, 2008).

40. Donald A. Norman, "Emotion and Design: Attractive Things Work Better," *Interactions Magazine* 9, no. 4 (2002): 36-42.

41. Terri L. Holtze, "The Web Designer's Guide to Color Research," *Internet Reference Services Quarterly* 11, no. 1 (2006): 87-101; Gitte Lindgaard, "Aesthetics, Visual Appeal, Usability and User Satisfaction: What Do the User's Eyes Tell the User's Brain?" *Australian Journal of Emerging Technologies & Society* 5, no.1 (2007): 1-14.

42. Donald A. Norman, *Emotional Design: Why We Love (Or Hate) Everyday Things* (New York: Basic Books, 2004).

43. James Kalbach, "'I'm Feeling Lucky': The Role of Emotions in Seeking Information on the Web," *Journal of the American Society for Information Science and Technology* 57 (2006): 813-818.

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44. One example of a website that focuses on creating pleasure and fun in the search process is Etsy, an online community that allows users to sell handmade goods (<http://www.etsy.com/>). In its original form, Etsy's color function was a Flash application that was extremely kinetic, producing bubbly “kite tales” of glowing and fading disks of color as the user moused over an apparently empty grid. Clicking on a color would produce pictures of items for sale that matched the color. Etsy’s search function was not only aesthetically pleasing but fun and gamelike, and several people to whom the authors showed the site reported having bought something they had found using this color search – even when they were merely testing the interface in a spirit of scholarly enquiry.

45. Aura Lippincott, “Issues in Content-Based Music Information Retrieval,” *Journal of Information Science* 28 (2002): 142.

46. Jin Ha Lee and J. Stephen Downie, "Survey of Music Information Needs, Uses, and Seeking Behaviours: Preliminary Findings," *Proceedings of the 5th International Conference on Music Information Retrieval: ISMIR 2004* (2004): 441–446.

47. Ibid., 5. Helene E. Roberts makes the same point about contextual information and its necessity for art historians in “A Picture is Worth a Thousand Words: Art Indexing in Electronic Databases,” *Journal of the American Society for Information Science and Technology* 52, no. 11 (2001): 911-916.

48. Ibid.

49. Esther Gillie, “Research in Color and Music,” e-mail message to authors, April 2, 2008. We would like to thank Esther for very graciously recalling her methods and research for that class project on the very day that we contacted her.

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50. Next Generation Catalogs for Libraries listserv at <http://dewey.library.nd.edu/mailling-lists/ngc4lib/>. Archives at <http://dir.gmane.org/gmane.culture.libraries.ngc4lib>.

51. "Steve is a collaboration of museum professionals and others who believe that social tagging may provide profound new ways to describe and access museum collections and encourage visitor enagement [sic] with museum objects." Steve: The Museum Social Tagging Project, <http://steve.museum/> (accessed June 2, 2008).

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