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A Grateful Dead Analysis: The Relationship Between Concert and Listening Behavior

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Summary. The Grateful Dead was an American band that was born out of the San Francisco, California psychedelic movement of the 1960s. The band played music together from 1965 to 1995 and is well known for concert performances containing extended improvisations and long and unique set lists. This article presents an analysis of 1,590 of the Grateful Dead's concert set lists from 1972 to 1995 and the August 2005 to October 2007 listening behavior of Grateful Dead fans who use the last.fm music service. While there is a strong correlation between how songs were played in concert and how they are listened to by last.fm members, the outlying songs in this trend identify interesting aspects of the band and their fans 10 years after the band's dissolution.

1 Introduction

The Grateful Dead was an American band which, despite relatively little radio airtime, enjoyed a cult-like following from a fan base that numbered in the millions. The Grateful Dead originated in San Francisco, California in the early 1960s and toured the world playing concerts until the untimely death of the foreman and lead guitarist Jerry Garcia in 1995. The primary source of revenue and exposure for the Grateful Dead came through their concerts and tours. The band was prolific in the number of concerts they played with an astounding estimated 2,300 concerts over their 30 years as a band. During these 30 years and 2,300 concerts, over 37,000 songs were played. The Grateful Dead's success and continuity through multiple generations of music listeners is perhaps due in part to their fundamentally eclectic nature. The band utilized many song writers, composers and singers, and this resulted in a broad diversity in sound. Robert Hunter and John Barlow were the primary lyricists for the Grateful Dead [1]. Accompanying their lyrics were compositions primarily by Jerry Garcia and Bob Weir. While Jerry Garcia and Bob Weir were the primary singers as well, others included Ron McKernan, Brent Mydland, and Phil Lesh. Furthermore, through the years, the Grateful Dead accumulated an astounding

repertoire that included over 450 unique songs. In concert, all of these factors came together to ensure a unique experience for their fans each and every time.

Perhaps even more astounding is the dedication that their fans (known as “deadheads”) had to their music [2]. The typical deadhead was not a passive consumer of recorded studio albums, but an active concert goer that traveled with the band from concert to concert, city to city, and country to country. Some 10 years after the Grateful Dead disbanded, their music is still heavily listened to as evinced by statistics gathered from the popular online music service known as last.fm.³ The last.fm audioscrobbler plug-in is software that works with popular computer music players such as iTunes or WinAmp. Whenever a song is played using, say, iTunes, the plug-in reports this activity to the last.fm server where it is aggregated. With 72% of the users of last.fm under the age of 35⁴, the popularity of the Grateful Dead, a generation of fans later and 10 years after their dissolution, is still very strong. From August 2005 to October 2007, there were over 2.5 millions Grateful Dead song usages recorded by last.fm.

This article presents an analysis of the Grateful Dead’s concert behavior and exposes a relationship between the concert song patterns from 1972 to 1995 and the last.fm usage statistics of the band’s songs from August 2005 to October 2007. Section 2 presents an analysis of the concert behavior of the band. Section 3 presents an analysis of the band’s usage behavior of last.fm members. Section 4 presents a comparative analysis of the concert and usage behavior of the Grateful Dead.

2 The Grateful Dead Concert Behavior

The Grateful Dead played a large number of concerts during their 30 years as a band. Concert set lists provide the raw data from which to study the concert behavior of the Grateful Dead.⁵ The data gathered includes 1,590 set lists for concerts from 1972 to 1995. A typical, unmodified set list is presented below:

Winterland Arena, San Francisco, CA (12/31/77)

Music Never Stopped
 Tennessee Jed
 Funiculi Funicula
 Me and My Uncle
 Loser
 Jack Straw
 Friend of the Devil
 Lazy Lightnin'
 Supplication

Sugar Magnolia

³ last.fm is available at: <http://www.last.fm/>

⁴ Source: last.fm internal web statistics.

⁵ Set list data obtained from <http://www.cs.cmu.edu/People/gdead/setlists.html>. The data were cleaned to remedy various typographical alterations (e.g. TRUCKING and TRUCKIN’ are the same song), to fix various spelling errors (e.g. WARF RAT and WHARF RAT are the same song), and to fix various abbreviations (e.g. CHINA CAT and CHINA CAT SUNFLOWER are the same song).

Scarlet Begonias
Fire on the Mountain
Truckin'
Wharf Rat
drums
Not Fade Away
Around and Around

One More Saturday Night
Casey Jones

Blank lines divide the set list into 4 components. The first component is the concert venue and location along with the date that the concert was played. The second component is the first set song list in the sequence in which the songs were played. For example, FRIEND OF THE DEVIL was played after JACK STRAW in the above example. The third component is the second set list of the concert. The fourth and last component, which is usually the shortest, is the encore set list. The Grateful Dead were known to typically play their concerts in this 3 set form.

A basic measure, given many concert set lists, is to simply count the number of times a given song is played over all concerts. The ranked list of songs is a rudimentary “greatest hits” list of sorts, but also a histogram of concert plays sheds light on the distribution of these counts. Did most songs get approximately the same number of concert plays, or did the band play a small set of favorite songs interspersed with less popular songs to provide variety? Table 1 shows the raw counts for the 15 most played songs. Note that of the 1,590 concerts analyzed, 1,386 of those concerts included the DRUMS improvisational rhythm sequence, which typically appeared in the second set of most concerts. The second set of the Grateful Dead is known for fewer songs and longer extended improvisational sessions. Furthermore, the second set is also known for its “blending” of songs in which there was no pause between the end of one song and the beginning of another (that is, the second set was often a medley of sorts). A common bridge between two songs was DRUMS. Figure 2 presents a histogram of denoting the number of songs that were played a given number of times. In summary, many songs were played only a few times and few songs were played many times.

3 The Grateful Dead Usage Statistics

The online music service last.fm tracks how registered members listen to music by what songs they play on Internet radio or through a plug-in for their computer music player (e.g. iTunes, Winamp, etc.). The last.fm service maintains a database of the listening behavior of its registered members. From this database, the last.fm service is able to recommend songs and artists to its members based on the listening behavior of similar members. In analogy, such a recommendation algorithm is related to how Amazon.com takes advantage of its users’ purchasing behavior to recommend products to customers. Table 3 lists the top 15 Grateful Dead songs used by last.fm members. This information was gathered from August 2005 to October 2007. Figure 4 presents a histogram of how songs were used by last.fm members. In summary, many songs were listened to only a few times and few songs were listened to many times.

song	times played
DRUMS	1386
PLAYING IN THE BAND	651
SUGAR MAGNOLIA	494
NOT FADE AWAY	486
THE OTHER ONE	438
JACK STRAW	437
TRUCKING	427
ME AND MY UNCLE	412
LOOKS LIKE RAIN	407
PROMISED LAND	407
I KNOW YOU RIDER	406
CHINA CAT SUNFLOWER	403
NEW MINGLEWOOD BLUES	398
AROUND AND AROUND	395
TENNESSEE JED	390

Fig. 1. The top 15 Grateful Dead songs played in concert from 1972 to 1995.

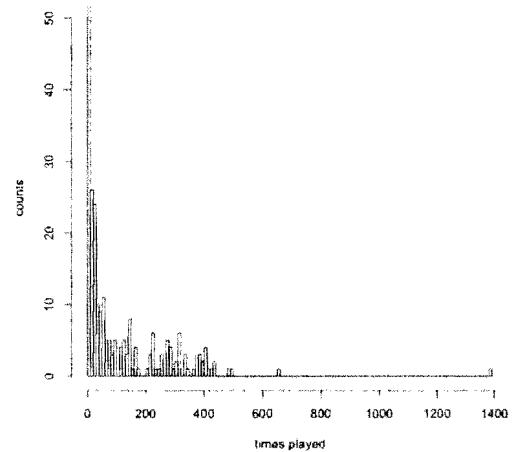


Fig. 2. A histogram of the number of times a song was played in concert. The vertical axis was trimmed from its maximum of 150 in order to preserve diagram clarity.

4 The Relationship Between Concert and Usage Behavior

The previous two sections describe the Grateful Dead concert behavior and the usage information gathered from last.fm. This section provides an overview of the relationship between these two disparate data sets. Usage data from last.fm is available for each of the 338 unique songs in the concert set lists. It is possible to quantitatively measure the amount of correlation⁶ between the number of concert plays and the number of last.fm listens. The analysis reveals that the listening behavior of last.fm members is strongly correlated to how the Grateful Dead performed their songs (a measured correlation of 0.763 where 0 is uncorrelated and 1 is perfectly correlated). Since the data are not perfectly correlated, examining songs which are exceptions to this trend is often valuable. Figure 5 plots each song in a 2-dimensional space, where the horizontal axis shows the number of times that the particular song was played in concert and the vertical axis shows the number of times the song was listened to by last.fm members. The solid curved line shows region for which songs display a strong correlation⁷.

The two dashed lines represent the 40th-percentile and 75th-percentile of concert plays. An interesting aspect of this plot are the outlying songs in the top left quadrant and the bottom right quadrant. The top left quadrant represents those songs that are heavily listened to by last.fm

⁶ A Spearman ρ rank-order correlation reveals a correlation of $\rho = 0.763$ with a p -value $< 2.2e-16$, where $\rho = -1$ is inversely related, $\rho = 0$ is unrelated, and $\rho = 1$ is correlated [3].

⁷ Specifically, the line represents a linear regression model that predicts usage in terms of concert plays. The data were fit to a line; the line appears curved because the values on both axes are plotted on logarithmic scale to preserve diagram clarity

song	times used
FRIEND OF THE DEVIL	143988
SUGAR MAGNOLIA	124736
TRUCKING	122877
CASEY JONES	102449
BOX OF RAIN	88340
UNCLE JOHNS BAND	82431
RIPLPE	80629
TOUCH OF GREY	71270
BROKEDOWN PALACE	54675
CANDYMAN	54344
FIRE ON THE MOUNTAIN	48516
FRANKLINS TOWER	45404
SCARLET BEGONIAS	42137
DARK STAR	39953
CHINA CAT SUNFLOWER	36479

Fig. 3. The top 15 downloads of Grateful Dead songs on last.fm from August 2005 to October 2007.

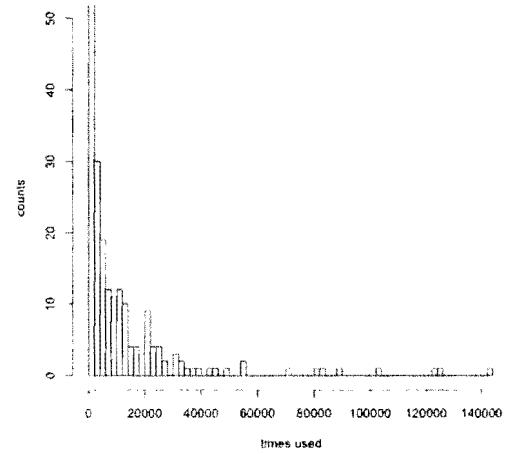


Fig. 4. A histogram of times a song was used on last.fm. The y-axis was trimmed from its maximum of 200 in order to preserve diagram clarity.

users, but rarely played by the Grateful Dead in concert. The bottom right quadrant represents those songs that were heavily played by the Grateful Dead (and presumably favorites of concert-going deadheads), but not frequently listened to by last.fm members. Finally, TRUCKING and SUGAR MAGNOLIA are in the upper right hand of the plot and represent not only the most popular songs in terms of times played in concert, but also times listened to on last.fm.

5 Conclusion

There exists a plethora of music history data available online that previously would have been very difficult or expensive to collect. This data may be analyzed using simple, well understood techniques to shed light on a particular band's preferences or the preferences of a fan base. Specifically, there are many websites which, after a band gives a concert, record and report the set list of songs played during that concert. After many years of performances an extensive record is publicly available. There is also an online service which makes a record whenever a subscriber listens to a particular song, then makes the anonymous statistics publicly available. This article presented an analysis of the Grateful Dead's concert behavior and their fan's listening behavior.

Acknowledgements

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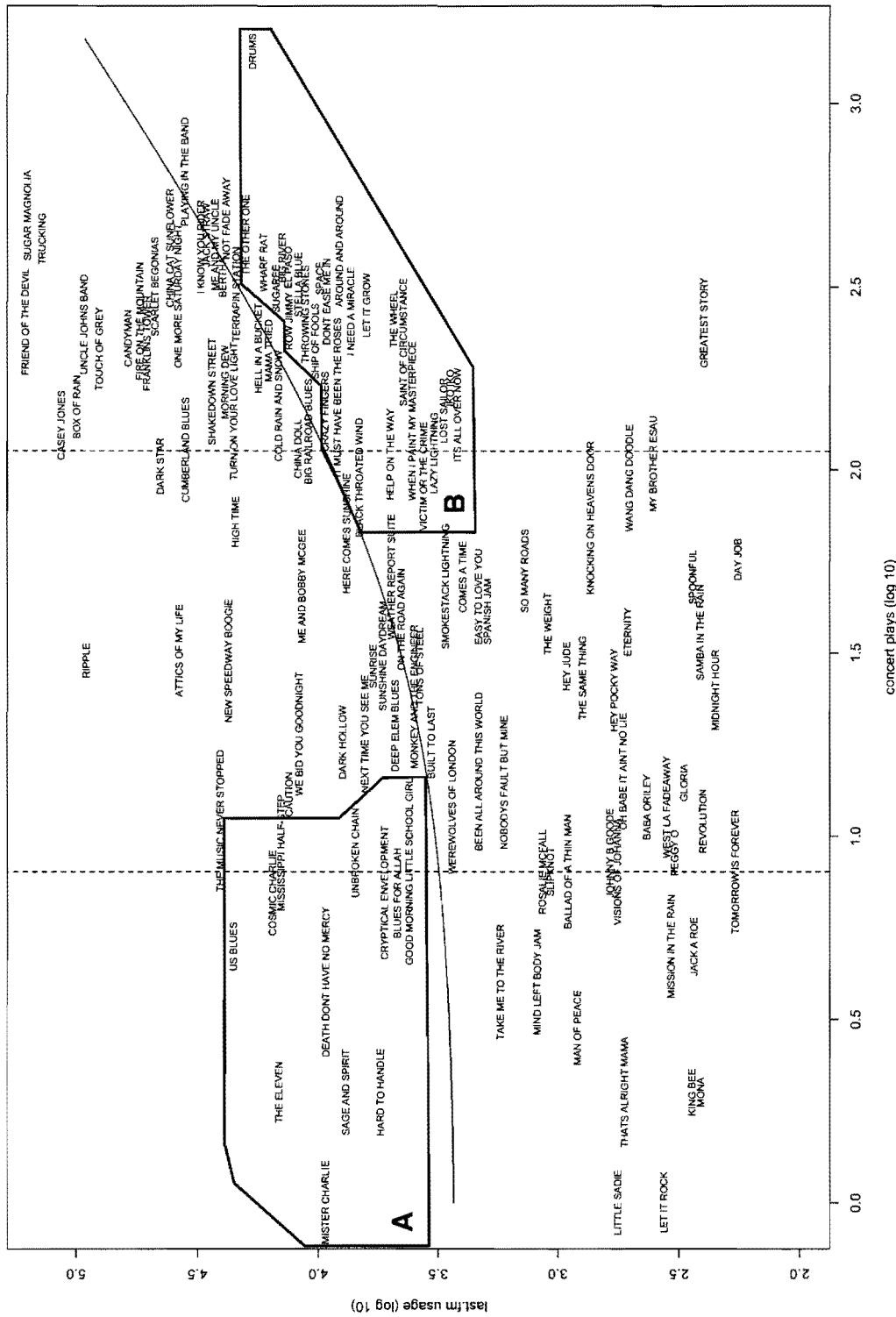


Fig. 5. Grateful Dead concert plays vs. last.fm usage.