Analyzing the Association Pattern Between Various Parameters Related to Audio Using WEKA Tools

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Abstract

The QoE by an end user depends on three important factors end –user services, networks used by end-user, equipment/terminals indented for end-users. As per the literature survey there is no way to estimate the QoE of the user based on his/her preferences. This research is based on studying the preferences of different users on selecting the multimedia component Audio. 514 members where tested to know their preferences on different Audio Equalization parameters such as 60Hz band, 170Hz band, 310Hz band, 600Hz band, 1Khz band, 3Khz band, 6Khz band, 12Khz band, 14Khz band and 16Khz band Slider Equalization using VLC media player. Using WEKA tool, the association pattern of various parameters related to audio in VLC media player and the user types is analyzed.

Keywords: Association Pattern, Equalizer, VLC, WEKA

Introduction

The vast development in variety of Networks and end systems poses an impeccable challenge in communication. This challenge becomes more of a risky challenge when multimedia data are transmitted. The QoS of Multimedia Streaming Applications becomes a very big issue considering the dynamic nature of *network characteristics, end system equipment and user's preferences.* In traditional Multicasting, Multimedia streams are transmitted at the same rate and resolution to all receivers independent of the network characteristics, end system equipment and user's preferences [1]. Such an Approach results in resources being wasted and many also result in receivers having their quality expectations unsatisfied.

In this paper a study is made on audio component. Data is collected regarding the audio from 514 members to know their preference on different audio equalization parameters such as 60Hz band, 170Hz band, 310Hz band, 600Hz band, 1Khz band, 3Khz band, 6Khz band, 12Khz band, 14Khz band and 16Khz band Slider Equalization. According to the values preferred by the users, the users are categorized as Type I, Type II, Type III, Type IV. From this values using the WEKA tool the association patters of various parameters related to audio and the user type is analyzed.

The remainder of this paper is organized as follows. Section 2 provides related work, Section 3 overviews Color Parameters, Section 4 presents a brief discussion of the use of video transcoding, and Section 5 shows the results. Finally, the paper concludes in Section 6 and discusses some directions for future work.

Related Work

The usability of devices and services has been studied for a long time, but attention to user experience and QoE is more recent. During the 1980s and 1990s most user-centered work focused on the usability of information and communication technology (ICT). Since 1998 usability has been defined by the International Standards Organization (ISO 9241, p. 2)[2], as the extent to which a product can be used by specified users to achieve specified goals with

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effectiveness, efficiency and satisfaction in a specified context of use. In recent years the use of ICT has extended from the workplace to the home and for applications that support leisure and social activities in addition to work. Consequently, the concerns of human-computer interaction have evolved from a focus on effectiveness and efficiency to user experience factors such as enjoyment, engagement and the appeal of using and owning ICT, e.g. [3].

The technology-centered approach mainly emphasizes the concept of QoS and has its strongest reference from the ITU (International Telecommunications Union). The ITU Recommendation [4] is the key reference and states that QoS is the: "Totality of characteristics of a telecommunications service that bear on its ability to satisfy stated and implied needs of the user of the service." [4]. although the ITU definition refers to user satisfaction, QoS is mainly used by technicians to define technical parameters of telecommunication applications such as network delay and packet loss. In addition, a focus on user satisfaction is rather limited because it is only one of many measures of user behavior with a communication service.

The Quality of Experience (QoE) approach is concerned with understanding the outcomes of people's use of ICT. The majority of work to date on QoE has concerned subjective measurement of experience and QoE is typically defined in terms of user satisfaction [5]. A QoE measure therefore needs to be stated together with the technical conditions of a communication service if it is to be useful for stakeholders. Consequently, QoE should be expressed in QoS terms [6] and [7]. In recognition of this, ETSI (the European Telecommunications Standards Institute) has provided the definition supported in this report. It is argued that the focus should be on how end-users experience a specific service, terminal or network. This report proposes a way to measure QoE and derive a body of QoE data as guidelines. The approach described enables comparing one service delivered with different Quality of Service parameters to see which QoS-level is good enough.

Audio Parameters

Equalization in audio production is basically the process of adjusting the volume of specific audio frequencies for obtaining a balanced frequency spectrum. Right use of equalizer can indeed make songs sound significantly better. It cut the unwanted frequencies or boost the ones that need to be more presence [8]. VLC features a 10-band graphical equalizer. **Equalization Level Sliders are u**se to adjust the equalization level. Also control the level via Band Tokens.

The Audio Equalizer gives bass and treble control of the tonal qualities of the microphone and, thus, of transmit audio quality. Equalizing for Spectral Character Equalization is nothing more than selectively amplifying a signal based on frequency. Each harmonic is responsible for one aspect of the audible character of a signal; knowing these relationships allow to quickly zero-in on the correct frequency range of the signal and quickly apply boost or cut to enhance or correct what you are hearing. "equalization" The audio spectrum has several critical portions that are responsible for our perceptions of sounds that user hear [9].

Table 3.1: Properties of Audio Equalizer and their Frequency Ranges

Range	Frequencies
Very Low Bass	16-64 Hz
Bass	64-256 Hz
Midrange	256-2048 Hz
Lisping Quality	3000 Hz
Presence Range	4750-5000 Hz
Brilliance	6500-16 kHz

Equalizer Operation

An equalizer is used to change the frequency response of an audio system. This enables the sound technician or the user to make adjustments that enhance the quality of the audio produced. However, it augurs well to remember that a sound system is like a chain, it is only as good as its weakest link. Poor microphones or speakers, et cetera can only be partially compensated for by a good equalizer [10].

A speaker that is not producing an even output, where some frequencies are louder than others can be smoothed out by adjusting the slide controls on a graphic equalizer. This takes a sharp ear and a degree of experimental adjustment in the inexperienced user. The sound coming from the speaker can appear to be too harsh and lacking in base[11]. Table 3.2 shows the properties of Equalization Bands.

Table 3.2: Properties of Equalization Bands

Frequency	Properties
60Hz	Hard Bass
170Hz	Medium Bass
310Hz	Light Bass
600Hz	Smooth Bass
1Khz	Voice Quality
3Khz	Funnel Quality
6Khz	Lisping Quality
12Khz	Overall Sharp
14Khz	Smooth Treble
16Khz	Sharp Treble

WEKA Tool

WEKA is a state-of-the-art facility for developing machine learning (ML) techniques and their application to real-world data mining problems. It is a collection of machine learning algorithms for data mining tasks. The algorithms are applied directly to a dataset. WEKA implements algorithms for data preprocessing, classification, regression, clustering, association rules; it also includes a visualization tools. The new machine learning schemes can also be developed with this package. WEKA is open source software issued under the GNU General Public License [12]. In this paper the association pattern of various parameters related to audio and the user types is analyzed using association rules.

Association Rule

WEKA contains an implementation of the Apriori algorithm for learning association rules [13]**.** This is the only currently available scheme for learning associations in WEKA. It works only with discrete data and will identify statistical dependencies between groups of attributes. Apriori can compute all rules that have a given minimum support and exceed a given confidence [14].

The data collected from the 514 members are categorized according to the user preferences of selecting the audio parameters such as ARG1, ARG2, ARG3, ARG4, ARG5, ARG6, ARG7 and ARG8.

These eight audio related gene are group into four type as TYPE1, TYPE2, TYPE3 and TYPE4. Using the WEKA tool the 10 audio equalizers are associated separately with the each type.

Table 4.1: Type Id

TYPE	PARAMETER
TYPE1	ARG1
	ARG2
TYPE2	ARG3
	ARG4
TYPE3	ARG5
	ARG6
TYPE4	ARG7
	ARG8

Findings

The following charts show the no of users and their preferred value of selecting the audio parameters. From all the users value the majority of the user preferred value is taken consider. Using those audio equalizer values, an association pattern between different equalizer settings and the user preferences is analyzed. The result of the paper concludes that there exist an association pattern between different equalizer settings and the user preferences with the confidential interval 0.60 and 1.0.

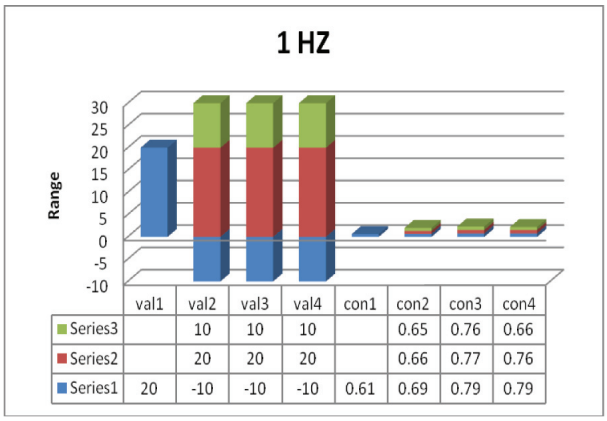


Chart 5.1: Frequency 1 HZ

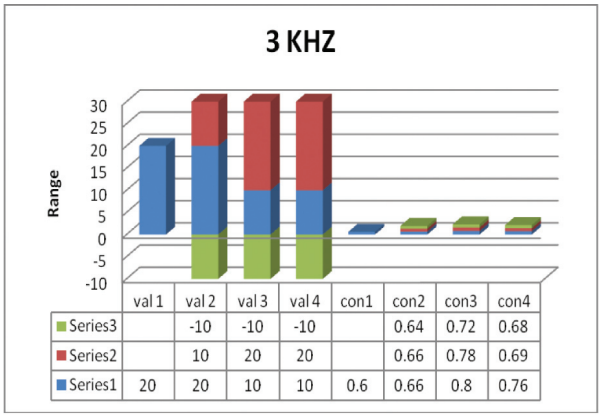


Chart 5.2: Frequency 3 HZ

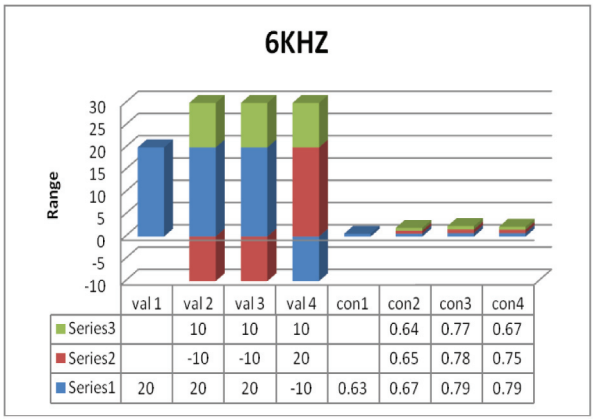
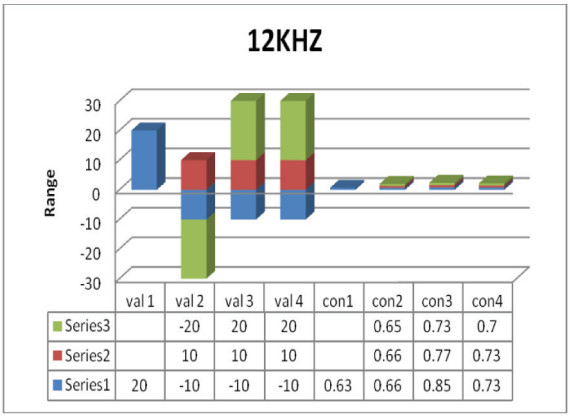
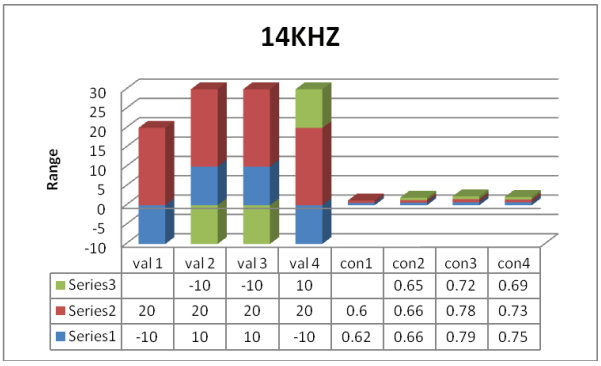


Chart 5.3: Frequency 6 HZ



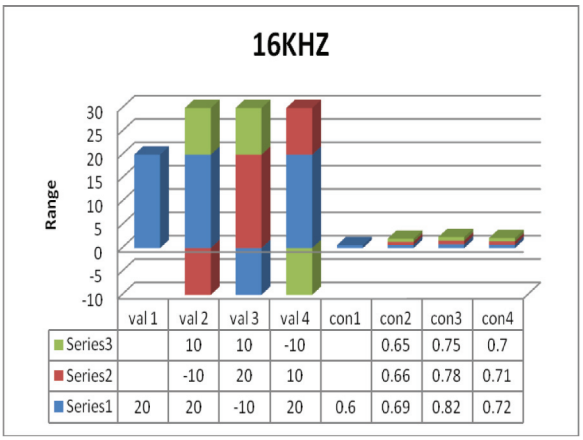
	val 1	val 2	val 3	val 4	con1	con2	con3	con4
Series3		-20	20	20		0.65	0.73	0.7
Series2		10	10	10		0.66	0.77	0.73
Series1	20	-10	-10	-10	0.63	0.66	0.85	0.73

Chart 5.4: Frequency 12 HZ



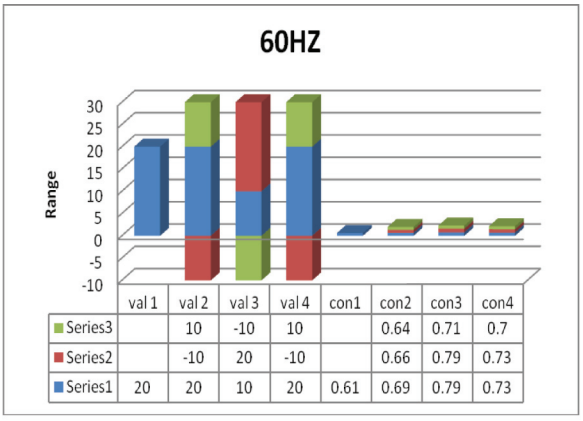
	val 1	val 2	val 3	val 4	con1	con2	con3	con4
Series3		-10	-10	10		0.65	0.72	0.69
Series2	20	20	20	20	0.6	0.66	0.78	0.73
Series1	-10	10	10	-10	0.62	0.66	0.79	0.75

Chart 5.5: Frequency 14 HZ



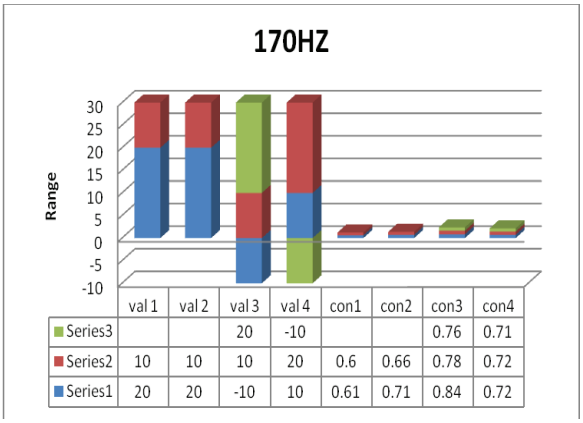
	val 1	val 2	val 3	val 4	con1	con2	con3	con4
Series3		10	10	-10		0.65	0.75	0.7
Series2		-10	20	10		0.66	0.78	0.71
Series1	20	20	-10	20	0.6	0.69	0.82	0.72

Chart 5.6: Frequency 16 HZ



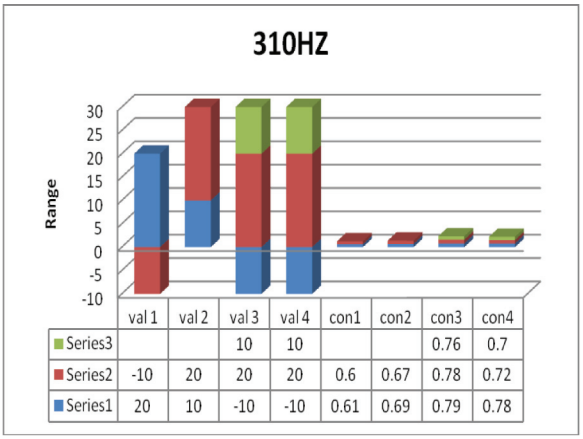
	val 1	val 2	val 3	val 4	con1	con2	con3	con4
Series3		10	-10	10		0.64	0.71	0.7
Series2		-10	20	-10		0.66	0.79	0.73
Series1	20	20	10	20	0.61	0.69	0.79	0.73

Chart 5.7: Frequency 60 HZ



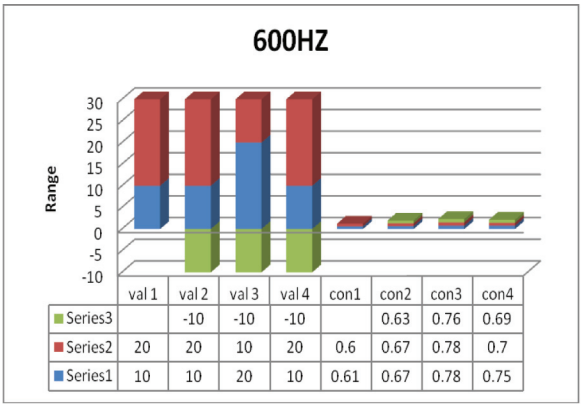
	val 1	val 2	val 3	val 4	con1	con2	con3	con4
Series3			20	-10			0.76	0.71
Series2	10	10	10	20	0.6	0.66	0.78	0.72
Series1	20	20	-10	10	0.61	0.71	0.84	0.72

Chart 5.8: Frequency 170 HZ



	val 1	val 2	val 3	val 4	con1	con2	con3	con4
Series3			10	10			0.76	0.7
Series2	-10	20	20	20	0.6	0.67	0.78	0.72
Series1	20	10	-10	-10	0.61	0.69	0.79	0.78

Chart 5.9: Frequency 310HZ



	val 1	val 2	val 3	val 4	con1	con2	con3	con4
Series3		-10	-10	-10		0.63	0.76	0.69
Series2	20	20	10	20	0.6	0.67	0.78	0.7
Series1	10	10	20	10	0.61	0.67	0.78	0.75

Chart 5.10: Frequency 600 HZ

Conclusion

As per the literature survey there is no way to estimate the QoE of the user based on his/her preferences. This paper is based on studying the preferences of different users on multimedia component Audio. 514 members were tested to know their preferences on different Audio Equalization parameters such as 60Hz band, 170Hz band, 310Hz band, 600Hz band, 1Khz band, 3Khz band, 6Khz band, 12Khz band, 14Khz band and 16Khz band Slider Equalization using VLC media player. Using WEKA tool, the association

pattern of various parameters related to audio in VLC media player and the personalities types is analyzed.

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