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Is Your Content Hazardous?

Content Conformance to Legal and Regulatory Requirements

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Media consumers have become increasingly discerning about the quality of content they consume and its (sometimes negative) impact on the human senses. For example, Flashy video with rapid scene changes and sudden luma transitions is potentially harmful to people who are prone to Photo Sensitive Epilepsy (PSE). Rapid changes in Loudness levels – normally observed during commercial breaks in programmes – are another source of nuisance for consumers.

Governments around the world are realizing the need to regulate these aspects of media and are enacting laws to ensure that the interests of consumers are protected. Various organizations such as ITU, ISO, and ITC have formulated recommendations specifying concrete thresholds and restrictions on the temporal and spatial characteristics of media content. Once these laws go into effect, companies across the content supply-chain have to be aware of potential legal ramifications of non-compliance to regulatory laws.

This paper looks into some of these issues that may make the content hazardous for consumers and the resulting impact on the media industry. In particular, broadcasters need to increasingly ensure that the content that they broadcast conforms to various legal & regulatory requirements across various regions.

Introduction

Media industry has been associated with bringing entertainment to consumers. Content is an integral part of our lives across different screens – cinema, television, internet, & mobile. As media consumption increases, incidents have come to light where consumers have suffered physiological harm because of content issues such as Audio Loudness & Flashy Video.

Broadcasters around the world are facing new legal & regulatory requirements as governments/regulators are trying to control the harmful aspects of media content. Avoiding **hazardous** content is a matter of regulatory compliance on the part of broadcasters and can have financial implications if not addressed properly.

Audio Loudness

Background

Historically, the methods of measurement of phonic electric signal levels during sound production for radio and television broadcasting did not reflect the subjective reception of the sound volume by the public.

Complaints about loud commercials are a long standing issue. Advertisers had a self-serving incentive to be loud in order to get people's attention. So, they developed material that was acceptable as per basic measurement techniques, despite being perceived as being loud by consumers.

A key challenge is to have a measurement technique that could consistently correlate with human perceptions when the program producer was creating the content. The attempts to encourage the development of a co-regulation mechanism did not work. Therefore, it became necessary to establish the new regulatory requirement for loudness.

This 1954 HOWTO from Mechanix Illustrated invites the reader to take apart the family TV set to make a remote-controlled mute button (called a "SHADDAP")

Regulatory Landscape

ITU

- The International Telecommunication Union (ITU) recognized the loudness problem and its work gave rise to ITU-R BS.1770. The purpose of that standard was to establish an agreed algorithm for the measurement of loudness and the true peak levels of programmes. It is a robust standard which has the benefit of a simple implementation.

Poland

- On 15 December 2009 the National Broadcasting Council adopted an amendment to its Regulation of 3 June 2004 concerning principles of advertising and teleshopping in radio and television programme services.
- The amendment aims to limit the practice of excessively increasing the volume, as well as the violent, abrupt change of sound levels during radio and television advertising and teleshopping spots in comparison to the programmes preceding the advertising break.
- In order to ensure that this requirement will be properly exercised, the broadcaster is obliged to conduct comparisons of the loudness level of the programmes broadcast within the period of 20 seconds before the beginning of the transmission of advertising or teleshopping to the loudness level of each transmitted advertising and teleshopping spot.

- The technical rules of volume measurement level have been elaborated based on ITU recommendations: ITU-R BS.1770-Algorithms to measure audio programme loudness and true-peak audio level and ITU-R BS.1771-Requirements for loudness and true-peak indicating meters.

USA

- H.R.6209 - Commercial Advertisement Loudness Mitigation (CALM) Act requires the Federal Communications Commission to prescribe a standard to preclude commercials from being broadcast at louder volumes than the program material they accompany.

- The CALM Act refers directly to ATSC Recommended Practice A/85 “Techniques for Establishing and Maintaining Audio Loudness for Digital Television”,

Europe

- The EBU has studied the needs of audio signal levels in production, distribution and transmission of broadcast programmes. It is of the opinion that an audio-levelling paradigm is needed based on loudness measurement. This is described in EBU Technical Recommendation R 128.

- In addition to the average loudness of a programme (‘Programme Loudness’) the EBU recommends that the descriptors ‘Loudness Range’ and ‘Maximum True Peak Level’ be used for the normalization of audio signals and to comply with the technical limits of the complete signal chain as well as the aesthetic needs of each programme/station depending on the genre(s) and the target audience.

Detecting Audio Loudness

The first research on the topic of how the ear hears different audio frequencies at different levels was conducted by Fletcher and Munson in 1933.

The curves as shown in Figure 1 depict how the human ear perceives loudness differently at different frequencies.

There has been a change in the leveling paradigm from peak normalization to loudness normalization. This is illustrated in Figure 2.

This change is vital because of a problem that has become a major source of irritation for television and radio audiences around the world – that of the jump in audio levels at the breaks within programmes, between programmes, and between channels. Loudness normalization is the solution to counteract this problem.

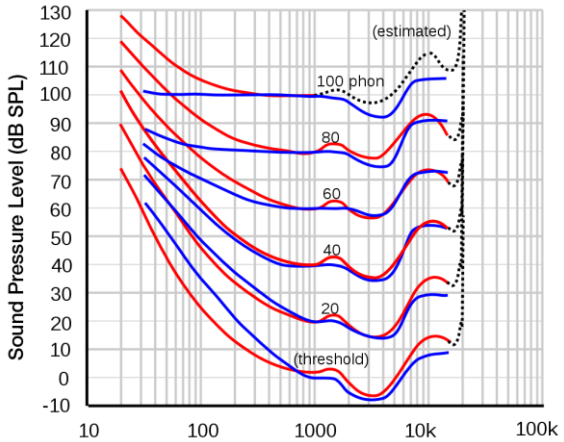

Figure 1 Fletcher-Munson curves

Broadcasters need to rely on automated content verification solutions to ensure that loudness is measured objectively rather than rely on subjective human verification.

Some important parameters while detecting audio loudness are:

- Acceptable duration of audio loudness
- Acceptable level of audio loudness
- Audio channel – cumulative or channel-wise
- Average loudness level
- Acceptable Duration of Audio Loudness

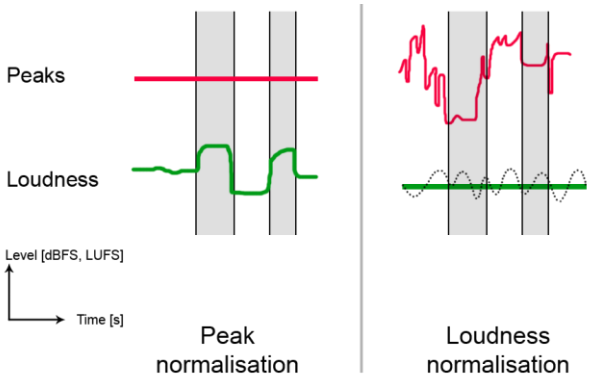

Figure 2 Peak normalisation & Loudness normalisation

Different regulations have taken different approaches to loudness measurement. An "EBU Mode" loudness meter as defined in EBU Tech Doc 3341 offers three distinct time scales:

- **Momentary Loudness** (abbreviated "M") – time window: 400ms
- **Short-term Loudness** (abbreviated "S") – time window: 3s
- **Integrated Loudness** (abbreviated "I") – from "start" to "stop"

The CALM Act mandates adoption by FCC of the ATSC (A/85) that describes how to quantify audio loudness and then give a procedure for sending information to TV receivers to essentially adjust their volume control automatically to maintain a constant loudness.

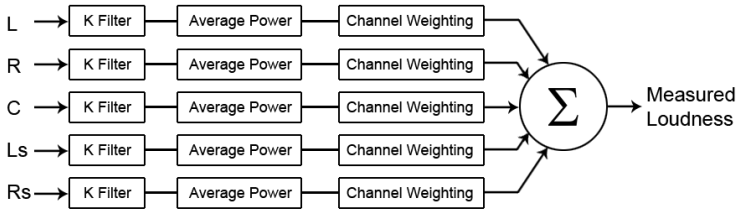

Figure 3 ITU-R BS. 1770 loudness algorithim

The technique used to quantify loudness is basically the same one used in the 1980s CBS system and is shown in Figure 3.

Flashy Video

Background

Photosensitive epilepsy (PSE) is a form of epilepsy in which seizures are triggered by visual stimuli that form patterns in time or space, such as flashing lights, bold, regular patterns, or regular moving patterns.

Persons with PSE experience epileptiform seizures upon exposure to certain visual stimuli. The visual trigger for a seizure is generally cyclic, forming a regular pattern in time or space. Flashing lights or rapidly changing or alternating images (as in clubs, around emergency vehicles, in action movies or television programs, etc.) are an example of patterns in time that can trigger seizures, and these are the most common triggers. Static

spatial patterns such as stripes and squares may trigger seizures as well, even if they do not move. In some cases, the trigger must be both spatially and temporally cyclic, such as a certain moving pattern of bars.

The most common form of epilepsy, PSE afflicts as many as 0.8% of children aged 4 to 14. The number of diagnoses has risen in recent decades with the growing popularity of flashy video games, which can trigger a seizure. Most kids grow out of PSE by the time they're in their late teens. Although the condition has been recognized for years, no one has pinpointed what sorts of patterns are most dangerous or why.

- In March 1997, the 25th episode of an anime series called YAT Anshin! Uchū Ryokō had a similar incident when a reported four children were taken to hospitals by ambulances when a scene with red and white colors flashed.

- Photosensitive epilepsy was again brought to public attention in late 1997 when the Pokémon episode "Dennō Senshi Porygon" (aka "Electric Soldier Porygon") was broadcast in Japan, showing a sequence of flickering images that triggered seizures simultaneously in hundreds of susceptible viewers (although mass hysteria caused 12,000 children to report seizure-like syndromes).

- 2012 London Olympics promotional film incident: An animated segment of a film promoting the 2012 London Olympics was blamed for triggering seizures in people with photosensitive epilepsy. The charity Epilepsy Action received telephone calls from people who had had seizures after watching the film on television and online. In response, it was reported that London 2012 Olympic Committee removed the offending segment from its website.

Regulatory Landscape

These incidents caused the UK and Japan to introduce Guidelines on the use and incidence of Flashing Images and Regular Patterns in order to protect photosensitive or potentially photosensitive viewers from provocative stimuli. The Guidelines seek to protect viewers by reducing risk of seizure from 1 in 4000 to 1 in 3 million.

Summary of UK Transmission Guidelines

- Luminance flashes or changes to and from saturated red may occur up to 3Hz. Higher flash rates are only allowed for up to 25% of the screen area.

- Stationary patterns containing more than 5 light dark bars should not occupy more than 40% of the screen area. Such patterns that oscillate, flash or reverse are restricted to 25% of screen area.

- Luminance flashes or patterns that violate the above conditions may still be allowed if the contrast between light and dark is less than 20 cd/m2 or if the darker component is lighter than 160 cd/m2 (maximum TV brightness is approx. 200 cd/m2.

Detecting Flashy Video

Detection of harmful flashes is normally done in accordance with Recommendation ITU-R BT. 1702. In accordance with this recommendation, there should not be more than 3 flashes in a second.

While checking for flashy video, the detection mechanism should check for:

- Rapid Scene Changes
- Luma Flashes
- Saturated Red Flashes
- Regular Patterns – examples could be light & dark stripes that are horizontal, vertical, slanted, or spiral that:
    - cover more than 40% of a frame
    - are stationary or moving (reversing, oscillating, changing direction)
    - persist for more than 0.5 seconds
- If the pattern is moving slowly and smoothly, is should not be detected as harmful

Detection of flashy video in a media workflow is extremely difficult using traditional, manual verification or sampling techniques. A normal person who doesn't suffer from PSE would not be able to detect flashiness in a video. Additionally, flashiness in a video affects different humans to different extent, thus there is a need for objective verification.

Automated content verification solutions help in ensuring flashiness compliance. Their faster performance makes it possible to verify the entire media content, not just a sample.

Summary

The media environment is changing as governments around the world bring in regulations to control potentially harmful aspects of media. Various organizations such as ITU, ISO, and ITC have formulated recommendations specifying concrete thresholds and restrictions on the temporal and spatial characteristics of media content.

Companies across the content supply-chain have to be aware of issues such as Audio Loudness & Flashy Video. There is enough regulatory guidance available for Broadcasters to establish mechanisms to control content issues that may make the content hazardous for consumers. The availability of Automated Content Verification Systems has made it easy to detect these issues in media content. It is a matter of regulatory compliance and not just a good-will act on the part of broadcasters.

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