WRITTEN ASSIGNMENT 2: FINAL REVIEW
AUTOMATIC TELEVISION VOLUME CONTROLLER

Grant Cuthbert (SID 420081629)

Digital Audio Systems, DESC9115, Semester 1 2012
Graduate Program in Audio and Acoustics
Faculty of Architecture, Design and Planning, The University of Sydney

ABSTRACT

This review proposes the development of an automatic television volume adjustment device using Digital Signal Processing technologies. It aims to provide a practical solution to a common annoyance many people encounter on a daily basis: the noticeable difference in perceived loudness between normal programming and commercials.

1. INTRODUCTION

1.1. Problem

It can be frustrating when a television commercial abruptly interrupts a program with what seems to be a significant volume increase to that of the program. In speaking with family and friends on the subject recently, I found that every person who I discussed the subject with was aware of it's occurrence and expressed negative opinions regarding it.

While this practice seems an obvious ploy to attract attention to the advertisements, one could argue that this practice could contribute to lower network ratings if people are inclined to change the channel when a loud commercial disturbs them.

1.2. Law and regulation

One common assumption is that television networks are simply raising the volume level during commercials. If this were the the case, it would be relatively straight-forward to regulate. However, there are several other factors aside from loudness which can be used to achieve similar results. An example of this is the excessive use of compression during commercials.

Compression reduces the dynamic range of a signal, where the minimum volume is raised, but the maximum volume remains unchanged. For this reason loudness regulation alone is not a comprehensive solution.

In the United States, the issue was addressed in 2011 by the Federal Communications Commission, resulting in laws which require commercials to have “the same average volume as the programs they accompany”[1]. This will come in to effect in December 2012.

In Australia, Free TV has implemented Operational Practice 48 – *Audio Levels and Loudness* [2]. While this regulation seems relatively comprehensive - containing requirements regarding loudness, alignment signals, compression, limiting and equalisation – networks still find loop holes and commercial volume increases are still prevalent.

1.3. Existing products

Many products have been developed to counter these adjustments with varying degrees of success. Most of which have aimed to limit the maximum volume so that the difference between programs and commercials is not noticeable. During my recent discussions I found that some people desire a different outcome to this. For example, some people would prefer there to be *no audible sound* during commercials. In order to achieve this, we need to reduce the level across the whole amplitude spectrum – not just limit the maximum level.

1.3. Aim

This review aims to demonstrate how DSP technologies may be utilised in the development of a consumer product for use within Australia that adjusts television volume fluctuations of an undesirable nature, in a manner that satisfies user preference.

2. METHOD

2.1. Methods of detection

The main challenge in implementing automatic commercial volume attenuation is detecting when a commercial begins. There are several methods typically used to identify commercials;

- Detecting blank frame often found at beginning of commercial
- Detecting absence of network logo/ watermark (typically found in the bottom right corner of the screen)
- Detecting significant scene transitions

While these methods are valid and have a relatively good rate of accuracy, they are not ideal as there are many approximations and assumptions made by the system.

OP 48 imposes a requirement on Australian networks which states “commercials must be preceded by a one kilohertz tone having a constant relationship to and representing the normal level of the audio material that follows it.” [3] This requirement can potentially offer and more accurate method of detection and adjustment.

2.2. Control parameters

The proposed device will have the following simple controls

- *Off/ On* switch
- *Attenuation* – desired dB change during commercials

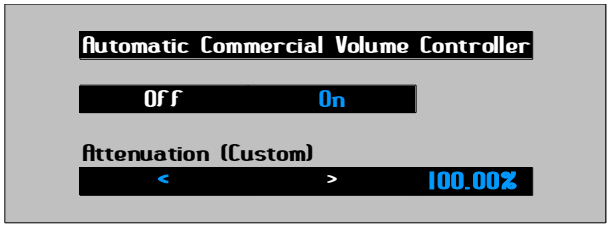

Fig 2.1

2.3. Implementation

As previously stated, we will use the 1 kHz tone (also known as the 2-pop) which precedes commercials in Australia as the activation signal. This tone is of one frame in legnth and precedes the commercial by two seconds. For DVB-T (Digital Video Broadcasting - terrestrial)/ MPEG2 used on Australian television, the frame rate is 25 frames per second.

The television audio is sent via RCA cables as an electrical signal. Upon entering the device, the signal is processed through an analog-to-digital converter (ADC). If a 1 kHz signal at -20 dBFS is detected for 0.04 seconds (1 second/ 25 frames), the device is activated. The *active* status is indicated by a red light on the device as seen in Fig. 2.1.

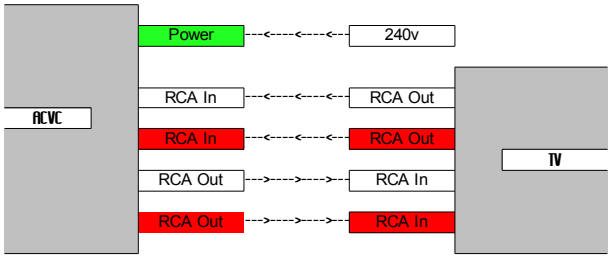

Fig 2.2

During the time that commercials are not being broadcast, the device continues to process the signal in bypass mode. While it does not alter the signal, it does note the maximum dB level transmitted for each 30 second period. If the *balance* option is selected, the device limits the maximum dB level to the value recorded for the last 30 second period.
If the *custom* option is selected, the signal is attenuated per the user defined dB setting on the device.

Following the appropriate process, the signal passes through a digital-to-analog converter (DAC) and is returned to the television via RCA. The setting is abandoned once a black 0.04 second frame is encountered, signaling a return to normal programming.

Simple multiplication of the signal will achieve the desired result.
Eg. for a setting of 80.50%
$y(n) = x(n) * .805$

3. CONCLUSION

Using this simple design, the device could be easily implemented in a timely manner. Being that there are so many variables in television broadcasting internationally, it is appropriate to have a device which is country-specific to maximise commercial detection accuracy.

4. ACKNOWLEDGEMENTS

The author thanks Dr William L. Martens and Luis Miranda for education in digital audio technologies relevant to this paper.

5. REFERENCES

[1] Federal Communications Commission. *Loud Commercials.* [online]. Available: www.fcc.gov/encyclopedia/loud-commercials [June 4, 2012].
[2] Free TV Australia. *Classification Handbook.* [online]. Available: www.freetv.com.au/media/CAD/Classification_Handbook.pdf [June 5, 2012].
[3] Free TV Australia. *OP 48 – Audio Levels and Loudness.* [online]. Available: http://www.freetv.com.au/media/Engineering/OP48_Issue_2_-_January_2007_-_Audio_and_Loudness_Levels_2_.pdf [June 5, 2012]