NAB TV TechCheck

The Weekly NAB Newsletter for Television Broadcast Engineers

October 13, 2008

AES PAPER ON PERCEPTION OF AUDIO-VIDEO SYNCHRONIZATION

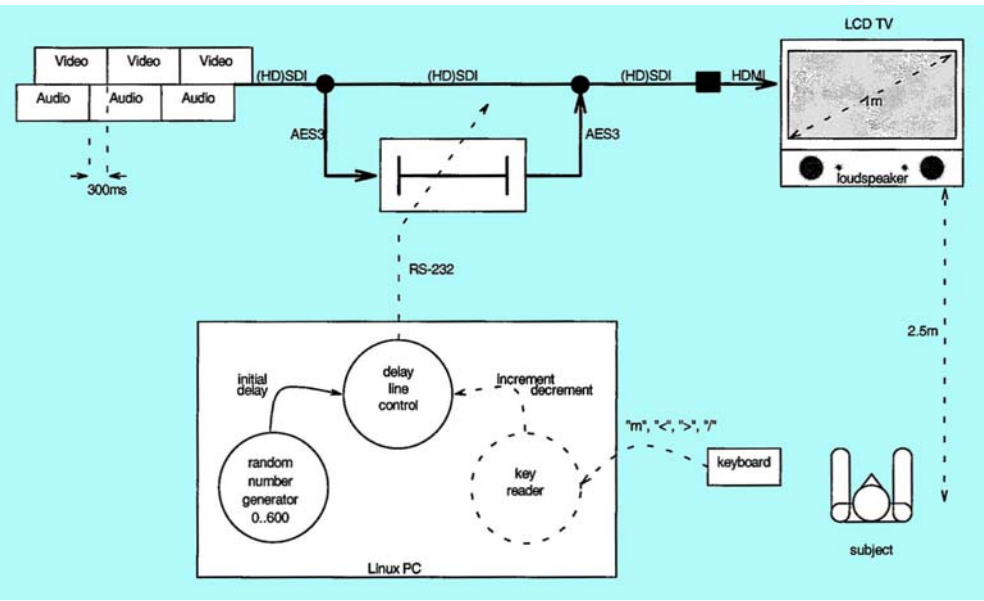
The 125th Convention of the Audio Engineering Society (AES), held in San Francisco from October 2-5, included a paper entitled *Factors Affecting Perception of Audio-video Synchronization in Television* by Andrew Mason and Richard Salmon of the British Broadcasting Corporation (BBC) in the United Kingdom. This paper reports on research being carried out at the BBC Research Laboratories into audio-video synchronization (A-V sync), specifically in the area of human perception of synchronization errors.

The timing relationship between audio and video in television is commonly referred to as "lip sync." As noted in the paper, this term originates from observation of television pictures showing a person talking, where a mismatch of more than a few tens of milliseconds between the sounds heard and the pictures seen can ruin the illusion that is television: the motion of the talker's lips should be correctly synchronized with the sounds heard. In the paper, the concept of correct synchronization, and some of the technical and psychological factors that can affect perception of the correctness a televisual presentation, are discussed. Also noted is the fact that several international organizations are actively working in the field of audio video synchronization, with the aim of reducing the accumulation of errors that often plague television broadcasts.

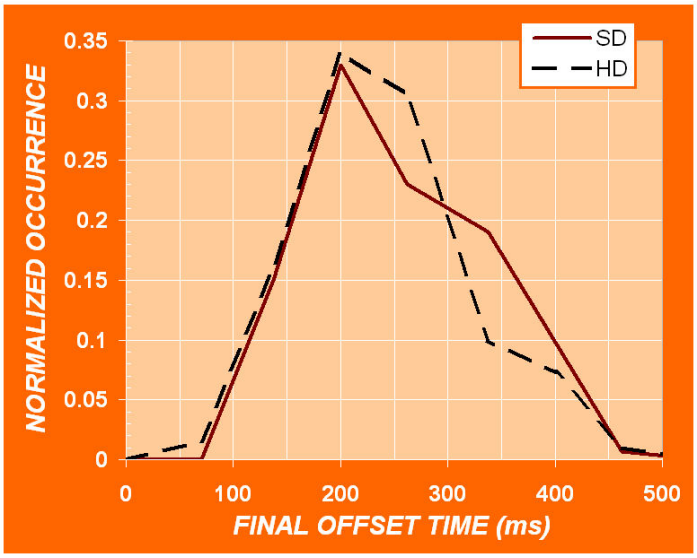
The first part of the paper discusses the role that acquisition, production, processing, and reproduction equipment may play in the introduction of synchronization errors, focusing on:

- Camera types
- Router
- Audio mixer
- Aspect ratio conversion
- Low bit rate coding, including DVB
- Audio dynamic range compression
- Loudspeakers and acoustic environment
- Vision mixer
- Video synchronizer
- Standards conversion (change of frame rate)
- Digital video effects (DVE)
- Sample frequency conversion
- Displays
- Audio processing in the receiver

The paper describes how all these factors can contribute to A-V sync errors, some small but some of multiple frames duration, if delays are not compensated. The paper also states that mishandling of MPEG system time clock (STC) and presentation time stamps (PTS) in DTV receivers are a source of much of the perceived mistiming in broadcast television reception.



Of particular interest is an experiment, described in the paper, designed to assess the effect of image resolution on audio-video synchronization perception, comparing 625 SD to 1080i HD (both at 25 fps). The test set-up is shown in the block diagram above; viewers were asked to correct a 300 ms offset between an audio



and a video signal, for both SD and HD images, and the final offset value (as established by the viewer) was noted. Some preliminary results from this experiment are shown in the graph, which illustrates the probability that a particular final time offset was selected, with larger "normalized occurrence" values representing a higher likelihood. (Note that because of other delays in the experimental apparatus, the "FINAL OFFSET TIME" scale in the figure is a relative scale and does not represent the actual, final offset between the audio and the video.) These results, while not showing a major difference between lip sync perception for SD and HD images, do indicate some differences.

While viewers were most likely to select a final offset time of 200 ms for either SD or HD, note that the distribution of the SD results is wider than that of the HD results, suggesting that accurate lip-sync is less critical for SD images than for HD. The authors believe that additional studies would be useful to further characterize this behavior.
The next part of the paper discusses the work being done by other organizations in the field of A-V sync. It mentions the work in the International Electrotechnical Commission (IEC), Advanced Television System Committee (ATSC), the Society of Motion Picture and Television Engineers (SMPTE, led by a member of NAB Science and Technology staff), European Broadcasting Union (EBU), and the AES.

The final part of the paper describes objective and subjective methods for measurement of A-V sync developed by the BBC. The "electronic clapperboard system" described has many similarities to a system developed by Sarnoff Corporation and described in October 29, 2007 issue of *TV TechCheck* .

A copy of the complete AES paper will be available for purchase on the AES Web page soon – go to www.aes.org/publications/preprints/ and look for the link to the AES 125th Convention, San Francisco, Calif.

FCC Reminds Television Stations to Update Their DTV Transition Status Report - FCC Form 387 - By October 20, 2008

On October 10, 2008 the FCC's Media Bureau issued a public notice reminding TV stations of their obligation to update Form 387 by October 20, 2008. The FCC adopted the requirement for stations to periodically file a DTV Transition Status Report in the *Third DTV Periodic Review Report and Order.* All television stations that have not reported on their DTV Transition Status Report that their post-transition DTV facilities are "fully operational," must update their DTV Transition Status Report by October 20, 2008. Stations should report the current status of their efforts to complete their post-transition DTV facilities and should report any change to the information contained in their previous DTV Transition Status Report. The Public Notice states that although detailed explanations concerning the DTV transition status may be filed as an exhibit, stations must complete all relevant boxes on their DTV Transition Status Report. It also states that the information is important in order for the FCC to be able to determine whether stations are on track to complete the DTV transition on time.

Form 387 must be updated electronically using the FCC's Consolidated Database System ("CDBS") Electronic Filing System on the Media Bureau's Web site at: http://www.fcc.gov/mb/cdbs.html or http://fjallfoss.fcc.gov/prod/cdbs/forms/prod/cdbs_ef.htm.

For more information see the Public Notice here: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-08-2264A1.pdf, or contact the Media Bureau's Video Division: Nazifa Sawez, Nazifa.Sawez@fcc.gov, at (202) 418-7059, or Shaun Maher, Shaun.Maher@fcc.gov, at (202) 418-2324.

Deadline Extended for NAB Broadcast Engineering Conference Call for Papers

The NAB Show will host the 63rd NAB Broadcast Engineering Conference on April 18 – 23 at the Las Vegas Convention Center in Las Vegas, Nev. The NAB Broadcast Engineering Conference is a highly technical conference where presenters deliver technical papers ranging over a variety of topics relevant to the broadcast and allied industries. We invite you to submit a proposal to present a technical paper at our conference. The deadline for submitting your proposal is **October 27, 2008**.

To submit a technical paper proposal, click here and complete the electronic form. If you have questions regarding the NAB Broadcast Engineering Conference, please contact John Marino.

It's Not Too Late to Register for the 58th Annual IEEE Broadcast Symposium

The IEEE Broadcast Technology Society
Managing the Transitions
15 - 17 October 2008
The Westin Alexandria
Alexandria, Va.

Keynote speakers to include: Richard E. Wiley, Wiley Rein, LLP and Peter Fannon, Panasonic Corporation. Please visit the Registration page for additional information.

ATSC Digital VSB Measurements Seminar

Monday, October 20, 2008
Sheraton Indianapolis Hotel & Suites
Indianapolis Ind.

A one-day seminar on the ATSC's digital television (DTV) vestigial sideband (VSB) transmission system measurement methodologies will be presented on October 20 in Indianapolis Ind. Presented by DTV transmission engineer, Gary Sgrignoli, the seminar identifies and describes the pieces of test equipment needed for VSB testing in the laboratory, at transmitter sites and at remote field sites.

For additional information contact Gary Sgrignoli, Meintel, Sgrignoli & Wallace at (847) 259-3352 or Gary.Sgrignoli@IEEE.org.